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1883.

NEW SOUTH WALES.

VOTES

AND

PROCEEDINGS

OF THE

LEGISLATIVE ASSEMBLY

DURING THE SESSION

OF

1883,

WITH THE VARIOUS DOCUMENTS CONNECTED THEREWITH.

IN FOUR VOLUMES
AND SUPPLEMENTARY VOLUME.

VOL. IV.

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LEGISLATIVE ASSEMBLY.
NEW SOUTH WALES.

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SESSION 1883.

IN FOUR VOLUMES
(AND SUPPLEMENTARY VOLUME.)

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1883.

LEGISLATIVE ASSEMBLY.
NEW SOUTH WALES.

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GENERAL INDEXES

TO THE

LETTERS OF REGISTRATION

FOR

INVENTIONS AND IMPROVEMENTS IN THE ARTS OR MANUFACTURES,
GRANTED IN NEW SOUTH WALES,

FROM 1855 TO 1880 INCLUSIVE;

TOGETHER WITH

ACTS 16 VIC. No. 24 AND 42 VIC. No. 27;

MODE OF APPLYING FOR LETTERS OF REGISTRATION, AND SUGGESTIONS FOR PREPARING
DRAWINGS ACCOMPANYING SPECIFICATIONS;

CLASSIFIED TABLE OF LETTERS OF REGISTRATION GRANTED,
WITH ABRIDGMENTS OF THE SPECIFICATIONS;

AND VARIOUS OTHER PARTICULARS.

COMPILED UNDER THE DIRECTION OF THOMAS RICHARDS, GOVERNMENT PRINTER,
REGISTRAR OF COPYRIGHT, &c.

ORDERED BY THE LEGISLATIVE ASSEMBLY TO BE PRINTED,
20 *March*, 1883.



SYDNEY: THOMAS RICHARDS, GOVERNMENT PRINTER.

1883.

*266—A

ERRATA.

Page 38,	No. 59,	Class 4.	For "meat-cutting" read "cutting."
" 39,	" 220,	" 4.	For page "2" read "9"
" 43,	" 296,	" 7.	For "1873" read "1874."
" 43,	" 523,	" 7.	For "1873" read "1879."
" 45,	" 799,	" 13.	For vol. "1" read "2."
" 45,	" 43,	" 15.	Omit "to" before "improvements."
" 46,	" 721,	" 15.	For vol. "2" read "1."
" 47,	" 12,	" 17.	Insert "and" before "cattle," omit "and" after "slaughter-houses."
" 47,	" 297,	" 17.	For "1873" read "1874."
" 48,	" 561,	" 17.	Page "177."
" 48,	" 680,	" 17.	For "1882" read "1881"
" 50,	" 893,	" 18.	For "B" read "1882, vol. 2."
" 56,	" 108,	" 18.	Four lines from bottom insert "of" after "bottom."
" 58,	" 367,	" 18.	Six lines from bottom, for "successfully" read "successively."
" 59,	" 716,	" 18.	For "A" read "1882, vol. 1."
" 59,	" 851,	" 18.	For "B" read "1882, vol. 2."
" 61,	" 798,	" 18.	For "B" read "1882, vol. 2."
" 61,	" 585,	" 18.	Five lines from bottom, for "one" read "use."
" 64,	" 278,	" 18.	For page "74" read "47."
" 65,	" 33,	" 18.	For No. "33" read "533."
" 67,	" 53,	" 18.	Before "Aug." insert "4."
" 67,	" 138,	" 18.	Fourth line, after "or plain" omit "or plain."
" 68,	" 767,	" 18.	For "A" read "1882, vol. 1."
" 71,	" 527,	" 22.	Insert "for" after "&c."
" 73,	" 836,	" 25.	For vol. "1" read "2."
" 78,	" 481,	" 31.	Two lines from bottom, for "excavating" read "excavator."
" 78,	" 499,	" 31.	For "wool in weight" read "weight in wool."
" 78,	" 602,	" 31.	For "Fay" read "Fry," and for "1879" read "1881, vol. 1."
" 79,	" 840,	" 31.	For vol. "1" read "2"; also, four lines from bottom, omit "the same" insert "it."
" 80,	" 211,	" 32.	Fourth line, for "hand-lever" read "hand-lever."
" 80,	" 421,	" 32.	Third line, for "parts" read "ports."
" 80,	" 669,	" 32.	For "1878" read "1881, vol. 2."
" 81,	" 91,	" 33.	After "Eve" insert "(by his attorney, Alfred E. Clarke)."
" 81,	" 236,	" 33.	For "tractive" read "traction."
" 82,	" 886,	" 33.	Omit page "311."
" 83,	" 892,	" 33.	Insert page "311."
" 85,	" 409,	" 39.	Five lines from bottom, for "of" read "or"; and three lines from bottom, for "hands" read "hands."
" 85,	" 745,	" 39.	For page "62" read "65."
" 85,	" 770,	" 39.	Five lines from bottom, for "in vessel" read "a vessel."
" 86,	" 699,	" 40.	Fifth line, for "of" read "or."
" 87,	" 203,	" 44.	Third line, for "top half" read "top-half"; seventh line, for "crowbar" read "cross-bar"; ninth line, for "compound" read "compounded," and omit last "of."
" 88,	" 737,	" 44.	Third line, for "cars" read "ears"; fourth line, for "testor" read "sector."
" 89,	" 80,	" 46.	Four lines from bottom, for "five" read "fore."
" 94,	" 746,	" 48.	Sixth line, for "jine" read "fine."
" 95,	" 270,	" 49.	Third line, for "Combing" read "combining."
" 96,	" 299,	" 49.	Three lines from bottom, for "resolve" read "revolve."
" 98,	" 63,	" 50.	Last line, insert "in" before "the."
" 99,	" 106,	" 52.	For "Mephiticosenon" read "Mephiticoseun."
" 99,	" 456,	" 52.	Four lines from bottom, for "been" read "being."
" 100,	" 771,	" 52.	Fourteenth line, for "moisture-deposition" read "moisture-depositing"; seven lines from bottom, for "jaw" read "fan."
" 101,	" 172,	" 53.	For "jinger-bar" read "finger-bar."
" 101,	" 185,	" 53.	Omit "Higham" from name of applicant.
" 102,	" 489,	" 53.	Omit "which is" insert "the solution being."
" 102,	" 573,	" 53.	Insert "Wolseley" after "York" in name of applicant.
" 103,	" 252,	" 55.	Middle of paragraph, for "fire, clay" read "fire-clay."
" 104,	" 242A,	" 56.	Fourth line, after "bottles" insert "containing."
" 105,	" 646,	" 56.	For page "122" read "221."

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886	"	"	" " "
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PREFACE.

INVENTIONS and improvements in the arts and manufactures are protected in Great Britain by Letters Patent, in New South Wales by Letters of Registration. The Letters of Registration Act of this Colony, 16 Vic. No. 24, was passed on 6 December, 1852, it being doubtful at the time whether the Imperial Act on the subject extended to or had effect in New South Wales; the Act did not, however, come into force till 10 January, 1854. Most of the British Possessions have now their own Patent Laws, and Great Britain no longer grants Patents for the Colonies.

The Act was soon freely used, but the specifications and annexed drawings that accumulated were not made accessible to the public till after they had been ordered to be printed by the Legislative Assembly. This took place on 10 May, 1861, when Resolutions were moved by the late Mr. James Hart, M.P., asking for a return containing full particulars on the subject, and that "similar returns be laid before Parliament annually."

This order has been strictly complied with; but it has not been found possible till recently to publish the specification volumes regularly, owing to delays in printing the plans. The improved facilities for reproducing maps, plans, and diagrams photo-lithographically, and by other photo-mechanical means, which this Department now possesses, render it possible, however, to publish the specifications complete immediately after the Letters of Registration are granted, provided the diagrams and illustrations are drawn in a manner suitable for rapid reproduction. Instructions on this point are given at p. 14. At present most of the diagrams have to be redrawn, or to undergo a process of adaption nearly as expensive; but by following the instructions referred to, a large saving would result to applicants in the first instance, and to the Government subsequently, in the publication of the specifications. The immediate saving to Government that might be made in this direction would be about £350 per annum, and a larger saving would accrue in the future, as the business must of necessity increase very much. The saving to applicants cannot be exactly estimated, but it is clear that it would be considerable, and they would have the further advantage of being able to prepare their applications and secure their Patent rights more expeditiously than at present.

In this publication an attempt is made for the first time to supply classified Indexes and Lists of reference to the Letters of Registration issued in the Colony, which amounted to 900 up to the end of 1880, and cover about 2,300 pages of print.

The following remarks will fully explain the arrangement of the book :—

1. The instructions relative to the mode of applying for Letters of Registration, the copies of forms to be used in making the application, and the instructions for preparing drawings and diagrams will be found at pages 12, 13, and 14.

2. The abridged Specifications of Patents are arranged under the same classes or heads as the *Imperial Abridgments of Specifications*. These heads are consecutively numbered, and the numbering is the same as that adopted by the Imperial Patents' Office, so that any particular class of Patents can be followed out from the Imperial series of *Abridgments* through this publication. It may be mentioned that the Imperial headings have been slightly altered and some new ones added, in order to adapt the compilation to recent phases of invention and to local subjects.

3. At p. 23 is a List of the Classes; at p. 27 a Key to the Classes and to leading terms and phrases occurring in titles of inventions—Imperial and Colonial; and at p. 37 commences a Classified List of Letters of Registration with Abridgments of Specifications arranged chronologically under each head.

4. At p. 161 follows an Alphabetical Index of the Names of Persons to whom Letters of Registration have been granted.

5. At p. 169 commences an Alphabetical Index of Subjects of Letters of Registration.

I have to acknowledge the valuable services of Mr. J. J. Spruson, Assistant Registrar of Copyright, who has been associated with me almost from the beginning in compiling this work, and it is due in a great measure to his industrious and careful help that it has assumed its present complete and it is hoped useful shape.

T. R.

Government Printing Office,

14 March, 1883.



REGISTRATION OF INVENTIONS.

An Act to authorize the Governor-General with the advice of the Executive Council to grant Letters of Registration for all inventions and improvements in the Arts or Manufactures to have the same effect as Letters Patent in England so far as regards this Colony. [Assented to, 6 December, 1852. Came into force under sec. 6 on 10 January, 1854.]

16 VICTORIA,
No. 24.

WHEREAS it is expedient that the exclusive benefit of inventions and improvements in the Arts or Manufactures should be secured for limited periods to the author or authors or designer or designers thereof or to his or their agents or assignees And whereas it is doubtful whether the laws of the United Kingdom respecting Patents extend to or have effect in the Colony of New South Wales Be it therefore enacted by His Excellency the Governor of New South Wales with the advice and consent of the Legislative Council thereof as follows:—

Preamble.

1. From and after the passing of this Act it shall and may be lawful for His Excellency the Governor of the said Colony with the advice of his Executive Council to grant Letters of Registration under his Sign Manual and the Seal of the Colony for the exclusive enjoyment and advantage for a period of not less than seven nor more than fourteen years for all inventions or improvements in the Arts or Manufactures to the author or authors or designer or designers thereof or to his or their agents or assignees as soon as such proceedings shall have been taken by such author or authors or designer or designers respectively as are in that behalf hereinafter mentioned.

Governor may grant Letters of Registration for a period of not less than seven nor more than fourteen years for inventions or improvements in arts or manufactures.

2. Every person who upon claiming to be the author or designer by his agent or assignee of any invention in or improvement to the Arts or Manufactures shall be desirous of obtaining such a Letter of Registration as is hereinbefore mentioned shall deposit with the Colonial Treasurer the sum of twenty pounds sterling and shall after such deposit present a petition to His Excellency the Governor setting forth that he is the author or designer or the agent or assignee of such author or designer as the case may be of a certain invention in or improvement to the Arts or Manufactures and specifying the particulars of such invention or improvement and that he has deposited with the Colonial Treasurer the sum of twenty pounds for defraying the expense of granting the Letters of Registration required by this Act it shall be lawful for the said Governor for the time being to refer the said petition to one or more competent person or persons to be appointed by the said Governor to examine and consider the matters stated in such petition and to report thereon for the information of His Excellency and if the report of the person or persons to whom the said petition shall have been referred by the Governor shall be favourable to its prayer it shall be lawful for His Excellency with the advice of his Executive Council to grant the Letters of Registration hereinbefore mentioned and such Letter of Registration shall within three days after the granting thereof be registered in the proper office in the Supreme Court otherwise such Letter of Registration shall be void and of no effect.

Deposit to be paid to Colonial Treasurer on applying for such Letters and mode of application.

3. Every grantee of such Letter of Registration shall be at liberty to assign the same and all the benefits and advantages derivable therefrom

Grantee of any such Letter may assign the same.

REGISTRATION OF INVENTIONS.

16 VICTORIA,
No. 24. therefrom to any person or persons by an instrument in writing under his hand and seal to be registered in the Supreme Court in the same manner and within the same period after the execution thereof as the original Letters of Registration are hereinbefore directed to be registered.

Limit as to
grantee's lia-
bility.

4. No grantee of any such Letter of Registration shall be liable in respect thereof for any higher charge than the said sum of twenty pounds except for such costs and charges as he shall voluntarily incur after the deposit of the said sum of twenty pounds with the Colonial Treasurer as hereinbefore mentioned.

Any such Let-
ter may be re-
pealed for cer-
tain causes.

5. Any Letter of Registration granted by virtue of this Act shall be liable to be repealed by writ of *scire facias* for the same causes and in the same manner as other grants of the Crown are liable to be repealed.

Commence-
ment of Act.

6. That this Act shall come into operation so soon as and not until the same shall have received the Royal approbation and the notification of such approbation shall have been made by order of His Excellency the Governor-General in the *New South Wales Government Gazette*,* and that such notification shall be sufficient evidence of such approbation.

PATENTS LAW AMENDMENT.

42 VICTORIA,
No. 27. An Act to amend the law relating to Patents for Inventions and Improvements in Arts or Manufactures. [19 June, 1879.]

Preamble.

WHEREAS by an Act of the Governor and Legislative Council passed in the sixteenth year of Her Majesty's Reign and intituled "An Act to authorize the Governor-General with the advice of the Executive Council to grant Letters of Registration for all inventions and improvements in the arts or manufactures to have the same effect as Letters Patent in England so far as regards this Colony" provision was made for the granting of Letters of Registration for the exclusive enjoyment and advantage for a period of not less than seven nor more than fourteen years for all inventions or improvements in the arts or manufactures to the authors or designers thereof their agents or assignees subject to the conditions and provisions contained in the said Act And whereas it is desirable in view of the forthcoming International Exhibition to be held in Sydney during the years one thousand eight hundred and seventy-nine and one thousand eight hundred and eighty to provide that the authors or designers of all such inventions and improvements as might be protected by Letters Patent under the said Act shall not be deprived of or prejudiced in the assertion of their patent rights in respect of such inventions and improvements by reason of such inventions or improvements being exhibited or used at or for the purpose of such International or other Exhibition Be it therefore enacted by the Queen's Most Excellent Majesty by and with the advice and consent of the Legislative Council and Legislative Assembly of New South Wales in Parliament assembled and by the authority of the same as follows:—

Short title.

1. This Act may be cited as the "Patents Law Amendment Act."

Interpretation
of terms.

2. In the construction and for the purposes of this Act the expression "Patents Act" means the Act sixteenth Victoria number twenty-four and the word "Exhibition" includes the International Exhibition appointed to be held in Sydney during the present or next year as well as any exhibition to be held in this or any other year by the Agricultural Society of this Colony and any exhibition of works of scientific invention or of the fine arts or of industrial art which the Governor with the advice of the Executive Council may by notification in the Gazette declare to be an exhibition within the meaning and

* 10 January, 1854.

PATENTS LAW AMENDMENT.

and for the purposes of this Act And the word "Invention" means any invention or improvement in the arts or manufactures such as might be patented under the Patents Act. ^{42 VICTORIA, No. 27.}

3. The exhibition of any new invention at any exhibition shall not nor shall the publication during the holding of such exhibition of any description of such invention nor shall the user of such invention for the purposes of such exhibition and within the building or place where the same may be held nor shall the user of such invention elsewhere by any person without the privity and consent of the author or designer thereof prejudice the right of the exhibitor thereof if he be the author or designer thereof to apply for Letters of Registration for such invention under the Patents Act nor shall the exhibition of such invention invalidate any letters of registration which may be granted under the Patents Act in respect of such invention. ^{Exhibition of new inventions not to prejudice patent rights. 33 & 34 Vic. cap. 27 s. 2.}

MODE OF APPLYING FOR LETTERS OF REGISTRATION.

1. As a preliminary to applying for Letters of Registration, under the Act 16 Vic. No. 24, a fee of £20 must be paid into the Treasury (sec. 2).

2. No grantee is held liable for any further charge "except for such costs and charges as he shall voluntarily incur after the deposit of the said sum of £20" (sec. 4).

3. The application is to be made by Petition to His Excellency the Governor.

4. The Department of Justice, Macquarie-street, Sydney, is charged with the administration of the Patent Law, and the Under Secretary for that department is accordingly to be addressed on all subjects relating to Patents.

5. The following documents are to be used in making application for registration:—

- I. The Treasury receipt for the registration fee (£20).
- II. Specification and drawings (both in duplicate). The specification should be on good paper or parchment, and conclude as a rule with a distinct claim. The drawings (if any) ought to be prepared in accordance with Suggestions to Applicants, p. 14. Combined specifications and drawings are objectionable.
- III. Petition to His Excellency the Governor, on best paper or parchment. Adapted from Form, p. 13.
- IV. Covering letter. Adapted from Form, p. 13.

6. The foregoing documents should be written on one side of the paper, leaving a quarter margin on left-hand side, and be addressed, under the covering letter, to the Under Secretary, Department of Justice.

7. If the applicant is an assignee, clear proof, in writing, of the assignment must be adduced.

8. If the Governor considers the application a fit one to pursue, he refers the Petition to one or more competent persons to be reported upon; and the applicant is expected to afford every facility in the investigation of his claim, to supply any information that may be required of him, and to act upon any suggestions that may be made to him by the examiners.

9. If the Governor and Executive Council see fit to grant the Petition, a Letter of Registration is issued under the Sign Manual of the Governor and the Seal of the Colony, which document must "within three days after the granting thereof be registered in the proper office in the Supreme Court," under penalty of its becoming void and of no effect.

10. The grantee of a Letter of Registration may assign the same to any person by an instrument in writing under his hand, which document must be registered in the same way as a Letter of Registration.

11. If a Petition for a Letter of Registration is not granted, the applicant is entitled to have returned to him the unexpended balance of the £20 fee paid by him to the Treasury.

(PETITION.)

Petition.

To His Excellency the Governor of the Colony of New South Wales.

The Humble Petition of John Jones, of No. 196, George-street, in the City of Sydney and Colony of New South Wales, Gentleman,—

Showeth:—

That your Petitioner is the author or designer of an invention entitled "Improved Furnace for Locomotives," the specification [and drawings] of which is [are] deposited herewith.

That your Petitioner is desirous of obtaining Letters of Registration for the said invention, and has deposited the sum of £20 with the Colonial Treasurer, in accordance with the provisions of "The Letters of Registration Act of 1852."

Your Petitioner therefore humbly prays that your Excellency will be pleased to grant unto him, his executors, administrators, and assigns, Letters of Registration for the said invention, for the term of fourteen years, in accordance with the provisions of the above-mentioned Act.

John Jones.

Sydney, 3rd March, 1883.

(COVERING LETTER.)

No. 196, George-street,

Sir,

Sydney, 3rd March, 1883.

I do myself the honor to forward to you herewith a Petition for Letters of Registration for an invention entitled "Improved Furnace for Locomotives."

You will also find enclosed a Treasury Receipt for £20 to defray the expenses connected with this application.

Trusting that the matter will receive early attention.

I am, Sir,

Yours faithfully,

The Under Secretary,

John Jones.

Department of Justice.

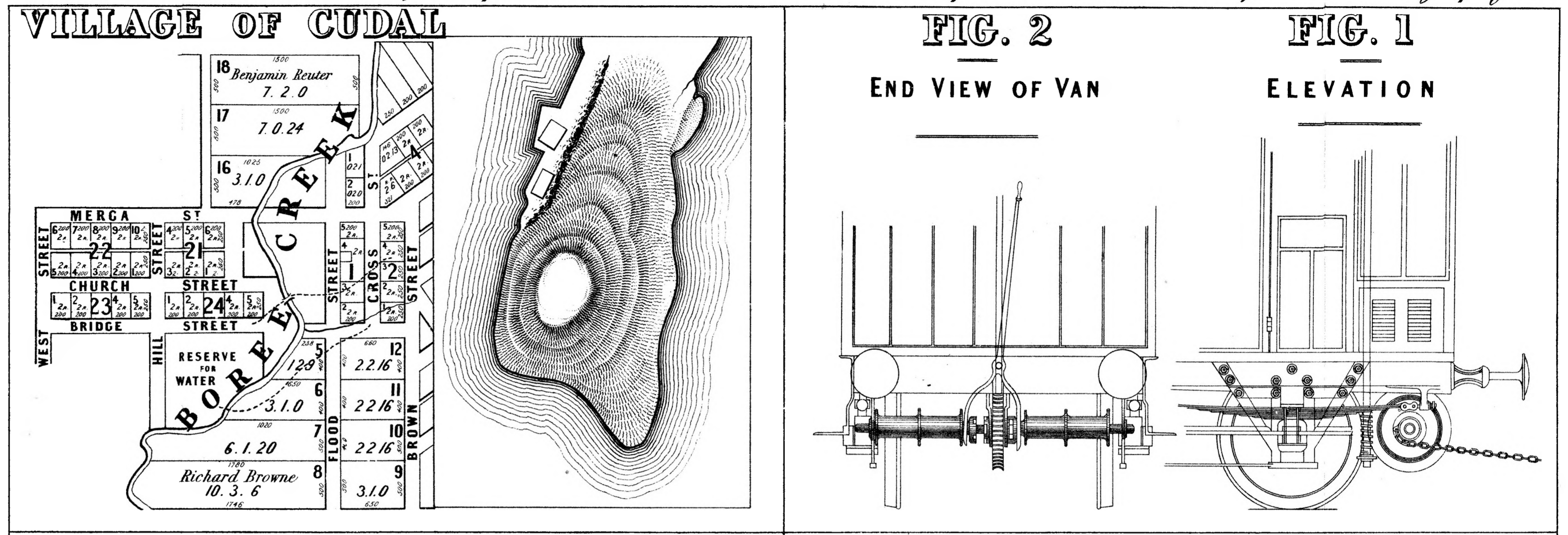
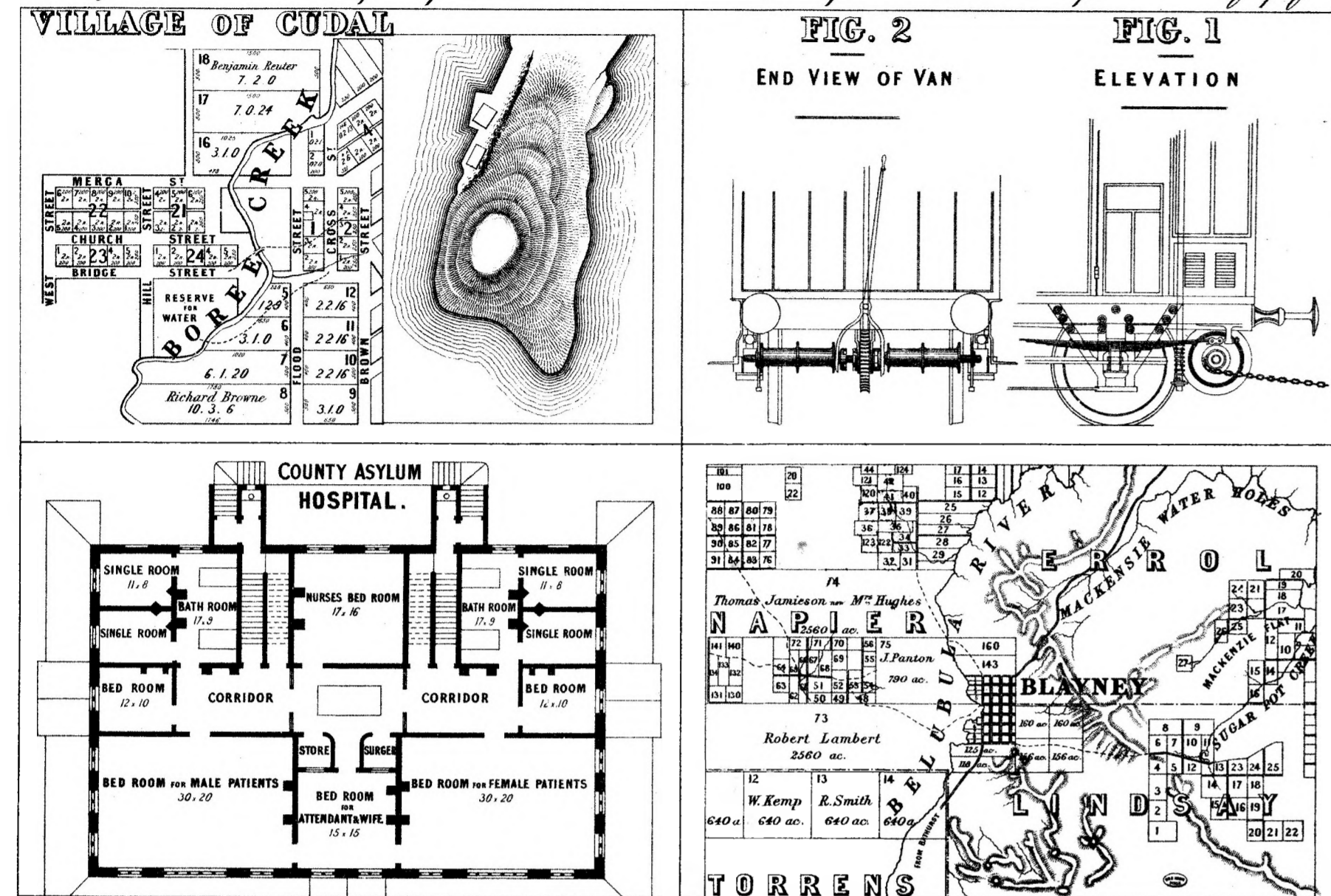
SUGGESTIONS FOR PREPARING DRAWINGS.

1. Read and adopt the Suggestions on the face of the lithographed Specimen on the opposite page.
2. This Specimen shows the most suitable description of LINES and of LETTERS to be used on PLANS intended to be photo-lithographed.
3. Plans not drafted in strict accordance with the "Suggestions to Applicants for Letters of Registration," printed on the face of the Specimen opposite, must be wholly or partially re-drawn in the Government Printing Office, before being photo-lithographed.
4. Plans drafted in more than one colour must be re-drawn in black *only*, and the necessary adaptations made, in the Government Printing Office, before being photo-lithographed. *When coloured plans are thus re-drawn, the references to colours in the Specifications must be eliminated, and if necessary literal references substituted.*
5. Specifications must not contain any References (whether in letters or figures) that are not given on the Plans, or the Plans contain any that are not given in the Specifications.
6. References must be shown distinctly on the Plans, and be marked on a white ground when possible.
7. References in Specifications must correspond *minutely* in form and style with those on the Plans accompanying them, *i.e.*, Capitals in the Specifications must be represented by Capitals on the Plans, Italics by Italics, Roman by Roman, &c.
8. Specifications and Plans should be compared with each other carefully, and every want of correspondence between them rectified, before they are deposited.
9. In case of Additional or Amended Specifications or Plans being lodged, particular attention must be paid to the References.

SPECIMEN

Showing the most suitable description of Lines and Letters, to be used on Maps and Plans, intended for Photo-lithography.

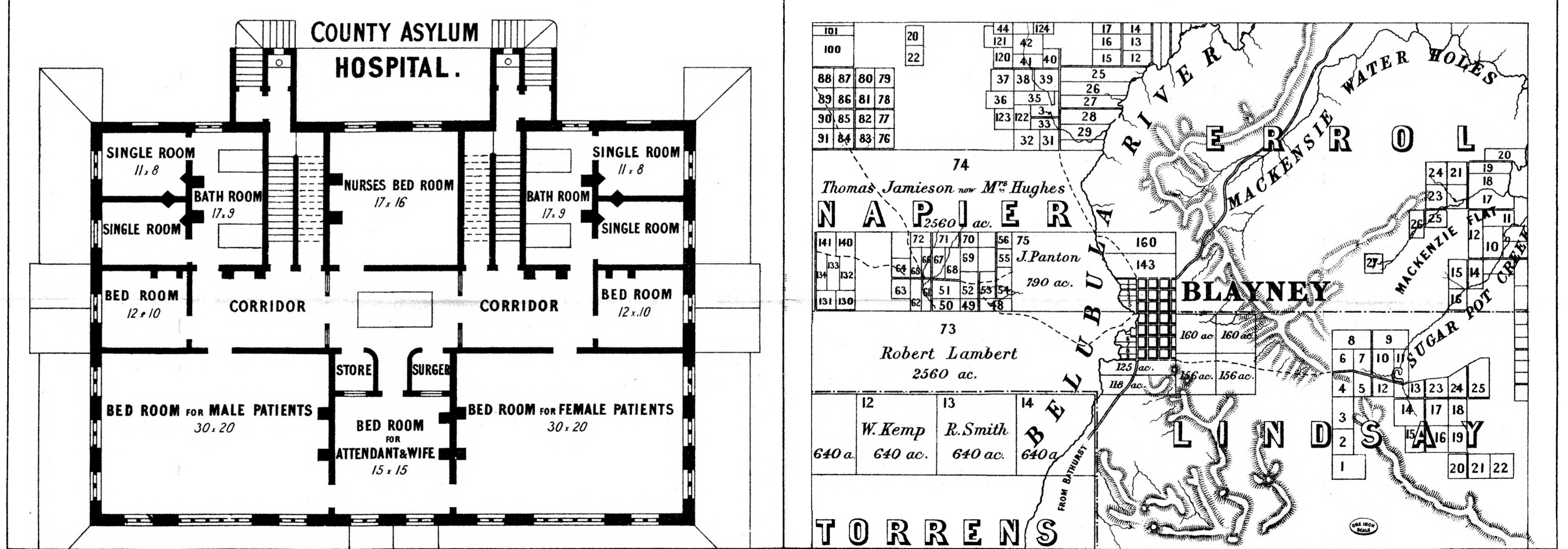
Showing the most suitable description of Lines and Letters, to be used on Maps and Plans, intended for Photo-lithography.



Suggestions to Applicants for Letters of Registration.

The following suggestions are offered to applicants for Letters of Registration, as to the manner in which Drawings accompanying Specifications should be prepared, with a view to their reproduction by Photo-lithography. Attention to these suggestions will greatly lessen the cost of illustrations to applicants in the first instance, and to the Government in their subsequent publication:—

1. The paper or cardboard used should be white, and have a smooth or calendered surface. A sheet of "double-thick Bristol-board," or Whatman's "Drawing paper," is recommended.
2. All drawings should be clear, sharp, well defined, not too fine, and perfectly black. Lines that are pale, ashy, very fine, ragged, or rotten, give bad results when photo-lithographed.
3. Brush-work must never be used. Shading, tinting, and imitation surface graining, should be shown in black lines only; and in fine shading the result should be attained with as few lines as possible.
4. Section lines should also be as open in their spacing as the case will admit of, and these, as well as right lines, in order to ensure clearness, should be made with a ruling pen. The shading to represent concavities or convexities may be dispensed with when the invention is otherwise well illustrated. Shade lines may sometimes be used with good effect, but heavy shadows, where they would obscure lines or letters of reference, should be avoided.
5. The drawing should be kept flat or rolled on a roller for transmission, as folding will interfere with it as a subject for photo-lithography.
6. The specimens on this sheet illustrate the effect of reduction,—the photo-lithograph being reduced to one-fourth the size of the original.



NOTES ADAPTED FROM STANDARD HAND-BOOKS
ON THE PATENT LAW,
 ARRANGED ALPHABETICALLY,

[The following Notes, which are adapted from "The Patentee's Manual" (Johnson), and other standard hand-books on Patent Law, and compiled in alphabetical shape to facilitate reference, are offered merely as SUGGESTIONS to intending Applicants for Letters of Registration.]

ACTS—

Letters of Registration, 16 Vic. No. 24 ; assented to, 6 December, 1852 ; Royal approbation, bringing into operation, notified in Gazette, 10 January, 1854.

Preamble expresses doubt as to whether Patent Laws of United Kingdom extend to or have effect in the Colony.

Authorizes issue of Letters of Registration having same effect in this Colony that Letters Patent have in England.

Patents Law Amendment, 42 Vic. No. 27, assented to, 19 June, 1879.

Quotes 16 Vic. No. 24 as " Patents Act."

Saves from prejudice patent rights in new inventions exhibited in or described in connection with any authorized exhibition.

AGENT—

May apply for Letters of Registration, to issue either in his own name or in that of his principal.

APPLICANT—

Need not reside in Colony.

Need not be a British subject.

APPLICATION—

For Letters of Registration. (*See* MODE OF APPLYING FOR LETTERS OF REGISTRATION, p. 12.)

APPLICATIONS—

Patents for " Applications" have reference to—

1. Application of existing article to a purpose for which other similar articles have been previously used.

2. Application of a well-known process to produce a well-known article.

3. Application of a well-known process to effect a result in a well-known article after the same process had been publicly applied to an analogous article.

Patents for " Applications" not favoured by law, when nothing new in machinery or methods employed.

Application in new manner of old mechanical contrivance, not a patentable invention.

ASSIGNEE—

May apply for Letters of Registration.

Must produce written assignment to him.

Grant to issue in name of.

ASSIGNMENT OF LETTERS OF REGISTRATION—

To be by instrument in writing under hand and seal of grantee of Letters of Registration.

To be registered in Supreme Court within three days of execution.

ATTORNEY—

Application for Letters of Registration may be made under power of.

Grant to issue in name of person appointing.

Power of, need not be lodged with other documents.

CHEMICAL PROCESSES—

To be patented in combination with mechanical contrivance whereby something useful is produced or effected—except in obvious cases.

CLAIMS—

- Statement of, at end of specification to be made distinct.
- To be construed with reference to whole context of specification.
- Not to specify anything not included in specification.
- Are not inserted in specification to claim anything new, but to disclaim what is old.
- Must not be on the one hand wide or speculative, or on the other restrictive.
- Must be drawn with great care; for if a "claim" clause is inserted, everything that it does not include is held to be expressly excluded.
- A claim to an entire combination does not secure minor combinations.
- A machine, &c., consisting of many old and new parts, should be claimed as a combination, and the minor combinations should be claimed explicitly.

COLONIES—

- British Letters Patent not now granted for the Colonies.

COMBINATION—

- Combinations of known parts are patentable, whether they produce a new or an old result, provided they enable the public to be supplied with a cheaper or better article.
- Care to be taken in specifying whether an invention consists of the useful application of a principle, or lies in the form, arrangement, or combination of the parts.
- New parts must be carefully distinguished from old parts.
- General combination had better be described, and new parts only specifically claimed.
- If as well as the combination being new there are some new parts, both the combination and the new parts must be claimed.
- Should be clearly expressed, so that a person of ordinary intelligence, with a general knowledge of the subject, would clearly understand the details without the aid of illustrative plans or diagrams.
- Patent for, does not protect the parts if they are not expressly claimed.
- Subordinate parts and minor combinations when claimed must be new, useful, and patentable, *per se*.

COMMUNICATION FROM ABROAD—

- No distinction made in this Colony as to nationality of applicant, or whether he is in the Colony or abroad.
- If previously patented in any part of the Empire, Examiners usually recommend Letters of Registration to be limited to duration of existing patent.

CROWN—

- Letters of Registration liable to be repealed by writ of *scire facias*, like other grants.
- Does not reserve right of using invention without assent of patentee.

DATE—

- Specification and Petition to the Governor to be dated.
- Letters of Registration—
 - Protection to run from and include day of signing and sealing.
 - To be registered in Supreme Court within three days of being granted, otherwise to be void.

DRAWINGS—

- Should be prepared in accordance with the printed instructions at page 14.
- To accompany specification, if necessary for elucidation of invention.
- Should always accompany specification of mechanical invention.
- If incorrect will invalidate patent.
- and specification must explain each other.
- To be in duplicate, and annexed to specification.
- The particular form delineated held to be the only one claimed, unless contrary distinctly expressed in specification.
- Must not show more than the specification explains.
- Must be distinctly referred to in the specification.

DURATION—

- Of Letters of Registration not to be less than seven, or more than fourteen years.
- For invention already patented elsewhere in British Dominions, Governor usually recommended by Examiners to limit duration of grant to period of existing patent.

EXHIBITIONS—

- Under "Patents Law Amendment Act," 42 Vic. No. 27 :—
 - International Exhibition, 1879.
 - Agricultural Society's Exhibitions.
 - Any scientific, artistic, or industrial exhibition declared to be such by the Governor in Council, and notified in the Gazette.
- Patent right not prejudiced by exhibiting, publishing description of, or using new invention at authorized exhibitions.

EXPERIMENTS—

- Do not vitiate right to patent—
 1. When disclosures made in the course of experimenting.
 2. When made by other persons who did not pursue them to a successful issue.

FEES—

- £20 to be paid into Treasury as a preliminary to applying for Letters of Registration.
- Grantee not liable to any higher charge, except such as he shall voluntarily incur.
- Treasury receipt for, to be annexed to Petition for Letters of Registration.

FOREIGN PATENT—

- Foreign invention may be patented in this Colony by inventor or his assignee.
- Foreign invention, if not so registered in this Colony, is public right.
- Inventions in any part of British Dominions, whether patented or not, may be registered in this Colony.
- Term limited to duration of existing patent.

IMPORTER OF INVENTION—

Entitled to patent, if invention new and useful in this Colony. (*See COMMUNICATION FROM ABROAD.*)

IMPROVEMENT—

The degree of, unimportant.

INVENTION—

Letters of Registration not granted for—

New game of skill or chance.

New method of calculation.

Newly discovered grain suitable for food.

Newly discovered natural substance suitable for manure—such as guano, or mineral phosphate of lime.

Must be referable to some manner of manufacture.

Must possess qualities of utility and novelty.

Originated in this Colony, patentable only by first and true inventor or his legal successors.

Application of old contrivance to new object without ingenuity, not patentable.

Ingenuity of invention not important, if utility great and novelty undoubted.

Patent for useless invention, or for invention not more useful than existing ones, void.

If material part of, not useful or not novel, invention void.

If several distinct inventions included in one patent, and some of them only are useful or novel, the useless or old ones will invalidate the whole.

Classes of inventions that have received sanction of judicial decisions:—

1. Vendible articles produced by chemical or mechanical processes, *e.g.*, medicines, felt, water-proof cloth, &c.

2. Machines, or improvements in machines.

3. Processes, often requiring special machinery.

Abstract principle cannot be patented, but a principle coupled with mode of giving effect to it can be patented.

Classes of inventions for which patents have been granted:—

1. New contrivances applied to new objects or purposes.

2. New contrivances applied to old objects or purposes.

3. New combinations of old parts, the subject matter consisting either of material objects or of processes.

4. New methods of applying an old thing.

5. Processes or methods differing from old processes or methods only by the omission of a step.

6. Chemical processes, usually but not always in combination with mechanical contrivances.

Small degree of, will support a patent, if there is some ingenuity displayed.

Must not have been in use in public.

By two persons, to be registered in both names.

British and foreign. (*See COMMUNICATION FROM ABROAD.*)

Published in book, &c., not patentable.

INVENTOR (*See NOVELTY*)—

Is person who first communicates invention to the public in a practical shape.

Has no patent right till he discloses his invention.

Person who derives knowledge of invention from another has no patent right.

First producer in merchantable quantities of chemicals already produced in small quantities can patent invention.

Must be originator of material part of invention, but may embody improvements suggested by his workmen.

Employer of inventor not entitled to patent.

Must not publicly use or describe invention before applying for patent.

Must not base invention on verbal information received from another.

British or foreign, may take out Letters of Registration in this Colony, whether resident here or not.

Importer embraced in term "Inventor," and stands on same footing, if invention new and original in this Colony.

Loses patent right, if he makes profitable use of invention before applying for registration.

Joint inventors to take out Letters of Registration in joint names.

First patentee secures patent right if there are independent inventors.

Executor of deceased inventor cannot apply for patent.

Person deriving knowledge of invention from papers of another is not entitled to patent.

Inventor or his assignee only entitled to registration.

JOINT INVENTION. (*See INVENTION, LETTERS OF REGISTRATION.*)**LETTERS OF REGISTRATION—**

May be granted by Governor and Executive Council.

Issued under sign manual of the Governor and seal of the Colony.

Are granted for not less than seven nor more than fourteen years.

Must be for inventions or improvements in the arts or manufactures.

Granted to author or designer of invention, or to his agent or assignee.

Granted in this Colony to legal proprietor for inventions patented elsewhere.

Preliminarily to applying for, £20 to be deposited at Treasury.

Mode of applying for. (*See INSTRUCTIONS TO APPLICANTS, p. 12.*)

Laid before Parliament annually, in Return to an Address of the Legislative Assembly, dated 10 May, 1861. A Chronological Index accompanies each volume.

Have same effect in this Colony that Letters Patent have in England.

Validity of, not guaranteed by the Crown, but dependent on law applicable to the case.

Abstract principle not proper subject of registration.

LETTERS OF REGISTRATION—*continued.*

May be obtained for—

Processes—

- New contrivances applied to old or new objects.
- New combination of two or more known things.
- New mode of applying known things.
- Mode of manufacturing differing from old process only by omission of a step.

Chemical processes—

- But not for applications of known articles or processes, without exercise of inventive faculties.
- Nor for uniting two things instead of three in a well-known manner.
- Chemical and mechanical inventions on same footing.

Second Patent held by first patentee not void. (*See SECOND PATENT.*)

Obstructive patents void.

Not granted to executors, unless previously applied for by inventor.

Imperial Patents do not now extend to Colonies.

If invention previously patented anywhere in British dominions, term of protection usually limited to period covered by original patent.

Joint inventors are made joint grantees.

Second patent for same invention not knowingly granted.

Set out in whose name grant issued.

The following are not grounds of objection to granting :—

1. Similarity of object in two inventions.
2. Previous invention of same thing not made public.
3. Previous useless machine for same object.
4. Including in invention subject-matter of previous patent.
5. Publication of invention between date of lodging specification and date of grant.

Granted conditionally upon being registered within three days in Supreme Court.

Liable to be repealed by writ of *scire facias* like other grants of the Crown.

Date from issue of grant under sign manual of the Governor and seal of the Colony.

No stamp duty payable in obtaining.

Assignment to be under hand and seal of grantee, and to be registered like grant. (*See ASSIGNMENT, &c.*)

Issue to grantee, his executors, administrators, and assigns.

MANUFACTURES—

Wide interpretation given to this term, to make it embrace any process or product, instrument or method, the introduction of which would be advantageous to the public.

MISREPRESENTATION—

In specification renders patent void.

NOVELTY (*See INVENTOR, LETTERS OF REGISTRATION, UTILITY*)—

And utility are the chief attributes that attach to patentable inventions.

If a material part of invention not novel, patent void.

If several distinct inventions included in same patent, some new and some old, the old ones vitiate the whole.

Invention borrowed from another or taken from a British book or other public print, invalid.

Previous invention for same object effected by different means, no obstacle to patent.

Subject-matter of unexpired patent may be included in invention.

Useful machine does not lose its patent-right because useless machine previously invented for same purpose.

If material part of invention not novel, patent void.

New application of old things, certain applications of which are already patented, not invalid.

Of combination patentable.

Inventor may employ others to perfect his invention.

OBSTRUCTIVE PATENTS—

Void.

OFFICE COPIES—

Charges for, same as for other office copies prepared in Crown Law Departments.

PATENT (*LETTERS OF REGISTRATION*) OFFICE—

Department of Justice, Macquarie-street, North.

When making application for Letters of Registration, the following documents to be lodged :—

1. Receipt for the £20 paid into Treasury.
2. Specifications and drawings (in duplicate).
3. Petition. (*See FORMS, p. 13.*)
4. Covering letter. (*See FORMS, p. 13.*)

PATENTEE—

Must be either the true and first inventor or the importer as assignee of a new invention not previously known in the Colony.

Need not reside or do business in Colony.

Need not be a British subject.

Executors or administrators cannot be, unless inventor had applied for patent.

Person in official position incapable of being, under certain circumstances.

Agent or assignee may be.

If assignee is, clear proof in writing of the assignment must be produced.

Agent usually takes out Letters of Registration in name of his principal.

PETITION—

Letters of Registration to be applied for by, to His Excellency the Governor.

Form of. (*See FORMS*, p. 13.)

To be accompanied with specification and drawings, and also with receipt for £20 fee paid into Treasury.

Letter to Under Secretary (Department of Justice), covering foregoing documents.

Form of. (*See FORMS*, p. 13.)

PRINCIPLE—

A bare principle, not patentable.

New, can only be secured in a concrete shape, that is, in connection with a specified mode of carrying it out.

Protection for one mode of carrying principle into effect secures all other modes.

When not new, protection ought to be for a particular method of carrying it into effect.

PRINTED BOOK. (*See PUBLICATION.*)PRIOR PUBLICATION. (*See PUBLICATION.*)PRIOR USER (*See PUBLICATION, PUBLIC USER*)—

Avoids patent, although not continuous up to date thereof.

If invention made for sale and actually offered for sale before obtaining Letters of Registration, patent would be bad.

Invention may be tested in a room open to the public before registration without vitiating patent.

Private use of invention by inventor does not vitiate patent, unless there has been profitable user.

Manufacture before obtaining grant of articles intended to be sold when grant obtained does not vitiate patent, if delay not occasioned by grantee.

Secret user endangers patent.

For experimental purposes, does not vitiate patent, even if experiments not absolutely private. (*See PUBLIC USER.*)

PROCESSES—

Are patentable. (*See LETTERS OF REGISTRATION.*)

PROPRIETORS—

A list of, is embodied in Indexes to Annual Returns of Letters of Registration laid before Parliament. Alphabetical List. (*See p. 161.*)

PUBLICATION (*See PRIOR USER*)—

Of invention in printed book will vitiate patent, although patentee did not derive knowledge from it.

In foreign book will have same effect if any connection can be traced therewith.

In prior specification will vitiate patent, unless new inventor shows how invention can be carried into practical effect and explains the mode of operation if former inventor has failed to do so.

Invention may safely have qualities tested in view of public.

Invention may be published immediately upon issue of grant.

PUBLIC USER—

If there are several inventors of the same thing, the one who first publishes his invention is entitled to the patent.

Of invention renders patent void.

For purposes other than those specified in invention may not vitiate patent.

Previous useless machine similar to useful machine newly invented does not vitiate patent.

Need not be continuous to avoid patent.

By inventor, for profit, by public use of article, or by publishing description of it, renders patent void.

Experiment not to be regarded as user.

RIVAL APPLICATIONS—

Examiners may recommend that unless applicants take jointly, no grant is to be made; or, that the invention be parcelled out between them.

Letters of Registration in derogation of a former grant will not be issued.

RULES—

For applying for Letters of Registration. (*See p. 12.*)

SCIRE FACIAS—

Letters of Registration liable to be repealed by writ of, in same manner and for same causes as other grants of the Crown.

SECOND PATENT—

Held by first patentee, not void.

May include subject-matter of previous patent.

Should distinguish improvements from previous invention.

Will not be granted for same invention, unless through *mala fides*.

SPECIFICATION—

To accompany Petition for Letters of Registration.

To have drawings annexed if necessary to elucidate invention.

Language of, to be clear and precise, and in no way equivocal or ambiguous.

Must accurately define invention, and conclude with a specific claim.

Must not be misleading or contain misrepresentations.

Must not claim more than invention covers.

Must distinguish new parts from old.

Must not include more than Letters of Registration express. (*See TITLE OF PATENT.*)

Must not omit anything essential.

Must describe most advantageous mode of working invention.

Must not claim old parts.

SPECIFICATION—continued.

Should distinguish new parts from old, in second patent.

Must not state as important what is not so.

Need not set forth every mode of applying a principle, nor enter into minute details as to materials or proportions.

Names of articles to be used to be taken in their ordinary sense.

Of patents for combinations. (*See* COMBINATION.)

If two methods are described, and one of them is impracticable, patent void.

Must be intelligible to a person of ordinary skill in the trade, without trying experiments.

Simple mistakes, explained by context, will not vitiate.

To be on good paper or parchment.

To be lodged in duplicate.

Drawings accompanying. (*See* Suggestions, p. 14.)

“Claim” clause necessarily inserted in—

Must not claim anything not in specification.

Has effect of disclaiming something.

Must not travel beyond limits of invention.

Must not unduly restrict inventor's rights.

If for combination only, not to claim the parts.

If combination and some or all of the parts are new, both the combination and the new part or parts must be specifically claimed.

Everything not claimed is held to be disclaimed.

If any of the new parts of a combination are omitted to be claimed, they are thereby abandoned to the public.

Must not be wide and speculative.

Must be consistent with title.

SPECIFICATIONS—

Printed with Letters of Registration. (*See* Volumes.)

STAMP DUTIES—

None payable in obtaining Letters of Registration.

TITLE OF PATENT—

If too general, vitiates patent.

If too narrow, cuts down inventor's rights.

Carried into Letters of Registration.

Must not be misleading, inapplicable, ambiguous, or at variance with the specification and specification read together.

Specification may explain.

Must correspond with specification.

UTILITY—

And novelty, the chief essentials of an invention.

If material part of invention not useful, patent void.

If several distinct inventions are included, and any one or more of them is useless, patent void.

Obstructive patents void.

Quantum of improvement not material.

The invention, not the thing produced, must be useful.

Useless part described as essential vitiates patent.

LETTERS OF REGISTRATION

GRANTED IN NEW SOUTH WALES.

(NUMBER CONTAINED IN EACH VOLUME PUBLISHED, FROM PATENT No. 1, GRANTED 15 JANUARY, 1855, TO PATENT No. 900, GRANTED 29 DECEMBER, 1880.)

Volume.	Numbers in each Volume.	Year in which granted.	Ordered by the Legislative Assembly to be printed.
1	Nos. 1 to 99	1 to 3, 1855 ... 4 1856 ... 5 1857 ... 6 to 15, 1858 ... 16 to 26, 1859 ... 27 to 36, 1860 ... 37 to 49, 1861 ... 50 to 63, 1862 ... 64 to 85, 1863 ... 86 to 99, 1864 ...	25 July, 1866.
2	„ 100 to 122	100 to 102, 1864 ... 103 to 122, 1865 ...	9 January, 1868.
3	„ 123 to 217	123 to 147, 1866 ... 148 to 171, 1867 ... 172 to 194, 1868 ... 195 to 217, 1869 ...	8 December, 1870.
4	„ 218 to 262	218 to 226, 1869 ... 227 to 262, 1870 ...	21 June, 1872.
5	„ 263 to 294	263 to 294, 1871 ...	21 April, 1873.
6	„ 295 to 342	295 to 342, 1872 ...	1 April, 1874.
7	„ 343 to 391	343 to 391, 1873 ...	9 July, 1875.
8	„ 392 to 451	392 to 451, 1874 ...	28 May, 1877.
9	„ 451A to 500	451A to 500, 1875 ...	27 March, 1878.
10	„ 501 to 562	501 to 562, 1876 ...	4 June, 1879.
11	„ 563 to 651	563 to 651, 1877 ...	3 March, 1881. Vol. 1, 1881.
12	„ 652 to 715	652 to 715, 1878 ...	26 October, 1881. Vol. 2, 1881.
13	„ 716 to 788	716 to 788, 1879 ...	Printed in accordance with Resolution of Legislative Assembly, dated 31 March, 1881—
14	„ 789 to 900	789 to 900, 1880 ...	Vol. 1, 1882. Vol. 2, 1882.

Nos. 223 and 873 erroneously omitted from the series; No. 879 withdrawn and subsequently registered again under another number.

ASSIGNMENTS OF LETTERS OF REGISTRATION.

[THE NUMBERS IN PARENTHESES ARE THE NUMBERS OF THE SUCCESSIVE ASSIGNMENTS; THE STARS (*) INDICATE THAT THE DOCUMENTS SO MARKED ARE PRINTED IN THE PARLIAMENTARY RETURN.]

13 (66,* 83*)	242A (347, 358, 364, 374,	435 (448)
15 (67*)	392, 398 and 399, 402,	440 (720)
40 (98*)	412, 432, 437 and 438	446 (459, 460, 508)
57 (68*)	and 439, 454, 477, 516,	455 (648, 830)
74 (94*)	528, 536, 542, 546,	463 (472, 509, 518)
103 (104*)	551, 565, 571 and 572,	467 (484, 600)
108 (—,* 120,* 121*)	581, 605, 610, 628,	483 (492)
112 (116,* 128,* 129*)	639 and 640, 670, 704,	490 (534)
114 (119,* 143*)	733 and 734, 819, 844	495 (608)
116 (128)	and 845, 860)	533 (550)
118 (170)	249 (277)	537 (631)
140 (147, 169)	256 (480)	556 (612, 666)
141 (283, 521)	268 (336)	558 (685A, 735, 757, 834)
144 (160)	288 (316)	598 (655, 784)
153 (179, 286, 357, 410,	293 (335)	603 (620 and 621)
458)	297 (413)	606 (676)
154 (420, 672)	315 (755)	607 (650 and 651)
156 (480)	316 (396)	629 (727, 823)
158 (404, 703A)	318 (633)	637 (709)
159 (186)	326 (422)	652 (671, 763, 791)
162 (305)	341 (426)	656 (687)
163 (238)	360 (480)	657 (709)
166 (480)	365 (382)	664 (688)
167 (171)	371 (665, 678)	669 (679)
190 (607A)	383 (506)	686 (691)
195 (212)	387 (530, 543, 562, 592	699 (712)
196 (342)	and 593 and 594, 611,	700 (728)
201 (204)	615 and 616, 624 and	711 (738)
205 (279)	625, 632, 641, 729,	765 (866)
208 (309)	833, 890)	777 (758 and 877)
211 (230)	390 (433)	779 (797, 798)
215 (290)	394 (480)	782 (796, 798)
216 (480)	398 (401)	789 (871)
217 (222)	405 (441)	846 (889)
221 (225A)	411 (480)	861 (872)
230 (243)	427 (430)	869 (870)
234 (244)	432 (507)	876 (878); also, — (756),
	433 (457)	— (764), — (891)

CLASSIFICATION OF LETTERS OF REGISTRATION.

[The figures at the beginning of each line indicate the number of the Class, and the figures at the end of the line indicate the page upon which the Class is to be found in the "Classified List of Letters of Registration."]

1. Drains and Sewers ; including the Manufacture of Drain-tiles and Drain-pipes, p. 37.
2. Sewing and Embroidering, p. 37.
3. Manure, p. 38.
4. Preservation of Animal and Vegetable Substances (without the use of Freezing Agents) ; also Preparation of same for Market, p. 38.
5. Marine Propulsion, p. 42.
6. Manufacture of Iron and Steel, p. 42.
7. Aids to Locomotion ; including Common Road Vehicles, p. 43*.
8. Steam Culture, p. 43.
9. Watches, Clocks, and other Time-keepers, p. 44.
10. Firearms and other Weapons, Ammunition, and Accoutrements, p. 44.
11. Paper : Manufacture of Paper, Pasteboard, Papier-mâché, &c., p. 44.
12. Cutting, Folding, Sewing, and Ornamenting Paper ; including Envelopes, Cards, Paper-hangings, &c., p. 44.
13. Typographic, Lithographic, and Plate Printing ; also Advertising, p. 44.
14. Bleaching, Dyeing, and Printing Calico and other Fabrics and Yarns, p. 45.
15. Electricity and Magnetism, their generation and applications, p. 45.
 - Generation of Electricity and Magnetism, p. 45.
 - Conducting and Insulating, p. 45.
 - Electric and Magnetic Telegraphs—Signalling, Transmitting, Receiving, or Recording Apparatus, p. 45.
 - Instruments for Exhibiting Electric Effects, p. 46.
 - Electric Lighting, Igniting, and Heating, p. 46.
 - Electro-deposition and Electrolysis, p. 46.
 - Electric Motive-power Apparatus, p. 46.
 - Electric Apparatus for Transmitting, Recording, or Reproducing Sounds, p. 46.
 - Electric Printing (other than Telegraphic), Writing, and Ruling Apparatus, p. 47.
 - Miscellaneous Applications of Electricity, p. 47.
16. Preparation of India-rubber, Gutta-percha, Vulcanite, Ebonite, Celluloid, &c., p. 47.
17. Production and Applications of Gas, p. 47.

* Ought not to include "Common Road Vehicles," for which see "94. Carriages and other Vehicles for Common Roads."

18. Metals and Alloys, p. 50.
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 - Do. (Quartz, &c.), p. 59.
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 - Nickel, p. 61.
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 - Shaping and Working Metals, p. 68.
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 - Sulphurets, Amalgam, &c., p. 68.
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37. Writing Instruments and Materials, p. 84.
38. Railway Signals and Communicating Apparatus, p. 84.
39. Furniture and Upholstery, p. 84.
40. Acids, Alkalies, Oxides, and Salts, p. 85.
41. Aeronautics, p. 86.
42. Preparation and Use of Tobacco, p. 86.

* Ought not to include "Cement," for which see "92. Stone, Marble, Slate, and Cement."

43. Books, Portfolios, Card-cases, &c., p. 87.
44. Lamps, Candlesticks, Gaseliers, and other Illuminating Apparatus, p. 87.
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72. Milking, Churning, and Cheese-making, p. 120.
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KEY TO CLASSES

OF LETTERS PATENT FOR INVENTIONS (IMPERIAL GOVERNMENT), AND LETTERS OF
REGISTRATION (GOVERNMENT OF NEW SOUTH WALES), AND KEY TO TERMS AND
PHRASES OCCURRING IN TITLES, &c., OF LETTERS OF REGISTRATION.

[The figures indicate the numbers of the Classes. The page at which each Class is
to be found is given in the "Classification of Letters of Registration," p. 23]

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CLASSIFIED LIST
OF
LETTERS OF REGISTRATION,
WITH
ABRIDGMENTS OF SPECIFICATIONS.

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
1. Drains and Sewers ; including the Manufacture of Drain-tiles and Drain-pipes.						
155	Charles Thieme Liernur ...	15 June, 1867	A pneumatic method for the inoffensive removal of all fluids, solids, and gases from water-closets or privies and their conduits, and of storing said materials so that they may be applied in their natural unchanged form to agriculture and other branches of industry.	8 July, 1867	1870	79
2. Sewing and Embroidering.						
182	Edward Cutler Wheelock...	11 July, 1868	Improvements in the construction of the cloth-plate of the Wheeler & Wilson sewing-machine, enabling it to be used at pleasure in producing either the lock-stitch, the two-thread double loop-stitch, or a new three-thread ornamental stitch.	9 Sept., 1868	1870	153
205	Richard Baylis	9th Dec., 1868	Improvements in machines having an arm-rest and hooked or barbed reciprocating needle for sewing together the soles and uppers of boots and shoes, consisting in means for moving and adjusting the work while on the rest, so as to obtain a continuous stitch or seam without stopping ; in devices for forming the stitch safely, regularly, and evenly ; in the method of heating the wax ; and also in the construction and combination of the several devices.	10 Mar., 1869	1870	223
245	Charles Frederick Bosworth and Nathan Adolphus Baldwin.	30 June, 1869	Improvements in the mode of, and apparatus to be used in sewing by machinery, specially adapted to the manufacture of straw hats and bonnets, and to manufactures in which braids or other materials are sewn together with a long stitch scarcely showing on the right side.	29 July, 1870	1872	77
309	Charles Henry Willcox and Cyrus Carleton.	31 Jan., 1872	Improvements in sewing-machines for getting rid of the noise which arises from the spool being jerked back and forth against the spool-pin in the operation of sewing, and for preventing the thread from falling over the end of the spool and getting wound around the spool-pin.	8 May, 1872	1874	37
450	William Sheppard and Samuel M'Gregor.	16 Oct., 1874	Improvements in the construction and working of wax thread sewing-machines.	26 Nov., 1874	1877	125
541	George Livingston Du Laney.	1 Aug., 1876	Improvements in sewing-machines consisting in imparting to the needle and looping-hook relative variable velocity ; in the peculiar arrangement of the spool-case holder, and in the means of producing the ornamental cable stitch and chain stitch ; in the peculiar construction and manner of securing the presser-foot to the bar ; in the hard rubber spool-case and spool or thread guard ; in the peculiar groove in the needle ; and in the novel tension device.	30 Aug., 1876	1879	125
690	William Bartlett.....	24 July, 1878	Improvements in sewing-machines, rendering them self-acting, by substituting for the treadle a system of clockwork driven by springs, or weights, or both	5 Sept., 1878	1881 vol. 2	89
807	George Baldwin Woodruff, Alexander Anderson, Spencer Mort, and George Browning.	6 Oct., 1879	Improvements in sewing-machines having an arm-rest and circular reciprocating shuttle, consisting in novel means for driving the shuttle, in novel mechanism for producing universal top feed, and in novel construction of the throat-plate.	4 Mar., 1880	1882 vol. 2	49

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
3. Manure.						
249	George Foord	18 July, 1870	Improved method of converting into manure animal substances and products, by the use of mineral acids, in such a way as to render them innocuous to health when so treated, at the same time preventing or arresting the putrescent decay of the same, without hindering their after decomposition in the soil, but rather favouring their ready assimilation by the crop.	1 Sept., 1870	1872	91
263	George William Wigner.....	14 Feb., 1871	Improvements in the mode of, and apparatus for treating and purifying sewage or water impregnated with sewage, and making manure therefrom, part of which apparatus is applicable to other purposes.	13 April, 1871	1873	17
293	Christopher Rawson, Philip Ovenden, James Wylde, Wm. M'Cree, and Henry Hill.	10 July, 1871	Improvements in deodorizing and purifying sewage, urine, and refuse matters and liquids, and in making manure therefrom, and in apparatus for these purposes.	13 Dec., 1871	1873	81
425	William Smith Amies	11 May, 1874	Improvements in artificial manures, consisting of an admixture of carbon and sulphate of iron.	8 June, 1874	1877	69
547	Bernard Ackerman.....	29 Aug., 1876	Improvements in the preparation of manure or fertilizing material from stable refuse, by compressing and baling the mixed excrementary matter and straw in such a way that storage or transportation will not materially affect its valuable properties.	3 Oct., 1876	1879	139
566	Henry Brisbane Swan	7 Dec., 1876	Invention and improvement for the deodorization, drying, solidification, and utilization of the blood of sheep, cattle, and other animals, for manure and other useful purposes, consisting in treating the same with a solution of caustic of soda, common or washing soda, lime and acid of lemon, and salt; mixing the ingredients with the blood, and drying the mixture by fire, gas, or steam, &c., or boiling it.	5 Feb., 1877	1881 vol. 1	5
861	James M'Govern	22 June, 1880	An improved drying and pulverising apparatus for treating the waste products and refuse of slaughter-houses and boiling-down establishments, and also fecal matter, with a view to converting the same into a fertilizer, by the application of superheated or wet steam, thus preventing the dried refuse from becoming carbonized, and retaining the maximum quantity of the manurial constituents in the product.	4 Aug., 1880	1882 vol. 2	227

4. Preservation of Animal and Vegetable Substances (without the use of Freezing Agents); also Preparation of same for market.

59	Edwd. James Blaxland.....	23 July, 1862	An invention for meat-cutting up meat intended for preservation.	27 Nov., 1862	1866	307
70	James Lorimer, Matthew Marwood, and Robert Rome.	9 Feb., 1863	Improvements in the mode of preserving animal and vegetable substances used in commerce, by applying to them the various compounds of chlorine and magnesium.	31 Mar., 1863	1866	341
87	Amédée François Rémond..	2 July, 1862	Improvements in the process of preserving provisions in metal cases, and in apparatus employed therein, whereby the process of cooking is economized and expedited, and the flavour and nutritious qualities better conserved.	19 Feb., 1864	1866	415
95	Alexander Hett & Frederick William Bassett.	16 April, 1864	Improvements in preserving animal substances and animal and other substances used for food, by treating same with solutions of certain salts known as sulphites and nitrites, and thereby preventing putrefactive fermentation; also in coating the preserved substance to enable it to maintain its moisture under long exposure to the air.	13 July, 1864	1866	443
105	John McCall and Bevan George Sloper.	29 Mar., 1865	Improvements in preserving fresh meat, poultry, game, and fish, and in the vessels employed therein, and their lining, the substance to be preserved being treated with bi-sulphate of soda or potash, sulphurous acid, and carbonic acid gas.	4 May, 1865	1868	15
113	Richard Jones.....	Not dated; received, 5 July, 1865.	Improved method of preserving animal and vegetable substances, consisting in displacing air from the vessel containing the substances, by introducing in its stead an inert fluid such as water or oil, displacing such fluid by the introduction of nitrogen gas or gases having an affinity for oxygen, and hermetically closing the vessel.	10 Aug., 1865	1868	67

No.	Name of Applicant.	Date of Application	Nature of Invention.	When granted.	Year of publication.	Page.
115A	Robert James Pierce (as agent of Dr. John Morgan).	Not dated; received, 24 July, 1865.	Improvement in the preservation of meat for food, consisting in draining the blood from the body of the animal immediately after killing it, and injecting certain fluids into the veins.	21 Sept., 1865	1868	83
135	Theophilus Redwood.. .. .	17 May, 1866	Improvements in the preservation of animal substances by coating them with paraffine, or with wax, spermaceti, or stearic acid, such improvements being specially applicable when the substances are intended for use as food.	23 Aug., 1866	1870	27
157	Wm. Richmond Alexander	10 July, 1867	Invention for preparing and preserving meat or other animal food in the form of powder, first by minute subdivision, then by disintegration, effected by a species of fermentation, induced by pepsine, yeast, hydro-chloric acid, the acid of sour milk, an acid and an alkali, or any of the digestive or fermentative bodies, singly or combined, and finally after passing through several processes by grinding the substance into powder.	15 Aug., 1867	1870	89
159	Elvine Wood Lang.....	23 July, 1867	Invention for the speedy and perfect cure and preservation of meat and fish for food fresh, by employing a preparation of a neutral sulphite of potassa obtained by neutralizing the bisulphite of potassa with carbonate of potash, and by other processes.	26 Aug., 1867	1870	93
174	James Dewar	5 Feb., 1868	Improvements in preserving substances for food, by the use of sulphurous acid diluted.	19 Mar., 1868	1870	123
187	James Manning and Elvine Wood Lang.	15 May, 1868	Improvements in the preservation of meat, in the preparation of a preservative solution combined with an alkali composed of sulphite and sulphate of potash, and in coating with an anti-corrosive and insoluble enamel the interior of tin vessels to contain the meat.	30 Sept., 1868	1870	169
199	Charles Edward Richardson and George Thatcher Waterman.	8 Dec., 1868	Improvements in preserving meat and other animal substances, by first freezing and then immersing the same in brine or other antiseptic solution, to penetrate the pores thereof when it thaws.	27 Jan., 1869	1870	209
210	Joseph Bancroft	4 Mar., 1869	Apparatus heated by steam for the desiccation of watery substances, and the preservation by desiccation of animal and vegetable products to be used as food.	30 April, 1869	1870	235
214	Josiah Vincent Lavers	19 April, 1869	Invention for preserving in a fresh condition the carcasses or skins of animals recently killed, without bringing the flesh or skin into contact with any liquid or solid substance to ensure its preservation, by hanging up the carcasses or skins in an air-tight apartment, and introducing into it compressed sulphurous and carbonic acid gas or carbonic oxide separately or combined, a due proportion of sulphuric acid and wood-charcoal being heated in a retort and conveyed by a pipe to the apartment.	17 June, 1869	1870	245
218	Owen Spencer Evans.....	8 June, 1869	Meat-preserving process—Forcing into strong metal cases containing the meat, an antiseptic gas, to expel the air therefrom, and hermetically sealing the cases.	4 Sept., 1869	1872	1
220	Louis S. Robbins	14 July, 1869	A new and improved process for preserving wood from mould or decay, by removing therefrom the surface moisture, and afterwards charging and saturating the wood with oleaginous vapours and compounds.	7 Oct., 1869	1872	2
227	Thomas Sim.....	29 Nov., 1869	Improvements in preserving meat, fish, and animal matter, and in apparatus employed for the purpose, consisting in permeating with sulphides of copper in a gaseous state animal substances from which the air has been previously excluded.	14 Jan., 1870	1872	27
235	Richard Jones	26 Jan., 1870	Improvements in the preservation of animal and vegetable substances to be used as food, consisting in exhausting from the case containing the food, while the process of cooking is going on and afterwards, the air and gases contained therein, and hermetically sealing the hole at top of the case, after the substances have been fully cooked and the gases ejected therefrom.	11 Mar., 1870	1872	51

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
4. Preservation of Animal and Vegetable Substances (without the use of Freezing Agents); also Preparation of same for market—continued.						
245A	Ferdinand Cassel	9 July, 1870	Improvements in the preservation of meat and other articles of food, by coating same with the oil obtained from the corns of grapes, such oil being extracted chemically by Lowenberg's well-known apparatus, or otherwise as described.	8 Aug., 1870	1872	83
302	Thomas Frederick Henley..	1 Dec., 1871	Improvements in the mode of treating meat and fish for the preservation of the same for food, by expressing the juices therefrom, applying the anti-septic properties of the essences of meat and of gelatine to the preservation of the juices, and the utilization of the juices.	1 Mar., 1872	1874	21
310	Frederick Sacc	17 April, 1872	Improvements in the preservation of fresh meat and vegetables, and in the preparation of extract of meat, by employing acetate of soda.	10 May, 1872	1874	47
325	Kevin Izod O'Doherty	2 July, 1872	Improved method of preserving animal substances or meat by filling the vessel in which the same is contained with fluid tallow under pressure, thus expelling the decomposing gases, and replacing them by tallow, which acts as an air-tight coating around the contents.	8 Aug., 1872	1874	93
326	Alfred Fryer	1 July, 1872	Improved process for treating animal and vegetable substances in order to their preservation and use, by heating them while they are hermetically enclosed in cases or receptacles which are subjected to a greater than atmospheric pressure in a boiler or other vessel.	9 Aug., 1872	1874	95
343	Robert Andrew Loughnan..	18 Nov., 1872	Improvements in the ordinary system of preserving meats, known as "the Chloride of Calcium Process," the meat-preserving pans used being converted into vacuum pans, the heating and steaming being thus effected at low temperatures, and the air being prevented from re-entering the canisters by accompanying the gradual diminution of the vacuum with a gradual increase of temperature.	6 Jan., 1873	1875	1
377	William Malpas	24 April, 1873	Certain chemical compounds for preserving wood, consisting of sulphate of copper, in combination with arsenious acid in a state of solution, applied to wood by immersion or otherwise to protect it against white ant or other insects.	21 Aug., 1873	1875	101
447	Pierre Paul Egide Marie Koch.	16 Sept., 1874	Improvements in preserving meat and other articles of food by the use without any solution of bisulphite of soda or its derivatives, either singly or combined with phosphate of soda in a natural and dry state, in small doses, the application of atmospheric pressure and introduction of deoxygened air, and packing for market in air-tight tin vessels.	10 Nov., 1874	1877	121
453	Roger Seccombe	5 Dec., 1874	Condensation of milk by the combination of dried atmospheric air compressed and steam, these combined powers being used for evaporating purposes.	14 Jan., 1875	1878	7
504A	Henry Baldock	14 Aug., 1875	Process for the preserving and treating of meat, hides, fish, flesh of animals and birds, butter, lard, fat, tallow, and any other animal matter whatever by the use of boric or boracic acid or any other borate or matter of which boron or oxide of boron forms a part.	20 Jan., 1876	1879	21
532	Friedrich Leybold	12 June, 1876	Improvements in the manufacture of preserved meat, in the shape of an improved product, consisting of condensed meat or "Pemmican Leybold," prepared and formed into blocks or cakes, having a protective coating or covering.	21 July, 1876	1879	95
540	Charles Hubert de Castella	26 July, 1876	Improvements in the preservation of animal substances by expelling the carbonic acid, atmospheric air, and other gases from the substances to be preserved and the packages in which they are contained, subjecting the substances to the pressure of several atmospheres of oxygen gas—withdrawing the pressure (with the exception of about one atmosphere)—and then hermetically sealing the package; also the adjustable casing for supporting the package while under treatment.	28 Aug., 1876	1879	121
559	Frederick Settle Barff	26 Oct., 1876	Improvements in preserving animal and vegetable matters without encasing them, and in the means and apparatus employed therein, consisting in the use of chemical compounds or elements which are able to absorb oxygen gas when existing in the atmosphere or when in a free state, such as soluble metallic salts or compounds, sodium, or potassium.	27 Dec., 1876	1879	169

No.	Name of Applicant	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
586	Charles Alden.....	4 May, 1877	Improved process and apparatus for preserving animal and vegetable substances, consisting in the application to the substances to be treated of a current of air characterized by certain degrees or stages of temperature, humidity, and force.	8 June, 1877	1881 vol. 1	79
614	Johannes Eckart.....	30 July, 1877	Improvements in the method of preserving meat, fish, game, and other like articles of food, and in apparatus for the purpose, consisting in the application of salting and preserving solutions under hydraulic or other heavy pressure, and in the similar application of salicylic acid solutions, either alone or combined with salt and saltpetre.	29 Aug., 1877	1881 vol. 1	149
634	James Dorrrough	9 Oct., 1877	Invention for resisting the influence of heat and cold in the package and carriage of all kinds of perishable goods by lining the receptacle or vehicle with furs, skins, or hides, dressed or undressed.	19 Nov., 1877	1881 vol. 1	183
649	Robert Harper	19 Nov., 1877	Improvements in machinery for making the body of tin canisters, consisting of mandril, mould, &c., and treadle.	21 Dec., 1877	1881 vol. 1	227
663	Pierre Paul Egide Marie Koch.	20 Aug., 1877	Apparatus for preserving food and substances liable to fermentation, or decay, whether natural or salted, smoked, boiled, or cooked, by applying to them a solution of bisulphate of soda of potash or of lime, employed either alone or associated with the acetate or the borate of soda. or with salicylic acid, &c.	25 Mar., 1878	1881 vol. 2	29
664	Joseph Page.....	15 Feb., 1878	Machine for cutting and compressing animal food and filling therewith tin canisters or other vessels (the cutting being effected by means of knives set in a grate and operated by pressure thereon, either with or without transverse movable knives; and the compressing process and filling of canisters being effected by the adaptation of a piston working in a cylinder); also for removing the vessels when filled.	25 Mar., 1878	1881 vol. 2	33
677	Tryon Joseph Magne Jewell and Thomas Godfrey Leslie.	29 May, 1878	"Jewell's Self-opening Can" consists of a can or vessel of sheet metal, upon the interior of the lid of which a piece of wire is so arranged and secured that when the exposed end of it is pulled, it cuts its way through the metal and thus opens the can.	10 July, 1878	1881 vol. 2	57
722	Daniel Williams	7 Jan., 1879	Apparatus for preserving meat and other perishable substances, by the aid of a current of dry air cooled and purified, circulating through the interior of an air-tight tank, carriage, chamber, &c., containing the same; also for creating the temperature required for the fermentation of beer and other fermented liquids.	20 Feb., 1879	1882 vol. 1	19
730	*John Absalom Absalom ...	10 Oct., 1878	A method of instantly testing the perfect soldering of any article requiring to be hermetically sealed or otherwise.	21 April, 1879	1882 vol. 1	33
752	Archibald Liversidge.....	28 June, 1879	Invention or improvement for the packing and preservation of meat and other animal food consisting in the use of an envelope or covering of vegetable parchment or gelatine rendered insoluble by treatment with bichromate of potassium, in lieu of packing the same in the "tins," canisters, or other receptacles commonly used for the purpose.	28 July, 1879	1882 vol. 1	87
759	Edward Scott Naylor	14 July, 1879	A new and original process for the preservation of meat in a partially roasted or cooked state, by means of a preparation of stearine or fat, from which the oleine has been extracted, the meat so roasted or partially cooked being packed in casks or cases, and entirely embedded in this preparation, which is poured over it in a liquid state and in solidifying excludes the air.	12 Sept., 1879	1882 vol. 1	99
766	Margarethe Meinert and Conrad Warnecke, assignees.	16 Aug., 1879	Improvements in the preparation of preserved meat, or compounds of the same with other substances, namely, desiccated meat, meat powder, meat tablets (composed of meat powder or of meat powder and vegetables) biscuits, rusks, &c., chiefly by employing the fumes of sulphide of carbon as described.	29 Sept., 1879	1882 vol. 1	113

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No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
4. Preservation of Animal and Vegetable Substances (without the use of Freezing Agents); also Preparation of same for market—<i>continued.</i>						
803	Herbert Maguire Whitehead.	31 Dec., 1879	Improvements in preserving meat in solid form, and in apparatus connected therewith, consisting in cutting the meat into slices or slabs, corresponding in size, &c., with the tins to be filled, by means of a plunger press with mould knife attached to it.	20 Feb., 1880	1882 vol. 2	37
859	Christian Heinrich Friedrich Schneemann, John Christian Hermann Baass, and Carl Heinrich Florens Müller.	9 June, 1880	Improvements in the means of and in apparatus for preserving meat and other articles of consumption, by drawing air with an air-pump through the vessel in which the same is contained, such air having been dried before entering the vessel by being passed through pumice-stone, then creating a vacuum in the vessel, and opening momentary communication between it and a reservoir of sulphuric acid gas, and then withdrawing the pressure.	26 July, 1880	1882 vol. 2	223
865	Thomas Foster Wilkins.....	30 June, 1880	A novel process for the preservation of butter, by mixing, blending, and incorporating with it in certain proportions glacial metaphosphoric acid either in the shape of a concentrated solution or in a solid crushed state.	13 Aug., 1880	1882 vol. 2	237

5. Marine Propulsion.

301	Alexander Young	18 Aug., 1871	The angular hydraulic jet propeller, or improvements in the propulsion of ships, whereby the power exerted by engines in putting the ship and water in motion is more efficiently utilized by vortex wheels or pumps projecting a column of water at a downward angle into unbroken water through pipes, the inlet passages of which are in communication with the water at the outside of the ship.	21 Feb., 1872	1874	17
431	Hermann Hirsch	11 May, 1874	Improvements in screw propellers, applicable to two, three, or more blade screws, consisting in a triple combination of qualities in the blade, namely, a curvature forward in the plane of rotation, an increasing pitch on the front and outer part of the blade, and a decreasing pitch on the back and inner part of the blade; also, the combination of these features with a decrease in the width of the blade from the boss towards the circumference.	14 July, 1874	1877	83
775	Robert Wilcox	6 Sept., 1879	Improvements in steam-vessels, relating to the shape of the bottom or bottoms, the means of propulsion, and the manner of guiding or steering vessels, designated the "Ocean Palace principle of Steamship."	3 Nov., 1879	1882 vol. 1	149
816	Zachariah Oram and Philip Brunner Grove.	18 Feb., 1880	Improvements in and relating to the construction of ships or vessels having twin propellers placed in front of midships, with right and left-hand blades set about parallel with the sides, and at an acute angle with the keel and a descending acute angle with the main shaft; also, this combination with clamshell-shaped recesses in sides of vessel to throw water outwards and backwards.	15 April, 1880	1882 vol. 2	83

6. Manufacture of Iron and Steel.

662	John Smith and Josiah Course.	8 Feb., 1878	Improvements in machinery or apparatus for trimming bevel-wheels, spur-wheels, and skew gear.	14 March, 1878	1881 vol. 2	25
717	Robert Joseph Harvey	26 Nov., 1878	Improvements in machinery for pressing plate metal into various forms by means of a die, a punch, and a gripper or holder, the edge of the metal being firmly pressed, but not too tightly held, while the plate is being forced into the die, thereby reducing what is known as "puckering."	20 Jan., 1879	1882 vol. 1	5
789	Milo A. Richardson	29 Mar., 1879	Improvements in the mode of and apparatus for sharpening files and other tools having a number of fine cutting teeth, edges, or points, by the use of what is known as the "sand blast"—a stream of sand, or its equivalent, set in motion preferably by a jet of steam.	8 Jan., 1880	1882 vol. 2	1

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page
7. Aids to Locomotion; including Common Road Vehicles.						
46	James M Leery	12 July, 1861	An improvement in the manufacture of three-wheeled vehicles, giving greater power over the front wheel, and enabling it to be turned from side to side with more freedom than in vehicles of the ordinary construction.	12 Aug., 1861	1866	255
72	Henry Hollinshed	4 Feb., 1863	Improvements in carriage wheels and labour-saving machines for making same: Consisting, as regards wheels, in the nave or centre being of cast-iron made in two parts to counteract the shrinkage of spokes, also in the use of angle-iron for tires; and, as regards machines, in appliances for cross-cutting, mortising or slotting, spoke-shaping and cutting the pins on ends of spokes, felloe-cutting, rounding, annular saw, and smoothing or glass-papering.	6 May, 1863	1866	349
246	William Halley and Isaac Clyde.	11 June, 1870	An invention of a friction brake for carriages of every description, to be attached to the nave or other portion of the hind wheels, consisting of an angle-iron or other flanged hoop secured to the nave or hubb, which is gripped or seized by the friction strap when the brake is applied, and prevents the latter from rubbing against the hubb when loose.	17 Aug., 1870	1872	85
271	Andrew Newell	22 Mar., 1871	Improvements in carriage-brakes, being an improved combination of parts, consisting of bolster, sliding front, axle, and king-bolt of angle-plate and slotted plates, operating in connection with the brake-bar to regulate the backward and forward throw of the axle.	11 May, 1871	1873	29
296	Henry Hoyt.....	6 Oct., 1871	Improvements in omnibuses: Consisting of a doubled curved roof, and of a peculiarly constructed fore-carriage and circle plate, hind-carriage and spring-bar, and brake, with springs, lever clogs, and attachments.	19 Jan., 1872	1873	1
312	Charles Hodgson.....	11 April, 1872	Invention for the transmission of produce or material contained in a suitable vessel or carriage along a rope of wire stretched between two fixed points; and improvements in so arranging the supporting points of such rope, and so constructing the pulleys, sheaves, wheels, and pendants which suspend the vessel or carriage, or so constructing the wheels which support a moving rope and the pendants of boxes hung thereon, that the said pulleys or boxes shall be capable of passing the supporting points of the rope without hindrance.	10 May, 1872	1874	51
491	Abiel Gifford Howland.....	19 Aug., 1875	An easy method of attaching and detaching shafts or poles to and from carriages and vehicles having four wheels, and to and from vehicles having four wheels known as buggies and American waggons.	12 Oct., 1875	1878	109
523	William Thomas Angus ...	28 Feb., 1876	"Angus's Shaft or Pole Detacher," being a contrivance for easily detaching the horse from the vehicle in case of probable accident, for quickly removing the shafts or pole or substituting one for the other, and for obtaining increased security by dispensing with the use of bolts.	3 May, 1876	1878	71
769	William Thomas Angus.....	1 Sept., 1879	Improvements in the construction of a certain vehicle known as the "Tray" or "Abbott" buggy, and designated the "Angus Buggy," being a complete single and double seated vehicle, with little additional weight over the springs, and easily adapted for use of four persons.	29 Sept., 1879	1882 vol. 1	129
856	Henry Samwells.....	14 April, 1880	Improvements in the method of supporting and staying the shafts of a certain description of vehicle, partaking of the character partly of a "Brougham" and partly of a "Hansom Cab," called a "Two-wheeled Brougham."	26 July, 1880	1882 vol. 2	207
8. Steam Culture.						
817	Hugo Graepel	15 Jan., 1880	Improvements in the method of driving machines for stripping wheat or other grain by steam power, to be styled "Graepel's Patent Steam Power Stripping Machine."	15 April, 1880	1882 vol. 2	87

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9. Watches, Clocks, and other Time-keepers.

848	Theodor Frederic Wiesener (assignee of John Alexander Lund).	6 Oct., 1879	An improved means or apparatus for synchronizing clocks or other time-keepers, and for transmitting seconds or other time or intermittent currents, enabling any number of clocks in one or more establishments to be regulated, by synchronizing the hands electrically, and without interfering with the pendulum or any other portion of the works to be acted upon.	30 June, 1880	1882 vol. 2	181
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10. Firearms and other Weapons, Ammunition, and Accoutrements.

[No Inventions under this Class yet registered.]

11. Paper : Manufacture of Paper, Pasteboard, Papier-mâché, &c.

291	Vincent Elijah Keegan.....	6 July, 1871	Improved mode of treating wood and other fibrous vegetable substances for the preparation of pulp suitable for making paper, by saturating the same with an alkali or acid, and subjecting it to a high degree of heat while so saturated.	6 Nov., 1871	1873	75
359	Thomas Wearne	11 Feb., 1873	Invention for converting cyperus vaginatus, cat's-tail grass, imphee trash, sugar-cane megass, grass-tree, knotty water-reed or sedge-grass, and other vegetable fibres, into a fibrous substance, principally for use in paper-making, and technically known as "half-stuff."	18 June, 1873	1875	41

12. Cutting, Folding, Sewing, and Ornamenting Paper; including Envelopes, Cards, Paper-hangings, &c.

[No Inventions under this Class yet registered.]

13. Typographic, Lithographic, and Plate Printing; also Advertising.

45	Frederick Grosse and Rodolph Jenny (through Randolph J. Want).	Not dated; received, 8 June, 1861.	Invention of a process termed "Bismuthography," whereby any drawing having been etched, the raised lines, figures, or letters, together with the graduated tints, are produced in the etched lines thereof, by the use of bismuth, so as to permit an impression to be taken therefrom as from a stereotype plate, by means of ordinary letter-press printing.	6 Aug., 1861	1866	251
273	Edward Roper (per Mr. N. Duffield).	1 Mar., 1871	Invention of an improved process of engraving called "Graphotype," by which relief plates are produced direct from the drawing of the artist, consisting in the use of oxide of zinc for producing a surface or plate upon which to make the drawing or engraving, and in the use of common glue for hardening the surface, chloride of zinc in combination with other materials for ink, and chloride of zinc and water for a hardening solution; also these processes combined.	2 June, 1871	1873	37
395	William Thomas Clark (assignee of George Dwight Stetson and Arthur Burdett Lyster).	12 Jan., 1874	Invention of a rubber stamp and the method of using the same: Consisting in taking an India-rubber cast of a form in type, through the medium of a plaster-mould, and in mounting the stamp and making the ink; applicable to printing on hard as well as soft substances.	10 Feb., 1874	1877	9
451	John Eccles	3 Nov., 1874	Improvements in the method of transferring drawings to stone, zinc, or wood, without injury to the drawing, and in such manner that the original remains available for further use.	8 Dec., 1874	1877	127
476	Robert Dixon Bannister and Samuel Milligan.	21 April, 1875	Invention of a new device for advertising purposes, specially adapted for use in railway carriages, cabins of vessels, &c., consisting of compartments for holding advertising cards with their faces displayed in such manner that when a card is taken out the card behind it is exposed to view, each package of cards being held in position by a spring at the back.	9 June, 1875	1878	69

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
13. Typographic, Lithographic, and Plate Printing; also Advertising—continued.						
513	Elijah Beech	3 Feb., 1876	Improvements in machinery for printing, consisting of an improved combination and arrangement of drums, discs, numbering discs, face-plates, wheels, perforating cylinders, perforators, impression cylinders, &c., whereby subject matter and progressive numbers may be continuously printed upon rolls or strips of paper, card, or other suitable material, which may be also perforated or divided by the machinery into suitable lengths for cheques or other documents.	7 Mar., 1876	1879	37
522	Edward Hely	14 Mar., 1876	Improvements in printing and embossing machines, adapted for working bill-heads, letter-paper, envelopes, &c., in one or several colours, rapidly, accurately, and at a small cost for plant.	28 April, 1876	1879	67
799	James Gardner	24 Sept., 1879	Process for party-coloured printing by a single operation, consisting of certain mechanical contrivances and additions to the usual inking apparatus of all type and other surface printing machines and presses, whereby printing can be executed in two or more colours at the one impression.	27 Jan., 1880	1882 vol. 1	25
835	Thomas Leavitt	6 April, 1880	Improvements in machinery for post-marking, and for obliterating stamps on letters, post-cards, and other articles, applicable to that particular class of machine in which the letters and cards are passed between a type cylinder and an impression cylinder.	28 May, 1880	1882 vol. 2	137

14. Bleaching, Dyeing, and Printing Calico and other Fabrics and Yarns.

[No Inventions under this Class yet registered.]

15. Electricity and Magnetism, their generation and applications.

Generation of Electricity and Magnetism.

[No Inventions under this Division yet registered.]

Conducting and Insulating.

107	Francis Webb Sheilds	Not dated ; received, 3 Mar., 1865.	Improvements in telegraph posts, consisting in constructing them in two parts, one of which is driven into the earth, and the other is fixed to it by rivets or screw-bolts or by welding.	4 May, 1865	1868	23
196	John Slater	23 Nov., 1868	Improvement in the construction of iron telegraph posts, consisting in making them of wrought-iron tubes fitted together in telescopic sections, with cast-iron feet to take the bearing or thrust and keep them perpendicular.	5 Jan., 1869	1870	197

Electric and Magnetic Telegraphs—Signalling, Transmitting, Receiving, or Recording Apparatus.

43	Wm. Hickling Burnett	Not dated ; received, 2 Mar., 1861.	Improvements in electric telegraphs, and in apparatus employed therewith, by which several telegraphs can be worked simultaneously, or nearly so, and some periodically with (by preference) only one line of wire, although more may be used ; also, to improvements in the manipulators and the recorders or indicators of telegraphs, and in the mode of working the same by relays.	21 June, 1861	1866	197
697	Stephen Dudley Field (by his attorney, Edw. L. Woods).	20 Aug., 1878	Improvements in electric signalling apparatus, to be used in connection with what is known in America as the "District Telegraph System," in which any number of houses or stations are connected by an electric wire with a central station, the apparatus in each house indicating from whence the signal comes and its purport, and intimating receipt of the message by return signal.	26 Sept., 1878	1881 vol. 2	115

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15. Electricity and Magnetism, their generation and applications—*continued.*

Instruments for Exhibiting Electric Effects.

[No Inventions under this Division yet registered.]

Electric Lighting, Igniting, and Heating.

361	Alexander Nicolaievitch Lodighin.	14 May, 1873	Improved means for producing electric light, consisting in the use of carbon stems, hermetically enclosed in a case charged with a non-supporter of combustion, capable of lighting roads, signalling on railways and on board ship, illuminating light-houses, &c. ; also the apparatus or appliances, and a modified arrangement of carbon stem.	23 June, 1873	1875	51
721	The Société Générale d'Electricité, procédés Jablochhoff (assignees of Paul Jablochhoff)—N. Vabey and Laurent Descours, directors.	6 Jan., 1879	Improvements in electric lamps, and in arrangements connected therewith for dividing and distributing the electric light, consisting in the use of pieces of carbon placed side by side, and separated by an insulating substance which is consumed along with the carbon, dispensing with all regulating mechanism, and colouring, sub-dividing, and varying the light produced.	20 Feb., 1879	1882 vol. 2	15
804	Thomas Alva Edison	30 Jan., 1880	Improvements in electric lamps, and in the method of manufacturing the same, by which light is given by incandescence, consisting of a light-giving body of carbon wire or sheets placed in a nearly perfect vacuum ; also in the method of manufacturing carbon conductors of high resistance, and of securing perfect contact between the conductors and the carbon.	2 Mar., 1880	1882 vol. 2	39
821	Thomas Alva Edison	15 Mar., 1880	An improvement in electric lamps, and in the method of manufacturing the same, having reference to the making of the carbon filament from paper, and the means of securing the carbon to the conductors.	21 April, 1880	1882 vol. 2	97
857	Thomas Alva Edison.....	14 June, 1880	Improvements in the utilization of electricity for light, heat, and power, being an improved system and means for the generation, measurement, and translation of electricity into light, heat, or power, at central stations for distribution to many consumers.	26 July, 1880	1882 vol. 2	211
858	Thomas Alva Edison.....	16 June, 1880	An improvement in electric lamps, and in the method of manufacturing the same, consisting in forming and sealing the glass bulb for holding the incandescent conductor, in such a way that a stable vacuum may be maintained therein ; and in so adjusting the radiating surfaces, resistance, and pressure, relatively to each other, as to greatly economize conductors.	26 July, 1880	1882 vol. 2	217
881	The Anglo-American Electric Light Company (Limited) (assignee of Charles F. Brush)—J. Irving Courtenay and Thos. J. Montgomery, Directors.	30 June, 1880	Improvements in electric lighting, and in apparatus therefor, having for its object the adaptation of dynamo-electric machines to variable external conditions, not by variation of the speed at which their armatures are rotated, but by variation of the intensity of the magnetic field, and this by means not directly depending on the volume of current circulating in the external circuit.	19 Oct., 1880	1882 vol. 2	269

Electro-deposition and Electrolysis.

[No Inventions under this Division yet registered.]

Electric Motive-power Apparatus.

[Vide 857, above.]

Electric Apparatus for Transmitting, Recording, or Reproducing Sounds.

693	Thomas Alva Edison	6 Aug., 1878	An improvement in means for recording sounds, whether made by speaking or singing, or by musical instruments, birds, or animals, and for reproducing such sounds from such record, termed the "Phonograph."	16 Sept., 1878	1881 vol. 2	95
843	Thomas Alva Edison	6 May, 1880	Improvements in telephones, by means of which sound, and articulate sounds in particular, may be transmitted by the agency of electricity, and corresponding sounds be produced at a distance.	21 June, 1880	1882 vol. 2	173

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15. Electricity and Magnetism, their generation and applications—*continued.*

Electric Apparatus for Transmitting, Recording, or Reproducing Sounds—*continued.*

855	Francis Blake	16 June, 1880	Improvements in telephones, having reference to a method of holding the diaphragm so that it will be free to expand or contract without altering its form; and improvements in that form of transmitting telephones in which the undulations or variations in the strength of an electric current necessary for reproducing sounds in a receiving instrument are produced by varying the resistance of the circuit through changes of pressure between two electrodes of the circuit.	26 July, 1880	1882 vol. 2	203
875	Thomas Alva Edison.....	7 July, 1880	Improvements in methods and appliances for telephonic communication, whereby great perfection is attained in the transmission of sound; also, the connecting of telephones in different places with a central office, whereby any one of the telephones can be placed in communication with any other in the circuit, and the persons at the connected instruments can converse with each other without being overheard, which system is called the Telephone Exchange.	16 Sept., 1880	1882 vol. 2	251

Electric Printing (other than Telegraphic), Writing, and Ruling Apparatus.

[No Inventions under this Division yet registered.]

Miscellaneous Applications of Electricity.

[No Inventions under this Division yet registered.]

16. Preparation of India-rubber, Gutta-percha, Vulcanite, Ebonite, Celluloid, &c.

[No Inventions under this Class yet registered.]

17. Production and Applications of Gas.

12	Bernard Josephson.....	Not dated; received 27 Oct., 1858.	Manufacturing gas from dung or excrement of human beings cattle, the refuse of slaughter-houses and tar, slops and rubbish from kitchens, and the refuse of tanneries.	16 Nov., 1858	1866	53
21	Richard Henry Jeffreys.....	19 May, 1859	Invention for lighting gas by the agency of voltaic, static, or magnetic electricity, in heating platinum wire, or wire made of palladium or other metals; in combination with means for cutting off or extinguishing gas by the power of the electro-magnet.	21 July, 1859	1866	97
37	William Withers Ewbank..	May, 1859; received 26 Oct., 1860.	Improvements in the manufacture of gas when oils and fatty matter are used, and in applying the refuse obtained in such manufacture to a useful purpose.	10 Jan., 1861	1866	171
297	George Eveleigh.....	28 Dec., 1871	Improvements in the manufacture and purification of gas, and in parts of the apparatus employed therein, when the substances used are coal, shale, bitumen, petroleum, turba, peat, oil, wood, or (in some cases) water, or other analagous substances; the process consisting of distilling from these substances, at a comparatively low temperature, the best and richest portion of the gas, together with the oleaginous, tarry, and other vapourizable matters; then distilling the latter till they are converted into gas—mixing this gas with the gas first formed, before or after purification—and passing the resulting mixture into the gas-holder or other vessel.	9 Feb., 1872	1873	3
327	William Baird, junior, (assignee of George Symes). Per Edward O'Keefe.	20 June, 1872	Improvements in portable apparatus for manufacturing illuminating gas from wood (by preference) or other substances, without danger of explosion or other unpleasant consequences, adapted for use in private houses and other buildings, railway carriages, and ships, consisting of a cheap and simple contrivance, viz., a circular box or retort of iron or fire-clay, placed in an ordinary stove, &c.	26 Aug., 1872	1874	97
339	Cyprien Marie Jessie du Motay.	29 Aug., 1872	Invention for the practical production of oxygen and hydrogen gases from the air and from water, by the special employment, as regards oxygen, of alkaline manganates and per-manganates, and as regards hydrogen, of hydrate of lime, of magnesia, and of carbon; also the industrial applications of these gases, especially their application to the Oxyhydric system of illumination.	4 Nov., 1872	1874	133

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
17. Production and Applications of Gas—continued.						
363	Thomas Whitwell	16 June, 1873	Improvements in apparatus for heating air and gases, consisting in the construction of furnaces, ovens, or heating chambers, of a circular or elliptical form, with upright walls or partitions, stayed by cross walls, and with apertures (capable of being closed by means of plugs, doors, or valves) which can be opened for the purpose of cleaning the interior from dust; also, consisting in the admission of heated air for the combustion of gas in the apparatus, and in the construction of apparatus with cleaning openings in the bottom.	7 July, 1873	1875	57
418	Henry Skoines.....	17 April, 1874	Improvements in the manufacture of gas and in the treatment of the residues therefrom, and in the combination of gases for the production of light and heat, and in the apparatus employed therein,—principally directed to the manufacture of gas from cannel coal, carbon, chalk, lime-stone, bitumen, furnace-slag, peat, wood, and paraffine or other oleaginous substances, also water, steam, and air,—the gas-producing substances being retorted, thus removing the sulphur and ammonia; and certain products hitherto treated as residues being then converted into gas, by causing the whole of the crude gases, vapours, or products to pass, with superheated or other steam, or with water, into a separate retort charged with chalk or analogous material in a highly heated state, which chalk or material retains the sulphur and ammonia, while the aqueous products, tar, and ammoniacal liquor are taken up by or combined with the steam and form gases, which are then passed into a final retort charged with carbonaceous material in a highly heated state, for the purpose of amalgamating them into one homogeneous and permanent gas; also certain alternative processes, one being to dispense with the use of the retort charged with cannel coal, &c., in the manufacture of illuminating gas.	21 May, 1874	1877	53
560	Thomas Boverton Redwood	26 Oct., 1876	Improvements in the manufacture of gas for burning, consisting, firstly, in the manufacture of a permanent gas, rich in carbon, by bringing the vapour of a suitable hydrocarbon into contact with copper, or an alloy of copper, kept in a highly heated state, and so arranged as to expose a large extent of surface; secondly, in causing gas obtained by distilling coal, together with the vapours generated with it, to come into contact with copper, &c., as before; thirdly, in causing a stream of water-gas to pass through retorts in which coal is being distilled, and leading the combined products into contact with copper, &c., as before.	27 Dec., 1876	1879	173
561	James Keith	14 Nov., 1876	Improvements in the manufacture of illuminating gas from crude mineral oils, such as shale, American petroleum, &c., and in the apparatus employed therefor, being a new or improved construction, arrangement, and combination of furnace, retort, retort setting, and washer.	27 Dec., 1876	1879	17,
579	Thomas Whitwell	19 Feb., 1877	Improvements in apparatus for heating air and gases, (being an improvement upon patent by same author, No. 363, of 7 July, 1873), consisting in the use of vertical walls or partitions so arranged as to divide the current and cause it to pass in the same direction along two or more adjacent walls or partitions, in place of passing alternately over and under them as heretofore; also, in the use of two structures alternately heated, through which a pipe is passed for the purpose of conveying the gas into a second apparatus previously heated, thus imparting considerable heat to the gas.	28 Mar., 1877	1881 vol. 1	59
589	Alexander Russell Walker..	30 April, 1877	Improvements in apparatus for heating water by gas, consisting in supplying the water to be heated in a shower near the escape of the heated air, and in the mechanical combination and arrangements for effecting this purpose.	11 June, 1877	1881 vol. 1	97
680	John Alfred Stephan	27 June, 1878	Improvements in the manufacture of carburetted hydrogen gas, consisting in making this gas from water or from sewage, by deoxygenizing steam and carburizing or imparting carbon to the hydrogen gas resulting from the operation.	26 July, 1878	1882 vol. 2	61

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
17. Production and Applications of Gas—continued.						
692	William Thomas Crockford and Simon Zollner.	22 Aug., 1878	An improved apparatus for producing illuminating gas, by the mixture of ordinary atmospheric air with the vapour of liquid hydrocarbons, consisting, firstly, in the construction of a vessel for the carburator, with a division sealed in liquid, and a double-valve chest connected to each side of the division, whereby it becomes an air-pump as it is oscillated from side to side; secondly, in the application of an intermittent motion to the carburator, for the purpose of giving a flow of the liquid to bring it more into contact with the air to be carburated; thirdly, in the application of a brake worked by the ascent of the gas-holder to stop the production of gas when the holder is full.	16 Sept., 1878	1881 vol. 2	91
724	James Crutchett.....	6 Jan., 1879	Invention for the manufacture of atomic steam coal gas, for lighting, power, and heating purposes, from pulverised or fine coal, coal-dust, saw-dust, oils, spirits, or other carbonaceous materials solid or liquid injected or otherwise introduced into retorts, furnaces, or ovens, by means of steam blasts or any other means.	20 Feb., 1879	1882 vol. 1	25
773	William Thomas Crockford and Richard Cashin.	23 Aug., 1879	Invention of an apparatus for producing illuminating gas by the mixture of atmospheric air with the vapour of liquid hydrocarbons, which mixture is effected by the application of capillary lines for the purpose of exposing a large surface of liquid hydrocarbon for evaporation.	17 Oct., 1879	1882 vol. 1	141
788	James Livesey, Joshua Kidd, and James Kidd.	28 Nov., 1879	Improvements in material and apparatus for the enrichment of inflammable gas by carburisation,—the material employed being solid hydrocarbon naphthaline, a comparatively waste product, which is prepared in a form convenient for packing, transport, and use, and which when volatilized furnishes a vapour of uniform character and of great illuminating power.	31 Dec., 1879	1882 vol. 1	191
790	William Montgomery Martin (assignee of Sigismund Wekey).	11 Dec., 1879	Improvements in the mode of generating gas for purposes of light and illumination, the said gas being also applicable as a source of heat and motive power, by means of a self-acting apparatus, designated the Airoline Gas Apparatus, which requires neither motive power nor machinery to work it, nor a gasometer in which to hold or store the gas after it has been generated.	8 Jan., 1880	1882 vol. 2	5
825	Henry Yarwood Attrill and William Farmer (by his attorney, Edward Waters).	31 Mar., 1880	Improvements in the manufacture of gas for heating and illuminating purposes, and in the means and apparatus connected therewith, consisting in making the gas descend slowly in a vertical retort, properly heated, supplying fresh coal at the top and taking away the coke at the bottom, using up the poorer gas (carbonic oxide) in the process, and drawing off the gases at different vertical heights (the quality improving with the height).	7 May, 1880	1882 vol. 2	113
841	James Henry Needles (by his attorney, H. T. Smith).	4 May, 1880	Improvements in apparatus for manufacturing illuminating gas from gasoline or light hydrocarbon liquids, consisting in the combination of a tank, oval cap, mixing diaphragms, and porous material, also of an air-pump and its connections, valves, valve chambers, &c., as described.	16 June, 1880	1882 vol. 2	167
868	Arthur Isaac Maxfield & Frederick Styman.	23 April, 1880	Invention of an apparatus for the production automatically of an illuminating and heating gas, of the kind known as "atmospheric air gas," from light hydrocarbon, spirits, or other like materials, by forcing atmospheric air over and through light hydrocarbons, and keeping them in a continual state of agitation during the process; also, an automatic arrangement for the production of illuminating gas for the use of railway or other carriages.	25 Aug., 1880	1882 vol. 2	243

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
18. Metals and Alloys.						
Alloys.						
893	John Berger Spence	27 Sept., 1880	Improvements in the manufacture of metallic compounds, and in the application of such compounds to various ornamental and useful purposes, in the arts and manufactures, entitled, "Spence's Metal," consisting of a fusible compound of sulphur and metallic sulphides.	6 Dec., 1880	B	315
Antimony.						
314	Reginald Bright	11 Mar., 1872	Improvements in the construction of furnaces for smelting ores, and in processes for smelting antimony and other ores, consisting in (1) fitting an ordinary reverberatory furnace with a plumbago bed from 6 to 12 inches in thickness—such bed to be laid on the brick bottom, which falls to the centre, forming a channel to the tap-hole, thus enabling crucibles to be dispensed with in most cases; (2) the ingredients and processes for manufacturing English and French star regulus and French metal tops.	30 May, 1872	1874	57
490	Henri Herrenschildt	23 Aug., 1875	Improvements in furnaces for smelting antimony, lead, tin, copper, cobalt, silver, iron, and nickel ores, consisting in the use of two fires, one at either end or side of smelting furnaces (constructed as described); the heat from the two fires passes into and meets in a smelting chamber, the roof of which is so constructed as to prevent the two currents from passing directly over the ore-bed into the flue and to compel them to mingle together and revolve over the ore-bed.	12 Oct., 1875	1878	107
Bismuth.						
117	Alfred Hallett, Joseph Darwent, & George Harwood Cossins.	3 Oct., 1865	Invention and improvement in the art of metallurgy, being a process of smelting for separating bismuth from copper by the introduction of sulphur, and for precipitating the bismuth from the molten mass by means of metallic iron.	14 Nov., 1865	1868	87
Copper, &c.						
226	Walter Watson Hughes ...	15 Nov., 1869	Improvements in furnaces for smelting copper ore and all other ores, consisting in (1) the use of an inclined plane to save labour in moving the ore to be smelted from one end of a furnace, or set of furnaces, to the other end, or from one kind of furnace in which the ore is calcined to another kind in which it is smelted, by which there is a saving of labour and also of time, by the pushing the ore while hot into the reducing furnace; (2) the utilization of the waste heat; (3) construction of heat-chamber under furnace; (4) plan and construction of skimming furnaces.	28 Dec., 1869	1872	23
318	Thomas Sterry Hunt and James Douglas, junr.	13 June, 1872	Improved process for extracting copper from its ores, consisting (1) in the use of a solution or mixture of neutral proto-chloride of iron, for the purpose of converting the oxide or sub-oxide of copper or their compounds into chlorides of copper; (2) in the use of sulphurous acid, for the purpose of decomposing the oxy-chloride of iron formed in the preceding action; (3) the use of a process for the purpose of extracting copper from its naturally or artificially oxidized ores, by the aid of the first or the first and second of the above reactions.	22 July, 1872	1874	69
569	Charles M'Pherson	19 Dec., 1876	Improved processes for extracting copper from its ores, consisting (1) in dissolving the copper in water to form a solution, (2) in precipitating the copper from such solution; and the invention involves—(1) The use of sulphurous acid, from whatever source obtained, either as a gas or as a liquid, or in solution, for the purpose of precipitating cuprous chloride, from cupric chloride, or from a cupric salt in presence of a soluble chloride; (2) the use of chloride of sodium or any soluble chloride, for the purpose of precipitating copper in the state of cuprous chloride from its cupric salts, by the reaction of sulphurous acid upon such salts; (3) the formation of sulphuric acid by the reaction of sulphurous acid on cupric chloride, or on cupric salts in presence of a soluble chloride, when the precipitation of cuprous chloride accompanies or is produced by such reaction; (4) the use of sulphurous acid when applied to the oxide or sub-oxide of copper, for the purpose of precipitating the copper in the shape of cuprous chloride; (5) the use of ferrous sulphate and of ferric sulphate, for the purpose of converting the oxides or carbonates of copper into sulphate of copper.	12 Feb., 1877	1881 vol. 1	15

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
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18. Metals and Alloys—*continued.*Copper, &c.—*continued.*

573	Charles M'Pherson.....	16 Feb., 1877	Improvements in processes and apparatus for the chemical extraction of copper, silver, and gold from their ores, consisting in :— The use of For converting Into 1. Ferrous and ferric sulphates The oxide, carbonate, or sulphide of silver 2. Do. Metallic silver Do. 3. Do. Metallic copper or sulphide of copper 4. Sulphate of ammonia The oxides or carbonate of copper 5. Do. The oxides or carbonate of iron 6. Do. The oxide or carbonate of silver 7. Chloride of ammonium The oxides, carbonates, or sulphides of copper 8. Do. The oxides, carbonate, or proto sulphide of iron 9. Do. The oxide, carbonate, or sulphide of silver 10. Ferric chloride The oxide, carbonate, or sulphide of silver 11. Do. Metallic silver Do. 12. The formation of the sulphide of ammonium. 13. The use of compressed air, hot or cold, for the purpose of oxidizing any unoxidized ore or mineral; also, for converting sulphides into sulphates. 14. The method of maintaining or producing resistance to compressed air by passing it through the ore, &c., and to compressed gases by passing them through a porous material. 15. The method of oxidizing ores, by drawing or sucking air through them, or by causing a partial vacuum at one end of the vessel containing them. 16. The method of continuous lixiviation described.	20 Mar., 1877	1881 vol. 1	31
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Gold, &c.

(Alluvium, &c.)

23	Samuel Lucas	22 Aug., 1859	Invention of a puddling-machine for washing earth, applicable to gold-washing purposes, consisting of a stationary horizontal cylinder with perforated bottom, a hopper at one end and a shoot at the other, and a revolving axis, the axis being armed with knives and a brush for its whole length, and provided with a screw at one end for discharging the waste stuff and water; also, underneath the cylinder, a rocking sieve with shoot.	20 Sept., 1859	1866	105
355	Alphonse Allain and Alfred Riviere Dejean.	18 Mar., 1873	Improvements in apparatus for washing alluvial and auriferous earths, which may be termed "the system of fixed angles," consisting of a water-tank with sluice gate, puddling compartment, and washing table <i>en suite</i> . The washing table consists of a series of boxes laid side by side across the table, which boxes can be lifted off to be cleaned; each box has a groove, and the boxes collectively present a series of transverse grooves across the table, rectangular at the bottom, but inclining towards the receiving end of the table, so as to each encounter the flowing wash-dirt with an acute angle; the several parts of the grooved boxes are made of pieces to join at a fixed angle, in order to facilitate the construction and repair of the machine, and as being the best possible shape for arresting the mineral in the wash. The machine is on wheels and is worked with the aid of a scraper.	8 May, 1873	1875	33
<i>Gold.</i>						
31	John Whitmee Chapman, Charles Chapman, and Geo. Chapman (brothers). Per J. H. Knibbs.	20 June, 1860	Invention of an oscillating corrugated gold amalgamator, consisting of a revolving chamber of cast-iron, &c., with four hemispherical grooves around it in which travel heavy iron balls, the mercury being placed in the grooves and the cylinder slightly inclined and oscillated, while it is made to revolve rapidly to facilitate the amalgamation of crushed quartz and water introduced through one end of the cylinder.	16 Aug., 1860	1866	143
62	Samuel Bradford Birkbeck and Morris Birkbeck Pell.	24 Sept., 1862	An improved method of extracting gold from its ores, as found in the Colony of New South Wales, by employing a dry amalgam of silver, gold, &c., wholly or partly, instead of mercury, &c., the amalgamation being effected by the action of heavy stone mullers attached to the arms of a revolving shaft set in the centre of a mill formed on the ground.	16 Dec., 1862	1866	319

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
18. Metals and Alloys—continued.						
Gold, &c.—continued.						
145	Henry Alderson Thompson	27 Oct., 1866	Improvements in processes and machinery for separating gold or gold-bearing ores from sand, tailings, &c., and in reverberatory furnaces for roasting such concentrated material or other sulphurets, &c., consisting (firstly) in improvements in percussion tables, namely, using stirrers, either making the table fixed and the stirrers movable, or the table movable and the stirrers fixed; and (secondly), in improvements in the decomposition of sulphurets or other baser metals which impede the extraction of gold by means of oxidation, consisting of an improved inclined reverberatory furnace, used either with or without a hot or a cold blast, whereby the gaseous matters of the fuel are consumed, and an amount of heated air is thrown into the furnace at a dull red heat, or as near thereto as can be economically obtained.	4 Dec., 1866	1870	53
152	Thomas Seelye Farmer and Edwin Torrens Brissenden	26 April, 1866	Improvements in machinery for amalgamating the metals existing in crushed auriferous material, designed principally to be used as an auxiliary to Wheeler's Amalgamating Pans," but capable also of being used as an amalgamator either with or without any other amalgamator, consisting of a stationary amalgamating pan and revolving shaft with arms having knives fixed angularly thereto and alternately reversed, and provided also with fixed vanes to counteract the centrifugal motion of the contents.	10 June, 1867	1870	69
163	Francis Bowyer Miller	1 Oct., 1867	Invention of an improved method of toughening brittle gold bullion, of refining alloyed gold (whether naturally or artificially alloyed), and of separating therefrom any silver they may contain, consisting in bringing the alloyed gold when in a molten state into contact with chlorine or hydrochloric acid gas (the latter mixed with, or in the presence of, atmospheric air or oxygen), in such manner that the silver or the baser metals it may contain may be separated from it as chlorides.	7 Nov., 1867	1870	101
247	Frederick Beer	16 July, 1870	Improved process and machinery for extracting gold from auriferous ores, rocks, or "tailings," containing arsenical iron pyrites, copper pyrites, antimonial pyrites, or the sulphites of other metals, consisting in decomposing and removing the sulphites while the stuff is in an incandescent state, during the process of roasting in a reverberatory furnace, by applying a hot air blast, or also (towards the end of the operation) by passing pure oxygen over the surface—after which all the gold can be obtained by amalgamation; also, by the use of super-heated steam as a substitute for or supplement to the above process.	23 Aug., 1870	1872	87
264	Frederick Beer	31 Dec., 1870	Invention of machine, entitled "Differential Specific Gravities Alluvial Gold-washing Apparatus, and gold-saving Amalgamator in Quartz-crushing Operations, with Concentrator of Pyrites," consisting of a combined concentrator and amalgamator. The concentrator consists of a long shoot, with several ripple-boards across it laid in a slanting position, discharging into the amalgamator. For general gold-washing purposes a grating of wire is to be placed at the discharge end of the "long tom" used for feeding the concentrator. The amalgamator consists of a perpendicular cylinder open at both ends, standing in a circular pan, and having in its centre a perpendicular rod, to the lower end of which is attached an agitator something like that of a churn, which agitator may be made self-acting by introducing a small water-wheel between the shoot and the orifice of the cylinder, which operates thus,—the quicksilver being placed in the pan and the tailings fed into the cylinder with a stream of water (the head of water being high enough to overcome the weight of the quicksilver), the stuff is forced up through the quicksilver and out over the sides of the pan, except only the gold, which is absorbed by the quicksilver.	21 Feb., 1871	1873	3

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
18. Metals and Alloys—continued.						
Gold, &c.—continued.						
329	Thomas Sutcliffe Mort (assignee of Henry Francis).	13 July, 1872	Invention of a machine for amalgamating gold, entitled, "The Centrifugal Amalgamator," consisting of a vertical revolving cylinder, lined or otherwise constructed with copper plates in order to present a large amalgamating surface, and having a concentric circular frame with beaters revolving rapidly within it; the machine is charged with quicksilver, which remains at the bottom of the cylinder constantly recoating the interior while the cylinder revolves slowly, and thereby promoting the amalgamation of the contents, which are introduced through a perforated pipe at the centre—the residuum being permitted to overflow through apertures or be withdrawn by a syphon.	28 Sept., 1872	1874	103
369	Edward Reading	4 June, 1873	Invention for reducing mineral ores and quartz stone to an impalpable powder, by means of which all the gold that may be therein may be readily extracted therefrom with a great saving of labour, consisting in burning or roasting the ore, and while it is in a heated condition subjecting it to a bath of sulphuric or other strong acid, for the purpose of destroying the mundic and sulphur, and thereby reducing the stone to a rotten state; then passing it through a mill, using in the process an alkaline solution composed of strong potash; and finally amalgamating with quicksilver.	7 July, 1873	1875	79
419	James Cosmo Newbery, George Henry Frederick Ulrich, and Henry Yorke Lyell Brown.	17 April, 1874	Improved process for extracting gold from auriferous antimony ores, antimonial compounds, and antimonial mixtures, consisting in adding metallic antimony to such ores, compounds, or mixtures, in the shape of fine powder sprinkled over the material when fused, which powder drops to the bottom precipitating loose particles of gold with it; and this alloy can be crushed and analysed, and treated again in the same way till the gold is all collected.	21 May, 1874	1877	57
802	Henry Joseph, John Matthew Muir, and Samuel Levy Bensusan.	31 Dec., 1879	Invention of process for the prevention of sickening of mercury and loss of gold during amalgamation of auriferous ores, blanketings, tailings, pyrites, &c., entitled "Joseph, Muir, and Bensusan's Improved Amalgamating Alkaline Process": Consisting in offering to the evolved bodies a substance or substances for which they have a greater affinity than for mercury, namely, the alkaline earths and their compounds, the oxides of barium and calcium (preferentially the latter, on account of its cheapness)—(1) Adding an excess of lime to the substance under treatment before or while it is ground or stamped. The usual proportion of the barium or calcium to be added does not generally exceed 10 per cent. of the whole weight; (2) roasting the auriferous substances mentioned with the ingredients named.	20 Feb., 1880	1882 vol. 2	33
<i>(Gold, Silver.)</i>						
30	Benjamin B. Thayer (by his agent Denton Bingham).	18 May, 1860	Invention of a machine for amalgamating gold and silver ores with quicksilver, consisting of a pan of cast-iron, &c., with a hollow cone rising in its centre—a cruciform muller fitting the bottom of the pan, driven by a shaft resting on a step in the cone—a corresponding annular groove in muller and pan-bottom for catching the amalgam—curved shoes bolted to the muller at different angles for triturating purposes—four vertical copper plates coated with mercury attached to the muller-shaft for catching floating gold—apertures, &c., for discharging waste and water and amalgam.	9 July, 1860	1866	139
288	Frederick Arthur Willson and James Hartwell Williams.	9 Sept., 1871	Invention of a process and machinery for the extraction of gold and silver from quartz-tailings and other waste, by grinding or triturating it in iron or wooden barrels lined with iron, caused to rotate with iron discs in the presence of water, salt, caustic soda, and quicksilver, or some of them, consisting in treating the fine stuff in an amalgamating barrel having rotating in it a number of discs of iron, &c., of the shape indicated in the drawings, the barrel being charged with water and the above ingredients—the contents of the barrels are afterwards to be discharged into amalgamating tubs in which arms are made to revolve over a surface of sodiumized quicksilver; and the stuff having been washed in one or more of these tubs is passed into a sluice-box, and from thence into a receiver, both of which are struck alternately by a beater, the percussion causing the deposition of the more solid contents.	30 Oct., 1871	1873	67

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
18. Metals and Alloys—continued.						
Gold, &c.—continued.						
337	Christian Ludwig Qwist and Stephen Thomas Leigh.	7 Sept., 1872	Invention of a new process for extracting gold and silver from iron pyrites, mundic, titanic sand, &c., consisting in adding sulphur to the ore, or using sulphur if already combined with the ore in sufficient quantity, the successive steps being—(1) Roasting in an ordinary furnace; (2) smelting in a reverberatory furnace, with the aid of a flux (such as lime with a little soda and salt added, if necessary)—tapping off the slag—leaving the matte at the bottom—and adding fresh charges till a sufficient matte has been accumulated; (3) tapping off matte and treating it with water; (4) washing again and smelting in a reverberatory furnace with flux, upon a bath of lead mixed with sulphate of lead, galena, or oxide of lead; (5) adding wrought iron; (6) tapping off slag and iron by successive operations, till lead remaining at bottom is supposed to be rich enough; (7) cupelling in the usual way.	4 Nov., 1872	1874	127
368	Allen Hollinshed and James Smith Norrie.	27 May, 1873	Improved apparatus and process for collecting and retaining gold and silver by amalgamation from quartz and other mineral substances, consisting in passing the stuff to be operated on together with water through a tube at a sufficient elevation to overcome the pressure of a column of mercury, whereby the lighter substances are carried to the surface and the heavier retained in the amalgamator, which is provided with perforated diaphragms for the better distribution of the current; consisting also in the use of sodium amalgam with the mercury, when desirable, especially in treating mineral substances containing pyrites.	7 July, 1873	1875	77
379	William Frederick Bassett.	18 Aug., 1873	Improved machinery and process for the separation of gold and silver from the sludge of puddled earth and the tailings of crushing machines, and for the self-retorting of gold and saving of the mercury employed, consisting of an amalgamator, comprising furnace, retort, receiver, condenser, mercurial arrester, and occasionally a puddling machine. The furnace is constructed to receive the retort, and is either built of brick or made portable. The retort is movable and connected with the condenser by an adapter; a tube, with funnel, top, and tap, stands out from the top of retort above movable cap, and passes down below ordinary level of quicksilver in retort; and a movable cap is placed over retort connecting with space between outer and inner skins of condenser by a telescopic tube (the whole protecting the retort with its tube and adapter from cooling effects of atmosphere). The flow into the amalgamator is immediately in front of the condenser, at the highest level of the receiver, and in the direction of the current—in which circumstances the matter is permeated with the vapour of the heated mercury, which amalgamates with floating particles of gold and falls to the bottom in the shape of amalgam. The receiver has a socket in its centre, into which a revolving shaft is set, carrying arms to which are attached blades or brushes, &c.; its bottom is conical and has a discharging well at its lowest point, with tap for drawing off the amalgam, and sluice trap. The condenser is an iron chamber, open at bottom, suspended over, and having its edges dipped into the sludge. The mercurial arrester receives the overflowing puddle from the amalgamator through a pipe descending into it; on a level with the bottom of the pipe and forming a complete false bottom is placed a finely perforated plate and over it a depth of quicksilver; an Archimedean screw in the pipe forces the sludge down through it and through the perforated plate and mercury above it (the scientific principle here applied and claimed being that mercury will not pass through wire gauze, or a finely perforated plate, through which sludge or water may be forced). As appendages to the other machinery, there may be a puddling machine with bottom dipping to the outlet, and a grating and sluice where it discharges into the amalgamator, and also a well and pump; also, certain other features described in the specification.	29 Sept., 1873	1875	107

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
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18. Metals and Alloys—*continued.*Gold, &c.—*continued.*

380	James Lawson and Thomas Jaffrey.	12 Sept., 1873	Invention of a machine for the immediate extraction of gold and silver from any mineral substance (whether oxidized or not) in which these metals are contained, consisting of two or more hollow drums, fitted on a hollow horizontal axle which also carries the pulley; at the mouth of the axle there is a hopper for receiving the ore, and hot or cold water is introduced into the machine through the hopper and axle by pipes; two or more balls, fitting the semicircular periphery of the drums, are introduced into each drum, for the purpose of grinding the ore while the drums revolve; at the exit from the first drum into the axle is a wire screen, and at the exit from the second drum through the axle is a finer screen; attached to the exterior of the second drum is a series of annular ripples charged with mercury; the ripples overflow upon a horizontal sieve, covering a trough which is fitted with a regulating plate dipping into it and likewise charged with mercury; the discharge thence is on to a blanketing table, or into a revolving barrel receiving and discharging through the axle, and also charged with mercury.	7 Oct., 1873	1875	111
596	Robert M'Collum Fryer ...	28 May, 1877	Improvements in apparatus for pulverizing ores and amalgamating the metals contained therein, by means of which ores containing gold and silver in a free state can be either pulverized without amalgamation, can be amalgamated after pulverization, or can be at the same time and by one operation both pulverized and amalgamated: Consisting of (1) the combination of a chamber to rotate, revolve, or oscillate on or about a horizontal axis, and of a weight or ram, solid or in the shape of a hollow cylinder, and sliding on a rod or not, so contained within the chamber that the weight and the material placed in the chamber are caused by gravitation to have a reciprocating motion, falling from one end of the chamber to the opposite end; (2) the combination of a series of chambers and contained weights with a central shaft around which they are disposed radially, in one or more contiguous circles, and arranged to rotate as in (1); (3) the combination of a series of crushing or pulverizing chambers, and contained weights or rams, with a central chamber, as in (2), such central chamber acting as an amalgamator for the outer chambers.	2 July, 1877	1881 vol. 1.	107
598	Robert M'Collum Fryer ...	28 May, 1877	Improvement in furnaces for roasting metallic ores, especially for separating gold and silver from quartz or from the baser metals, consisting of an upright cylindrical furnace, with double walls, &c., of iron, the intervening space being filled with water to preserve the inner shell from burning or oxydizing, and to generate steam, which is introduced into the stack to act as a blower; also of a cone suspended over the conical top of the furnace, and having flowing upon it, which water comes in contact with the gaseous and volatile products as they pass out under the cone to escape into the stack, and condenses and precipitates into the water space the metallic and other particles; also, of a suspended or invertible bottom to the furnace, freely admitting air and which can be emptied with ease—the cap and bottom being double-cased like the body of the furnace. This furnace is fed first with billets of wood and then with the ore in lumps on top.	2 July, 1877	1881 vol. 1	115

(Gold, Silver, Other Metals, Precious Stones.)

19	Richard Goulding	28 Mar., 1859	Improvements in machinery and processes for extracting gold, silver, and other metals, from auriferous or argentiferous ores or their matrices by the amalgamation of the metallic particles by chemical combination with quicksilver, consisting in an amalgamating machine with horizontal cylinder containing spiral screw propeller to amalgamate the contents and discharge the amalgam into a vessel at one end, the pulverized stuff and water being introduced under the quicksilver, and the action of the quicksilver stimulated by the application of heat on the reverberatory principle.	19 May, 1859	1866	87
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No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
18. Metals and Alloys—continued.						
Gold, &c.—continued.						
33	John M'ulloch	Not dated ; received, 23 July, 1860.	Improvements in the process of reducing ores containing gold, silver, lead, tin, and copper, or mixtures of these ores and metals, consisting in taking out the metallic compounds by ordinary comminuting and washing processes, mixing therewith carbonaceous and other materials and water, moulding the compound into blocks, slabs, or masses, subjecting the blocks to kiln, clamp, or oven burning, reducing the bricks to powder, and then collecting the comminuted metals by ordinary methods.	6 Sept., 1860	1866	151
44	Richard Goulding and Amos Downes Shepard.	Received, 20 May, 1861.	Improvements in processes and machinery for extracting gold, silver, and other metals from their ores and matrices, consisting in combining with the pulverized ores, &c., combustible materials, moulding the same into blocks and burning them into bricks, pulverizing the bricks and amalgamating the powder in a "Triturating Amalgamating Machine," consisting of a stationary circular dish and revolving vertical shaft having four arms with drags or sledges, &c.	10 July, 1861	1866	247
108	Zenas Wheeler (by his attorney, Thomas Seelye Farmer).	27 April, 1865	New and improved gold and silver amalgamator and separator, for working every description of quartz containing gold, silver, or precious metals, whether combined with mundic, pyrites, or other impurities; consisting (firstly) of a stationary covered pan with heating chamber underneath and a rotating muller, the bottom and sides of the pan and of the muller being armed with curved plates to promote the amalgamation of the pulp with the quicksilver, and the centrifugal force imparted to the pulp being counteracted by stationary adjustable curved plates; secondly, of a stationary tub into which the pulp is run for secondary treatment, this tub having a mercury chamber underneath and a rotating shaft resting on the bottom it, the shaft and arms being hollow, and the arms being equipped with metal pads to collect the amalgam, which drops from them into the receptacle beneath.	31 May, 1865	1868	27
118	Richard Goulding	25 Sept., 1865	Improvements in the extraction of gold, silver, and other metals from their ores or matrices, consisting (firstly) in improvements upon Patent No. 44, of 10 July, 1861, granted to same Richard Goulding and Amos Downes Shepard, namely, dispensing with grooves in bottom of amalgamating basin, and constructing the drags and sledges so that they may be reshod when worn; and (secondly), in an improved arrangement of machinery for the separating process, entitled, "Goulding's Combined Hydrostatic Movement Separator," being a combination of the hydrostatic gravitation principle with ordinary shaking tables or revolving or reciprocating pans—in the case of shaking-tables, the stuff being supplied through a hopper and tube attached to one end of the table, and discharging beneath the surface of the mercury, and travelling thence along the table to the hydrostatic ripple; and, in the case of revolving or reciprocating pans, entering through a hopper and tube, the foot of which is either immersed in the quicksilver or comes in through the bottom of the pan.	14 Nov., 1865	1868	89
125	Charles James Stevens	14 Mar., 1866	Invention of a machine for separating quicksilver from gold and silver and other amalgam, consisting in a vertical tube of iron fitted into the crown of a horizontal receiver, having a small opening on one or both of its sides covered with soft leather or other porous material, the mercury in the receiver being forced through the leather or porous substance by hydrostatic pressure, thereby separating any metals or other foreign substances held in mechanical or chemical suspension therein.	12 June, 1866	1870	5
190	Benjamin Rogers Brown ...	27 Oct., 1868	Improvements in ore-dressing, ore-washing, and concentrating machines for treating the precious and other metals, of the kind in which the pan oscillates about a central pin, discharging the waste at a central orifice, and the concentrated ore at the periphery, consisting in constructing the pan with a curvilinear bottom and single rim, and with a trough deepening towards the concentrated matter discharge orifice; also, a central receiver with T-shaped distributing pipes, which discharges near the rim, operated by a paul and ratchet teeth in the rim; also, rotatory stirrers operated in the same way.	7 Dec., 1868	1870	177

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
18. Metals and Alloys—continued.						
Gold, &c.—continued.						
219	John Hunt	3 Aug., 1869	Improved mechanism for washing and separating gold and other ores, as well as precious stones, referring to that class of machines having a forcing-box for injecting water into washing chambers, consisting in constructing the sieve and washing chambers in two or more divisions, in order to separate the material, according to its specific gravity—in interposing a grating between the hopper and sieve; and also in using a piece of canvas, or silk, &c., in the upper part of the sieve, resting on the surface of the water, for the purpose of preventing the floating off of fine mineral matter—in placing water-guides in the washing boxes in such a position as to prevent the water rushing direct to that part of the sieve nearest to the forcing-box—and in some minor improvements.	13 Sept., 1869	1872	5
237	George Milner Stephen	28 Mar., 1870	Invention of a "Gold and Diamond Cradle Amalgamator," consisting of a long narrow box, over which works a cradle with sieves and compartments, barrow, and rakes, for washing, extracting, cleansing, crushing, amalgamating, and separating gold, tin, &c., and precious stones, whether contained in crushed quartz or in alluvial deposits—a rocking motion being imparted to the cradle by a rod connected with one of the rollers, which are capable of being used for crushing, winding, and such like purposes—the whole of the motions being adjustable; also several minor improvements, including means for locking up the machine for safety.	29 April, 1870	1872	57
313	John Russell	9 April, 1872	Improvements in machinery for separating, washing, and extracting gold, silver, tin, or other ores from alluvial, or from crushed stone, and for separating pyrites and other sulphides from tailings or refuse from quartz-crushing, consisting of a cylinder composed of square bars placed longitudinally corner to corner and a little apart, set almost horizontally, and kept constantly revolving, and fed at the high end with sand, ore, and water; the smaller particles fall through the bars on to a table or shoot, having imparted to it a shaking motion, which with the aid of a jet of water deposits the stuff over the face of an endless web, which passes over rollers, carrying its load up a gentle incline against two jets of water, and dipping its slack into a receiving tank full of water into which it also discharges its load; the larger portions pass out through the low end of the cylinder into a hopper, which conveys them direct to the stamper-box, whence the pulverized stuff is passed through fine gratings on to a similar travelling table placed below the stamps; also the general arrangement of the apparatus, engine, and battery.	30 May, 1872	1874	55
319	Ebenezer Vickery and William Barton.	13 June, 1872	Invention of a smelting furnace, entitled "New Smelting Furnace," for separating gold, silver, and copper from other metals, and from ores, and from each other, or for smelting tin or other metals, consisting of a fan for blast or blast-engine; also, communicating with each other, a coal fire, charcoal furnace, and retort for metals or ores, all with feed-pipes. A feeding-hopper is placed above the furnace, a pipe from which passes through the flue to the metal feeder. The metals or ores get roasted and desulphurized in passing through this pipe to the retort. Chlorine gas is formed in the coal fire, and the carbon is extracted from the fuel, and all impurities consumed in passing the charcoal fire; and this, with the aid of the blast, produces an intense white heat in the retort, causing all metals other than gold and silver to melt into the tap-race, and the gold and silver to become oxidized and pass into the flue, where they deposit themselves on prepared plates of antimony and cast-iron, from which they can be taken by planing or other suitable treatment.	22 July, 1872	1874	73

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
18. Metals and Alloys—continued.						
<i>Gold, &c.—continued.</i>						
323	Richard Lloyd	29 June, 1872	Invention or improvement in apparatus for crushing, grinding, washing, amalgamating, and separating ores of gold or other metals, and for treating other substances, consisting of hopper, feed-rollers, and vertical annular drum, divided into two or more chambers by discs, in which a number of spherical or cylindrical weights are carried round by a revolving disc with a projection at one point, or hammers are wielded by radial handles; also, on the same axis with and on each side of the crushing discs is placed a large drum with a periphery of perforated plates and a groove for mercury, into which falls the stuff from the crushing drum to be sifted and amalgamated.	31 July, 1872	1874	87
348	Eugene Roehn.....	19 July, 1872	Invention of a machine for gold and silver quartz-crushing and amalgamating and for gem washing, consisting of a rocking trough with rounded bottom (the interior of which is fitted as a washing machine, the exterior of the bottom as a crushing machine); an arm to which is attached a stamper projects from each end, the stampers strike upon anvils which are boxed round and bedded on a solid foundation; from the centre of the bottom of the trough projects an angular axis or pivot, working between two rollers, for keeping the trough in position; underneath is a dry amalgamating box, into which the stuff falls between the two rollers; in the amalgamating box is a separator or distributor consisting of three crcross-arms worked by a crank; beneath the amalgamating box is a receiver to contain mercury.	27 Feb., 1873	1875	11
367	Thomas Denny	23 May, 1873	Improved machinery for pulverizing and concentrating gold and pyrites, consisting of a combined crusher and pulverizer, and buddle. A vertical revolving shaft carries round with it a receiver with four arms, having attached to their extremities heavy rollers in the form of the frustrum of a cone; these rollers travel in a pulverizing pan with a bottom slanting outwards; the material with water is discharged into the receiver by a hopper, and carried thence into the pan by a pipe discharging in front of each roller; after being pulverized it is carried by gravitation from under the rollers over an annular division into an outer ring of the pan, and flows thence through grooves under the false bottom on which the rollers travel into the buddle, which is set lower than the pan and has its bottom slanting inwards; on the bottom of the buddle are several annular divisions, viz., at its outer periphery a groove or well for mercury, and at equal distances three stops, over all which the stuff is successfully washed till the waste is discharged through a central opening surrounding the foot of the shaft; within the buddle are four adjustable arms attached to the shaft, for carrying round rakes or brushes in the annular spaces; also several minor improvements.	7 July, 1873	1875	73
390	Benjamin Rogers Brown ...	23 Oct., 1873	Improved machinery for washing auriferous or stanniferous drifts, for concentrating sand or slime ores, and for separating pyrites and gold from crushed quartz, consisting of pans suspended or supported and having a reciprocating motion—each pan being formed with a bottom sinking towards the middle, and having a space partitioned off along the middle, communicating with the rest of the pan, by apertures close to the bottom, which space has a separate discharging aperture of its own. The material to be concentrated is fed with water into the pan, and the water and waste are constantly flowing over the sides of the pan while the heavy particles drop into the central space.	9 Dec., 1873	1875	143

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
18. Metals and Alloys—continued.						
Gold, &c.—continued.						
570	William Adam Dixon	21 Dec., 1876	Improved processes and apparatus for extracting gold, silver, and copper from pyrites, copper ore, and all sulphides, consisting principally of sulphides of iron, mixed with or containing gold, silver, or copper, having reference to—(1) Recovery of gold and silver from iron or arsenical pyrites, or sulphides of iron; (2) removal of part of the iron from roasted pyrites or sulphides of iron; (3) production of an increased quantity of sulphuric oxide during the roasting of pyrites or sulphides; (4) removal of lead from the residue left after dissolving the iron; (5) the use of regulus formed from copper ores for the production of sulphuretted hydrogen; (6) the precipitation of copper from a solution of sulphate of copper or chloride of copper; (7) obtaining metallic copper from its sulphates; (8) recovery of gold and silver contained in the residue from any of the processes described; (9) extracting gold, silver, and copper by using fuel and water alone.	22 Feb., 1877	1881 vol. 1	19
660	James Cosmo Newbery.....	25 Jan., 1878	Improved process of treating ores of gold, silver, nickel, or cobalt. (1.) Ores bearing gold, silver, nickel, or cobalt, in combination with either sulphur, arsenic, or antimony, or with two or all of them; (2.) Silicious ores bearing nickel or cobalt without sulphur, arsenic, or antimony: Consisting in subjecting them, in the different manners described in the specification, to the simultaneous action of the compounds of chlorine (chlorides) and aqueous vapour whilst under calcination.	14 Mar., 1878	1881 vol. 2	21
681	Henri Herrenschildt.....	18 June, 1878	Improvements in the extraction of the precious metals from auriferous or argentiferous pyrites, consisting in—(1) Desulphurizing the pyrites, preferentially in inventor's revolving conical roasting furnace (Registration No. 533); (2) mixing certain fluxes with the product and smelting in a blast furnace, for the purpose of converting the baser metals into a fusible slag and the precious metals into a concentrated matte; (3) supplying gradually through the blast some sulphurizing agent; (4) tapping, granulating, and re-smelting, with finely ground oxide of lead or galena, to form a lead amalgam; (5) cupelling the amalgam.	26 July, 1878	1881 vol. 2	63
716	William Croasbill	18 Oct., 1878	Improved process and apparatus for the treatment of pyrites, or other refractory ores containing gold, silver, or other precious metals, consisting in—(1) The application of the methods and apparatus described to the treatment of the ores of the precious metals and to other industrial purposes, as affecting the recovery of nitric acid; (2) the use of hot-water spray for absorbing peroxide of nitrogen and recovering nitric acid from its lower oxides, and the use of hot-water spray in combination with atmospheric air or oxygen for reoxidizing and absorbing the lower oxides of nitrogen, and regaining the nitric acid.	20 Jan., 1879	A	1
851	James Howell Mears.....	19 May, 1880	Improved process for chlorinating ores, consisting in mixing the ores with water in a strong air-tight vessel, and subjecting the mixture while in a state of agitation to chlorine gas under chemical or mechanical pressure greater than atmospheric pressure, for the purpose of extracting therefrom gold and the precious metals, in combination, as chlorides in solution.	30 June, 1880	B	193
<i>(Quartz, &c.)</i>						
57	Hayden Hezekiah Hall.....	May, 1862	Invention of a pulverising machine, termed, Hall's Universal Pulveriser, for crushing gold quartz, &c., applicable also to the grinding of all kinds of grain; consisting of a circular shell or drum, the interior of the rim or periphery of which is corrugated, enclosing six revolving hammers, the material to be operated on being supplied on one side through a hopper, and thrown out at the other in the shape of an impalpable powder, by the arms acting as a centrifugal blower.	5 Nov., 1862	1866	299

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18. Metals and Alloys—*continued.*

Gold, &c.

114	James Hart	21 July, 1865	Improvements in machinery for crushing, amalgamating, and washing auriferous and other quartz, or earthy matters of every description, and if desired collecting therefrom all gold and other minerals and metallic substances contained therein, consisting of a machine composed of a cylinder or conducting case revolving on one or more wheels, friction rollers, or shafts, and having one or more cylinders revolving within it, the inside cylinder being perforated or not, and the surfaces, being plane, corrugated, or otherwise,—to be used either for crushing alone or for crushing and amalgamating.	7 Sept., 1865	1868	71
251	William Edmund Smith and Edward Albert Smith.	11 Aug., 1869	Improvements in machinery for crushing quartz or other hard substances, for extracting gold therefrom, by steam, horse, or manual power, consisting in the application of two stampers to one battery, and in the method of actuating the stampers.	18 Oct., 1870	1872	99
684	Thomas Denny and William Roberts.	8 July, 1878	Invention of machine for disintegrating quartz and other tailings, and pyrites, and for amalgamating the gold extracted therefrom, entitled, "Double Contrary Revolving Grinding and Amalgamating Pans for gold, silver, and other metals": Consisting of an upper and a lower pan, set parallel to each other but at an angle with the horizon, and revolving in opposite directions; a cone roller rests in the top of the upper pan, and a disintegrator half-way down; the roller is kept in revolution by the motion of the pan; the disintegrator is stationary, being fixed loosely to the frame, and rests in the pan (which it fits closely) on one side of its bottom, but is raised a little at the other side, the better to intercept the stuff, which is received into the machine from a spout between the roller and the disintegrator, and is flowing towards the latter. The lower pan is the larger one, and has three disintegrators (top, bottom, and middle) like the one in the upper pan; the overflow from the upper pan is received in front of the bottom disintegrator, and passing under it has to rise through, (say) 20 lbs. of quicksilver, and then pass successively under the other disintegrators till finally amalgamation is completed and the waste escapes over the low side of the underneath pan.	7 Aug., 1878	1881 vol. 2	71

Mineral and other Substances.

330	Eugene Dominique Nicolle and Thomas Sutcliffe Mort.	1 Aug., 1872	Invention of machinery for crushing, pulverizing, and amalgamating mineral substances, and for separating and amalgamating the metals contained therein, entitled, "Nicolle and Mort's Improved Crushing, Pulverizing, Amalgamating, and Distilling Apparatus," consisting of—(1) a crusher, constructed on the principle of the wedge or inclined plane, applied preferentially in a coiled form, and worked in a continuous, alternate, or rotary manner, the number of wedges in the circle being varied according to the size of the machine and description of work to be done; (2) a pulverizing amalgamator, consisting of two inverted cones made to work one inside the other at different angles, the crushed substances together with quicksilver being introduced at the apex where the surfaces are further apart, and emerging at the circumference, encountering copper bands and plates in its passage to promote amalgamation; and (3) a still, for recovering the quicksilver by the application of heat, working in conjunction with the pulverizing amalgamator, its action being continuous and the affinity of the quicksilver enhanced by the presence of heat in the process.	28 Sept., 1872	1874	105
334	Edward Nucella Emmett ...	23 July, 1872	Invention of apparatus for crushing, grinding, washing, amalgamating, and separating metallic particles from their ores and other substances, consisting of a shoot, connecting with the feed end of a revolving cylinder, the lower or discharging end of which forms the frustrum of a cone, which cylinder is set horizontally or on an incline, and has a belt of perforations around its middle communicating with a pair of shaking-tables—water and quicksilver being passed into the hopper along with the ore or debris under treatment.	9 Oct., 1872	1874	123

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
18. Metals and Alloys—continued.						
Mineral and other Substances—continued.						
375	John Phillips	17 July, 1873	Improvements in machinery for pulverizing, washing, and separating mineral, animal, or vegetable matters, and for reef-testing, metallurgical, and other such operations, entitled, "Phillips's Stamper, Grinder, Amalgamator, and Washer of Gold and Silver Ores," consisting in a frame-work; central shaft; four rollers; four stampers and mullers, loaded and shod; serrated stamper-beds, into which the stampers, &c. fall by gravitation without the aid of cams, &c.; splash-plate above stamping, grinding, and amalgamating trough; circular grating all round stamping trough; outer splash-plate or apron all round grating; arms attached to outer apron for carrying chains, rakes, or coulter, to keep loose the contents of the annular grooves, of which there are three, surrounding the outer apron, and into which the overflow of the trough successively falls till it passes out of the machine.	11 Aug., 1873	1875	97
381	John Phillips	1 Sept., 1873	Invention of machinery for the separation of mineral substances, the cleaning of tin and other ores, the amalgamation and separation of gold and mercury from lighter substances, and the exposition of precious stones, consisting of the following appliances,—(1) a rocking barrow with two handles, with or without a wheel, with false bottom and with or without riddled sides; or with four handles and transverse rockers; (2) barrow-rest and receiver; (3) for catching fine tin, pendulum pan which rocks and oscillates, and connected therewith—stops for retaining heavy substances, fixed comb-frame, rocking arms; (4) for cleaning ores by hand, (a) a ripple of peculiar construction, (b) cleaner, hinging at one end and falling down at the other, comprising oscillating mercury pan, comb frame, pan frame, magnets set across stream to catch iron particles—the comb frame moves up and down, while the pans move horizontally; (5) modifications of machinery, for treating large quantities, also for amalgamating and separating gold from tin or pyrites and saving pyrites; (6) scraping and searching tools.	14 Oct., 1873	1875	113
531	Alexander Heatherington...	19 May, 1876	Improved apparatus for separating metals, ores, or precious stones, from earth or other impurities, entitled, "Heatherington's Patent Ore-Separator and Amalgamator": Consisting of a chest with lids on top and doors in front; a strong grating, forming one-half of the top or cover, constitutes the receiver, and a slit along the bottom of the opposite end of the apparatus constitutes the discharge; a slanting board across the middle forms the inner end of the compartment under the top grating, and a fine sieve forms the bottom of the same compartment; fitting into the box are several removable inverted inclined planes, trays, or sluices, of which the higher end, called the "head" is fitted close to the inside face of the apparatus, and the lower end called the "tail" or overflow, does not quite reach the opposite face, but rests on pins, &c., the tail of one tray thus discharging on the head of the one beneath it, throughout the series, till nothing is left to pass off at the outlet, but water and slime; there is a small hole in the delivery end of the apparatus, underneath the lowest sluice but one, through which steam may be introduced by a pipe in cold weather.	17 July, 1876	1879	91
793	John Hollway	25 Nov., 1879	Improved processes for producing sulphur from pyrites—for utilizing sulphides in lieu of fuel—and for obtaining, in separate groups as metals, or in the form of oxides, sulphides, or slag, the metals originally contained in the pyrites and other substances treated.	19 Jan., 1880	B	11
Nickel.						
535	George Horwood Cossins ...	27 Nov., 1876	Improved processes for smelting nickel ore and obtaining metallic nickel therefrom, consisting (1) In the mixture of antimony with nickel ores, so as when smelted to form an alloy of nickel (whether the antimony be pure, or in the form of an oxide, sulphide, or any other salt or mixture); (2) in the one of chlorine (whether dry or derived by heating together sulphate of antimony and chloride of sodium), or a sodium or potassium salt, in the subsequent process of obtaining the nickel from such alloy.	10 May, 1877	1881 vol. 1	75

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18. Metals and Alloys--continued.						
Nickel--continued.						
587	Jules Garnier	12 Mar., 1877	Improvements in processes for the manufacture of nickel and its alloys—the nickel being extracted from its oxides, silicates, and salts generally, whether natural or artificial: Consisting in the employment of methods explained in detail in the specification, which is very lengthy, and embracing claims on the following points:—(1) The agglomeration of the ores of nickel or garnierite prior to their treatment for carburet nickel; (2) the manufacture of carburets with a base of nickel and iron, by the addition to ores that are poor in nickel, as well as to the nickeliferous scoria and slag, of rich and pure iron ores; (3) the manufacture of bricks for building purposes, by means of the dross of the smelting furnaces; (4) the preparation of metallic nickel by the previous reduction of its oxide contained in the ore itself, either in the crucible or in chests or "pots" of firebricks or in the reducing furnace; (5) the decarburization of carburets of nickel in a closed vessel, and the direct obtainment by cementation of a malleable nickel pure or alloyed with iron; (6) the refining carburet of nickel in the wet way by previously refining it (mazed age) under oxidizing actions; (7) the application of puddling according to the various systems in the refining of carburet of nickel; (8) the refining of carburets of nickel by reaction upon them of the oxides of copper, nickel, &c.; (9) the application of Bessemer's Converter in the refining of the carburets of nickel; (10) the employment of nickel rabbles in the divers operations by dry process of the metallurgy of nickel; (11) the employment of carburets of nickel and manganese in the manufacture of smelted or puddled nickels, the manganese serving as a deoxidizing agent, as in the ordinary manufacture of steel; (12) the refining of carburets with a nickel and iron base, by direct transformation into an alloy of copper and nickel after oxidation and scorification of the iron, manganese, chromium, &c.; (13) the preparation of alloys of nickel by the direct reduction of the garnierite mixed with the natural or artificial oxides of the metals with which it is wished to alloy the nickel; (14) the new product designated ferro-nickel or an alloy of iron and nickel,—as well as the means of manufacture.	8 June, 1877	1881 vol. 1.	83
Ores, Minerals, Metals, &c.						
55	Rowland Vounder Rodda ..	20 Dec., 1861	Improvements in process and machinery for metallizing and fusing ores or minerals, by submitting them (after they have been deprived of sulphur, arsenic, antimony, and every other volatile substance) to heat—in connection with substances or gases containing carbon—in vessels from which all atmospheric air is excluded; also, for fusing the metal thus metallized by raising it to the heat required for that purpose, but without raising it to the heat required for fusing the stony portion or gangue; also for separating the metal so fused from the stony or other foreign substance with which it may be associated, by crushing and washing.	2 Oct., 1862	1866	291
124	Arthur Hope	10 Mar., 1866	Invention of improvements in stamping machinery for crushing purposes, consisting in an arrangement of stamps whereby some of them act as preparatory crushers.	14 May, 1866	1870	3
131	Samuel Levy Bensusan (irrevocable attorney and sole agent for Newell Vicary Squarey).	17 Feb., 1866	Improvements in the construction of machines for dressing and cleaning ores and separating the heavier portions from the lighter, consisting (firstly) of an inclined table and travelling knives and rakes for working the stuff thereon; and (secondly) of another table, having in connection with it a third table for carrying the waste down the jigging hatches, into which a constant stream of water and waste ore is falling from the first table—the other appendages being troughs for carrying away the lighter portions of the ores not saved, tanks for catching the light and slimy ores, and a plunger—such machines being combined and in joint use with a constant stream of water.	15 Aug., 1866	1870	15

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
18. Metals and Alloys—continued.						
Ores, Minerals, Metals, &c.—continued.						
153	Benjamin Rogers Brown, Edward Stansfield, and William Henry Nash.	4 April, 1867	Improvements in ore-dressing, ore-washing, and concentrating machines, consisting of a circular pan with two rims, a conical bottom, and a central discharge, which pan rests on a central pin and has a rectangular oscillating motion imparted to it, the material to be operated on being introduced with a constant flow of water into a central hopper discharging into a basin overflowing onto a flat conical distributing apron, from which it is dropped around the inside of the inner rim of the pan, the lighter stuff being carried off at once through the central discharge, and the heavier stuff finding its way through perforations in the inner rim to the chamber between the two rims, where it is amalgamated with mercury, while the ores pass out in the order of their density through holes at different heights in the sides of the outer rim.	14 June, 1867	1870	73
191	Louis Buette	15 Oct., 1868	Invention of a machine for breaking or pulverizing ore, limestone, quartz, stone, slate, emery, &c., consisting of a hopper surmounting a pair of reciprocating and stationary jaws armed with perpendicular steel-faced angular flutes, the reciprocating jaw being moved rapidly by an eccentric on the shaft of the driving wheel, which is run by steam.	7 Dec., 1868	1870	179
194	John Munday	3 Oct., 1868	Improvement in machine for separating ores from their matrices when in a finely divided state, consisting in the application of knives or flukes to the radial arms of a buddle, by attaching them angularly to adjustable subsidiary arms connected with such radial arms.	17 Dec., 1868	1870	191
213	William Thompson Rickard and William Carne Paul.	4 May, 1869	Improvements in apparatus for washing pulverized ores and other matters, and for separating the metals contained therein or combined therewith by amalgamation, consisting of a trough or receptacle having preferentially a semi-cylindrical bottom with (when used for amalgamating purposes) a recess or channel at the lowest part; also, a screw or screws of about 2-inch pitch, strengthened with longitudinal bars, the heads being of copper or copper alloy—or if of iron, &c., galvanized to suit the process—and being amalgamated with mercury.	17 June, 1869	1870	241
224	Thomas Carr	16 Sept., 1869	Improvements in or applicable to machinery for disintegrating or pulverizing minerals, ores, clays, chemicals, artificial manures, and various other substances and articles of manufacture; and for mixing or separating various materials; and for dispersing fluids, semi-fluids, and molten metals, to facilitate or produce chemical or other changes,—being improvements upon Patent, by the same inventor, No. 778 of the United Kingdom, dated 9 March, 1859.	3 Nov., 1869	1872	15
263	Daniel Baddeley Pritchard.	8 Dec., 1870	Invention of machine, entitled the "Remfry Separator," for the classification and concentration of ores, minerals, and metals, according to their specific gravities, consisting of a trough divided longitudinally and transversely into two or more compartments, each of such compartments being fitted with a sieve or grating of metal and a loose piston—the trough being full of water and charged with stuff to be operated on, the action of the pistons imparts a pulsating movement to the water, causing a forcing and sucking action to take place through the sieves or gratings, which has the effect of separating the stuff into different grades continuously and minutely, thus obviating the necessity of using dressing apparatus or mercury.	24 Jan., 1871	1873	1

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
18. Metals and Alloys—continued.						
Ores, Minerals, Metals, &c.—continued.						
278	Charles Frederick Collom...	10 June, 1871	Improvements in means or apparatus for cleansing or dressing metallic ores, consisting in a revolving circular table with upper surface sloping outwards and water discharging upon it constantly from perforated pipes. The stuff to be washed being delivered on the table from a launder or shoot, is cleansed and graded by being washed further down the incline at each operation, the refuse being carried over the sides of the table—the point of delivery from the shoot is adjustable to suit stuff with different ranges of specific gravity, and the patent is subject to the following modifications: (1) The table may be set at an angle; (2) it may be made to slope inwards, in which case the water will be discharged at a point near the outer instead of the inner circumference; (3) it may be provided with revolving or stationary brushes; (4) it may be divided into two parts, sloping different ways and discharging into different receivers, the waste washing off into other receivers; (5) it is to be grooved for the reception of mercury if it is to be used for washing or dressing silver or gold.	24 July, 1871	1873	74
281	Gustavus Wolff	17 July, 1871	Invention of self-acting machine for the separation and classification of metals, ores, and minerals, according to their size and different degrees of specific gravity, consisting of a series of boxes <i>en suite</i> , increasing in size towards the discharging end, into and through which a flume conveys a stream of water together with the stuff to be treated, causing a deposit of stuff of a different specific gravity to take place in each box; also, a series of corresponding boxes underneath, into which clear water is admitted from a separate source, which water can be made to act upon the deposited stuff in any particular box or in all the boxes together by opening a slide valve or valves; also, the means of clearing each of the underneath boxes of the sediment finally deposited in it.	17 Aug., 1871	1873	55
311	James de Hirsch	28 Mar., 1872	Invention for roasting or calcining ores during their descent from a vertical furnace, consisting of a square stack with the bottom inclined towards the discharge hole; a fire bridge extending nearly to the top of the interior of the stack; a finishing chamber for roasting the finest particles; revolving pans in passages between the receptacle for ore, which is on top of the stack, and the interior of the stack; the furnace is heated with wood, coal, or turf by gas generators communicating with the stack; a strong upward current of air is maintained in the stack, by a powerful fan or a separate chimney, causing the lighter particles to be carried upwards across the fire-bridge and down into the finishing chamber, where they become exposed to the direct action of the flame and settle down in a roasted state; the heavier particles in descending the stack against the current get the sulphur which they contain oxydized, and fall into a chamber, or through a slit into a waggon, whence they can be easily removed.	10 May, 1872	1874	49
344	William Willoughby, Joseph Willoughby, and Saml. Willoughby.	19 Dec., 1872	Improvements in machinery or apparatus for stamping ores and other hard substances, consisting in a frame above which is placed a crank-shaft having two or more throws or cranks (one for each stamper), so arranged that the stamp-heads with their respective rods and attachments balance each other and proportionally lessen the driving power required, the rods being capable of being adjusted to the proper lengths, and being supported by springs; also, other peculiarities of construction.	7 Feb., 1873	1875	3
350	George Bishop.....	20 Feb., 1873	Improved machine for reducing mineral ores and quartz, consisting of a pot or mortar having a hemispherical bottom, and a <i>neatly fitting</i> pestle attached to a shaft held out of the perpendicular by an arm from the driving shaft, the rapid revolutions of which latter give the pestle an oscillating and smearing motion that reduces the ore to an impalpable powder and discharges it through a hole in the bottom of the mortar.	4 April, 1873	1875	21

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
18. Metals and Alloys—continued.						
Ores, Minerals, Metals, &c.—continued.						
354	Thomas Sutcliffe Mort	15 Mar., 1873	Improved method of constructing cams and discs for stamping machinery, consisting in making the cams in more than one piece, in order to permit of the renewal of the wearing parts without disturbing the cam or the shaft, and in making the discs for the shanks in two or more pieces or halves.	8 May, 1873	1875	31
383	Henry Richard Hancock ...	9 April, 1873	Improved machines for jigging ores, consisting in imparting horizontal as well as vertical motion to the sieves of jigging machines, whereby the jigging can proceed with or against the stream or in still water, which principle is applied to four forms of jigging machines, viz.—(1) The ordinary Cornish Hand-brake Staff Jigging Machine, (2) The Cornish Jigging Machine driven by machinery, (3) An original machine: and (4) an improved form of the same.	21 Nov., 1873	1875	115
397	Frederick Beer	23 April, 1872	Improvements in ore-crushers, consisting of an air-cushion or air-box with piston projecting downwards in a line with the stamp-rod, and designed to act as a buffer on the stamp-rod when the latter is ascending, and to cause it to rebound with force when released in descending.	2 Mar., 1874	1877	11
469	Edward Youngman Harrison.	17 Mar., 1875	Improvements in machinery for pulverizing and amalgamating, consisting of a rotating basin set at an angle in which a mechanical pulverizer rolls around, and embracing the following improvements:—(1) Instead of the bottom and sides of the basin forming a continuous curve, accommodated to the shape of a ball or spherical pulverizer, as in the "Berdan basin," they are made flat, and a conical pulverizer revolves on the sides; a ledge, with openings covered with gratings, is introduced, projecting inwards from the upper part of the side or wall; the face of the ripple or well between the ledge and the upper part of the wall is covered with copper plates. (2) Or, in lieu of the ledge, the upper part of the wall is made at an angle between that of the ledge and the upper part of the wall, and gratings are placed therein, as in the ledge. (3) Or, in lieu of the conical pulverizer, there is used an arch-shaped drag, thicker in its outer than its inner edge, and with passages through it from top to bottom,—all which improvements (with the exception of the first) are applicable to the "Berdan basin."	10 May, 1875	1878	39
483	William Henry Harrison ...	28 June, 1875	Invention for the reduction of ores of iron to a metallic state, as malleable iron and steel, by a chemical and mechanical contrivance designated "Harrison's Reduction Process," consisting in the employment of two kinds of furnaces differently constructed, with processes appropriate to each, designated respectively the "furnace process" and the "retort process"—the principle of the invention being the <i>direct application</i> of hydrogen and carburetted hydrogen gas to ores of iron brought to a red heat; the said ores being confined in the chamber of a suitable furnace, and sealed from the air during the reduction, such gas being especially manufactured for the reduction to a metallic state of ores of iron.	9 Aug., 1875	1878	87
33	Henri Herrenschmidt	10 Mar., 1876	Improvements in roasting furnaces and an apparatus connected therewith, consisting of a conical revolving purifying chamber, with its smaller end leading to the chimney stack or sulphur chamber, set horizontally, with fire-place, ash pit, and roasted ore receptacle at one end and the chimney stack at the other; also, hydrogen gas generator, to be introduced (if required) between the fire-place and the conical chamber, and a fan and sulphur chamber between the upper end of such chamber and the stack—the fire-place and roasted ore receptacle being made movable preferentially.	21 July, 1876	1879	99
557	Alexander Borthwick	26 Sept., 1876	Improvement in furnaces for treating ores, applicable to furnaces the ore-beds of which are formed of a tubular chamber revolving or partially revolving on its own axis, consisting in attaching to the inner periphery of such revolving chamber continuous parallel lifters or ridges.	27 Dec., 1876	1879	163

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
18. Metals and Alloys—continued.						
Ores, Minerals, Metals, &c.—continued.						
617	Thomas Alder Dickson Forster & George Jordan Firmin.	10 Aug., 1877	Improvements in processes and apparatus for amalgamating metals, and machine for washing ores: Consisting of two forms of apparatus—(1) A long horizontal cylinder with blast pipe, mercury tube, and hopper; communicating with a vertical cylinder, having within it a perpendicular revolving shaft, which serves as a water conduit and carries round with it fans and grinding rollers. The hopper is near the receiving end of it on top and is provided with a feed-screw; a pipe for admitting a blast of steam or air is let in through the receiving end of the cylinder and terminates underneath the mouth of the hopper; a mercury cup is fixed on top of the blast pipe and has a tube leading from it through the blast-pipe and extending to a little beyond its mouth; the stream through the cylinder is regulated by reflecting plates. This commingling of the "sand blast" with the ore produces continuous amalgamation, enabling the work to proceed without intermission. The horizontal cylinder enters a perpendicular cylinder forming a π with it, and the latter discharges into a washing tank. The tank has a conical bottom, sinking towards a well in the centre; footed in the well, and passing out through the crown of the tank, is a hollow revolving shaft carrying two sets of wings and three conical grinding rollers; the shaft is hollow, and conducts water down into the well, whence it surges up under the rollers; bibb-cocks are let into the sides of the tank at different heights to carry off the waste; and the amalgam falls into the well. (2) Similar tank; but having the hopper on top around the shaft, and the feed-screw formed on the shaft; and having a retort for vapourizing mercury built beside it and entering it near the top, thus subjecting the metallic contents to intimate amalgamation with the mercury.	17 Sept., 1877	1881 vol. 1.	153
619	Henri Herrenschildt, James White, and William George Lempriere.	20 Aug., 1877	Improvements in concentrators: Consisting of a box with parallel sides, having a V-shaped bottom in which rests a perforated pipe covered by a flat perforated false bottom or tray. In the box are sloping shelves, from one to the other of which the material under treatment falls till it reaches the false bottom or tray. The upper part of the box is divided by horizontal flanges into chambers having overflow pipes. At one end of the tray is the open end of a square elevator tube having an archimedian screw, which carries the stuff up to a discharging flume as fast as it is washed, thus rendering the apparatus continuous in its operation. The material to be treated is supplied to a hopper, from which it is drawn by a conical screw-feeder into the narrow end of a horizontal conical drum or trommel, driven by toothed gearing and supported by friction rollers. This drum is perforated throughout with holes of the different sizes to which the stuff is required to be reduced; all stuff which is sufficiently fine passes through these holes and the remainder falls out at the larger end into an inclined hopper leading to a narrow space between a fixed and a revolving surface, between which it gets crushed and then falls into the washing-box below.	25 Sept., 1877	1881 vol. 1.	159
661	Joshua Hendy (assignee of Thomas A. Cochrane).	30 Aug., 1877	Improvements in ore-feeders for stamp mills, consisting of a rotating table working upon an incline, in combination with a hopper for receiving and depositing ore upon such table, and stationary guides or scrapers for directing the ore to the desired point of discharge, being the lower side of the table.	14 Mar., 1878	1881 vol. 2	23
Quartz, &c.						
13	Minor King.....	27 Oct., 1858	Improvements in machinery for crushing quartz and other ores, consisting in a series of pestles placed within an annular mortar, and around a feeding spout, the pestles being actuated by a horizontal double or triple inclined cam, which acts against circular discs on the pestle rods, or by an equivalent device, so that the pestles are rotated as they are raised by the cam; also, in using in connection with the machine a screen and drip flange arranged relatively with each other and with the mortar and pestles.	8 Dec., 1858	1866	57

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
18. Metals and Alloys—continued.						
Quartz, &c.—continued.						
53	Enoch Chambers	27 May, 1862	Improvements in the use of hydraulic power for the breaking, crushing, or pulverising of quartz, blue-stone, or other stone or mineral of any description; and the use of a wrought iron lever or jaw in machines for crushing quartz or any other mineral; and the use of steel teeth and steel shield pieces for the levers or jaws in such machines.	Aug., 1862	1866	283
92	John McPherson	8 April, 1864	Invention of a pulverizing machine for crushing quartz or other material by the application of centrifugal force, consisting of a horizontal hopper-shaped mill with corrugated sides and revolving hammers.	31 May, 1864	1866	435
138	George Frederick Dunn ...	12 July, 1866	Improvements in quartz or alluvial crushing, grinding, and amalgamating machinery, consisting in a horizontal revolving disc or cylinder with corrugated, serrated, or plain, or plain surfaces, revolving within an external cylinder composed of segments with similar surfaces and having receiving and discharging ports, &c.; also, of a revolving blanket, with table, wash-trough, and ripple-board, the blanket forming an endless band travelling over two rollers (to one of which a crank-handle is attached), the underneath half dipping into a trough of water to facilitate the cleansing of it.	22 Aug., 1866	1870	37
139	William Drück	3 Aug., 1866	Invention of a direct acting stamping machine, for crushing quartz, ores, rocks, or earthy substances, by the power of steam or compressed air, consisting of a stamper attached to a piston working into an overhead cylinder, and so constructed as to admit, shut off, and release the steam or air without employing any slide or other valves.	12 Sept., 1866	1870	39
234	Frederick Beer	18 Jan., 1870	Improvement in quartz-crushing machinery, consisting in connecting with each stamper springs of the requisite resisting power, thus allowing a great reduction to be made in the weight of the head of the stamper, reducing the fall, and increasing more than threefold the number of strokes made,—such machine being worked by a steam reaction-wheel, or turbine, having arms fixed on its axis to engage the stampers, and raise them alternately, and the moter being simple, direct acting, and condensing its own steam.	25 Feb., 1870	1872	47
258	William Grey	12 Oct., 1870	Improved quartz-crushing or ore-reducing and amalgamating machinery, consisting of the application of spiral springs to stampers, for the purpose of increasing their power and effectiveness while reducing the weight of the stamp-heads—of the employment of insulated galvanic magnets in the troughs of amalgamators, for arresting pyrites—and of a closely covered hydrostatic amalgamator, in which the stuff is introduced under the surface of the mercury, and discharged by gravitation, in both cases through pipes in the top of the machine.	8 Dec., 1870	1872	123
261	George Milner Stephen	3 Nov., 1870	Invention of a portable hammer battery *	13 Dec., 1870	1872	131
445	Charles Wheeler	7 Oct., 1874	Invention of machine for treating quartz tailings and pyrites, entitled, "Wheeler's Grinding and Gold-saving Mill for treating Quartz Tailings and Pyrites": Consisting of a grinding pan which is set in a strong frame and has footed in its centre a vertical shaft, which is kept running by bevel wheels and overhead gearing; the bottom of the pan rises by successive annular steps towards the centre of the pan which is left flat; the vertical shaft has arms loosely attached, carrying rollers which are made with faces corresponding with the faces of the bottom of the pan; there is a pocket on each side of the machine through which the material to be treated is introduced into the pan from shoots; the material enters at the outer or lowest level of the pan and passes under the rollers at each successive step as it rises to the discharge at the centre; a jointed bend pipe connected with the discharge cleans out the machine by simply turning down the end of the pipe.	10 Nov., 1874	1877	115

* Specification missing.

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
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18. Metals and Alloys—*continued.*

Quartz, &c.—*continued.*

898	William Rasche, C.E.	13 Oct., 1880	Improvements in "Rasche's Patent Direct-acting Battery for Quartz-crushing, &c.," consisting of a single acting engine for lifting the stampers direct by the power of steam or other fluids, leaving them to fall and strike by their own gravity; also, the use and adaptation of mode of fixing the discs to stamper, rods or shanks—the valve gear, and the compensating lever for equalizing weight of lifting cylinder, &c.	9 Dec., 1880	1882 vol. 2	331
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Shaping and Working—(See also, *Iron and Steel, Class 6; Plating and Coating Metals with Metals, Class 23*).

97	Alfred Simpson	30 Mar., 1864	Improvements in soldering metals, more particularly the tops and bottoms of preserve canisters, consisting in novel implements, appliances, and methods for the purpose.	16 Aug., 1864	1866	451
702	Alban Gee.....	26 Aug., 1878	An invention entitled "Combination Rotary Press," for cutting and stamping tin plates or other metals into various shapes.	7 Oct., 1878	1881 vol. 2	137
767	William Aikin and William Whyte Drummond.	16 Aug., 1879	Improved method of moulding in sand, and machinery therefor, consisting in several appliances for forming moulds by mechanical compression.	29 Sept., 1879	A	117

Silver, &c.

356	Samuel House and Carl A. Stetefeldt.	21 Feb., 1873	Improved process of and furnace for chloridizing and treating silver and copper and other ores, consisting in dropping a mixture of finely pulverized ore and salt through a heated chamber, shaft, or flue, either against or with the flame and products of combustion; and in the combination of a shaft having fire-places near its bottom, with a flue provided with an auxiliary fire-place for this purpose.	16 May, 1873	1875	37
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Sulphurets, Amalgam, &c.

206	John Aickin.....	2 Jan., 1869	Invention of a compound for amalgamating gold and other precious metals, termed the "Magistral Amalgamating Compound," consisting of an admixture of quicksilver with other ingredients, capable of converting auriferous quartz sand into a fine paste, and forming a speedy amalgam.	16 Mar., 1869	1870	229
443	John Rutherford, assignee of John Antone Peer.	3 Aug., 1874	Improved machine for concentrating and saving sulphuret, amalgam, and other valuable heavy products found among the tailings of quartz mills or of gravel washing, consisting of a table in two lengths, the shorter one having a greater inclination than the other; above the higher portions at about a third of its length from where the slopes join, is a V-shaped feed trough, extending across the table, and perforated along the bottom to distribute the material evenly; the lower or discharged end of the table rests on a pulley or roller, which enables the table to travel backward and forward freely, and which can be raised or lowered to suit the grade of material passing; the higher end hangs upon links or chains; a motion resembling that employed in the hand-pan process is imparted to the table by a cylinder operated by a winch handle on its axis; a projection from the high end of the table rests against this cylinder, in a groove forming cams which give two sudden horizontal falls and wobbling or side motions at each revolution; an adjustable discharge roller, fluted or plain, rotating in boxes at each side of the table, and actuated by a ratchet wheel and paul, is placed just underneath the meeting point of the two planes of the table where there is a slot right across the table for saving the valuable products which fall into a trough underneath, the rest running to waste over the end of the table; a perforated pipe for supplying and distributing water extends across the high end of the table just above the junction.	10 Nov., 1874	1877	111

No.	Name of Applicant	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
18. Metals and Alloys—continued.						
Tin, &c.						
328	Richard Goulding	19 July, 1872	Invention for separating stream-tin from its ore and mine-tin from comminuted lode stuff, entitled, "Goulding's Improved Patent Ore Separator," consisting of the combination of a French shaking table with a hopper containing one or more screens or sieves at the feed end, set at an incline, and so arranged as to throw off the waste behind or at either side of the hopper and thus prevent it from entering the separator—the action of the machine being facilitated by introducing water with the stuff to be operated on, and by imparting alternating motion to the hopper and table combined.	12 Sept., 1872	1874	101
340	John Russell	9 Sept., 1872	Improvements in machinery for washing, separating, and classifying the ores of tin or other metals obtained from alluvial or from crushed stone, consisting in the application of a series of perforated gratings or sieves of copper, &c., superimposed in the order of the coarseness of their meshes (the coarsest on top); the active agent is water supplied from a hopper or shoot at a higher level than the trays; this keeps the water constantly flowing upwards through the trays, while at the same time a concussive or pulsating motion is imparted to it by a double action plunger pump introduced between the hopper and the trays; underneath the trays is a slime ore chamber; tray No. 1 has a discharge lip; the remaining trays discharge their sand into a sand chamber by a side delivery. The material for treatment is supplied to the machine through the perforations of a horizontal cylinder (Patent No. 313, of 30 May, 1872). Two of these machines are worked from the same cylinder, the parts being duplicated, and the movements mechanically reciprocating.	4 Nov., 1872	1874	137
352	Thomas Soutter Harwood, Robert Harwood, and John Mitchell.	13 Feb., 1873	Invention of a machine for sluicing purposes, entitled, "Harwood and Mitchell's Tin and Gold Sluicing Machine," consisting of a receiver for water, a shoot to receive wash-dirt and water, and a lower shoot for water, both shoots playing upon an adjustable screen which rejects stones and through which the washed stuff is delivered upon a false bottom, and thence on to a corrugated bottom, having at the delivery a wood ripple and perforated iron continuation, the action of the machine being accelerated by the inclination of the bottoms and the flow of water; also, a forking frame resting on the corrugated bottom, capable of being raised at either end or removed altogether, consisting of three transverse rotating bars or axis armed with spikes to travel on top of and in the corrugations of the bottom, which bars are kept revolving by two endless chains worked by a winch-handle.	7 April, 1873	1875	25
353	Joseph Justin Brenan and Cornelius Stanley M'Glew	16 Jan., 1873	Invention of a machine for washing tin and gold from alluvial, consisting of a hopper fitting into an oscillating frame, which hopper can be run out on a tramway and tilted by a mechanical arrangement, for the purpose of clearing it of washed stones. The wash-dirt, &c., escape through holes in the bottom of the hopper into a trough or receiver, which latter has passing through it a shaft with rakes or disturbers driven by pulleys, and has a rounded bottom and door—also a longitudinal opening with regulator. A table may be attached for receiving the washed stuff, which table has a small revolving rake or disturber driven by pulleys working in a hollow a little way along the table, and has pockets across the table for catching the mineral.	8 April, 1873	1875	29
442	Thomas Carpenter & Thomas Sutcliffe Mort.	28 Aug., 1874	Improved apparatus and method for the more effective and economic reduction of stanniferous scoriae, slags, and ores, by a more perfect deoxidization, fusion, and reduction thereof, through the medium of a blast furnace in combination with a retension chamber and the action of vapour therein, this vapour being caused by the heated air on its passage from the downcast to the uptake impinging upon water covering the bottom of the chamber, by which action with the aid of retarding curtains the fine particles of ore and volatilized metal are secured and deposited in the chamber.	10 Nov., 1874	1877	107

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18. Metals and Alloys—*continued.*

Tin, &c.—*continued.*

544	William Henry Harrison	19 July, 1876	Improved chemical and mechanical contrivance, entitled "Harrison's hydrogen process for the reduction of oxides of tin, copper, lead, and antimony," consisting in heating these oxides in retorts and conveying hydrogen or carburetted hydrogen gas amongst them with a view to abstracting the oxygen which they contain—in applying such gases under pressure obtained by means of a force pump—in the use of a siphon tapping hole which keeps the retorts sealed from air while permitting a continual flow of the fused metals—in passing a fine stream of steam over incandescent carbon for the purpose of procuring the hydrogen gas employed in the process.	30 Aug., 1876	1879	131
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19. Photography, Photo-lithography, and Photo-mechanical Printing.

27	John Walter Osborne	1 Dec., 1859	Improved process for obtaining lithographic impressions by the aid of photography, consisting in transferring to a lithographic stone or plate of metal a positive copy of the photograph of any drawing, writing, printing, or design, or of an original photograph or copy of photograph through the medium of a flexible surface, such copy being capable of receiving greasy or fatty ink and giving lithographic impressions.	18 April, 1860	1866	123
725	Samuel Thompson and Thomas Wilson Garlick.	14 Jan., 1879	Non-actinic process of writing and printing, consisting in the admixture of all the colours in the spectrum and the blending of such colours to produce all the intermediate tints of the same, and the application of the same to all paper and other printing and writing materials—also, the blending and application of these colours with black and white and the similar application of the same—to produce contrasts of colours pleasing to the eye, but which when tested by photography will be non-photographic, <i>i.e.</i> , produce no image.	20 Feb., 1879	1882 Vol. I	29

20. Weaving.

[No Inventions under this Class yet registered.]

21. Ship Building, Repairing, Sheathing, Launching, &c.

123	James Charlesworth and Charles Cooling Sharp.	10 Mar., 1866	Improved composition, consisting of a combination of tallow, resin, and white lime, and process for applying the same to ships' bottoms, wood, iron, &c., for the purpose of preserving the same from the effects of exposure to the atmosphere, to fresh or salt water, to earth, or to insects.	14 May, 1866	1870	1
198	William Thomson, John Sharp, Edwin Bull, John Holme Jones, George Moore, Stephen Bartlett, and William Errington.	24 Nov., 1868	Improved apparatus for raising sunken vessels or material, or sustaining weights afloat, consisting of—(1) Gas receivers or balloons; (2) the use of hydrogen or any other light gases (except atmospheric air) as the lifting or flotative power; and (3) the mechanical arrangements for producing the gas under water and conveying it to the receivers or balloons.	19 Jan., 1869	1870	205
494	Thomas Thomson	29 Sept., 1875	Improvements in rowlocks for boats, consisting in attaching the rowlocks to a hinged plate, so that they may be turned inboard under the gunwales when not in use, and may not be injured should they come in contact with a ship's side, &c.	3 Nov., 1875	1878	113

22. Bricks and Tiles, Artificial Stone and Cement.

69	Frederick Ransome	5 Jan., 1863	Improved processes for the manufacture of artificial stone and cement or plaster, and for treating timber for the purpose of preserving the same.	31 Mar., 1863	1866	337
78	John Platt and William Richardson.	17 July, 1863	Improvements in machinery for the preparation of clay for the manufacture of bricks, tiles, and other articles which may be made of such material.	2 Sept., 1863	1866	377

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
93	George Cowdery	19 April, 1864	Improvements in machinery for making bricks, consisting in the use of triangular feeding shafts and a cylinder of moulds or clay-holders, together with movable projections on the pressing-roller in combination with the stampers or plungers—the machine being either mounted on wheels or stationary.	30 June, 1864	1866	439
140	Battista Pedrazzi	10 July, 1866	Invention of machinery for making plain and ornamental roofing tiles, in the process of manufacture, and in the shape of the tiles.	12 Sept., 1866	1870	41
154	Friedrich Hoffmann	4 June, 1867	Improvements in kilns or ovens for burning bricks, tiles, pottery-ware, limestone, cement, and other substances, whereby the operation is rendered continuous, consisting in building the kiln or oven of an annular or continuous form, whether circular or otherwise, and (by preference) sunk in the ground so as to leave the roof only exposed.	1 July, 1867	1870	75
167	Battista Pedrazzi	7 Oct., 1867	Improvement in the shape of a roofing tile, called the "Variegated or plain Roman Tile," consisting in a combination of lines, rendering the tile water and wind proof and cool.	22 Nov., 1867	1870	115
262	Augustus Morand	2 Dec., 1870	Improvements in kilns for drying, burning, and cooling bricks and other articles or substances, consisting in a series of drying and burning chambers, communicating with each other by means of flues or passages whereby heat may be forced from any one chamber to any other of the series; also, of an air chamber at end, in which a graduated temperature is maintained, and which is in communication with the said chambers; also, of the necessary flues, pipes, tubes, passages, dampers, and valves.	20 Dec., 1870	1872	135
272	Riley Briggs, Augustus Morand, and Thomas Shann Derham.	30 Mar., 1871	Improvements in machinery for making bricks and similar articles, the crushing-rolls, pug-mill, moulds, and pressing-dies, with their actuating mechanism, being all arranged in combination upon one base-plate, and the machine being adapted for making either pressed or unpressed bricks or blocks.	17 May, 1871	1873	31
280	Augustus Morand	4 July, 1871	Improvements in machinery for manufacturing bricks, applicable to pugging and moulding machinery with horizontal rotating tables, consisting in operating the revolving parts by means of worm-gearing, in improved pushing and lubricating devices, and in complete arrangements for pressing and moulding.	9 Aug., 1871	1873	51
372	James Bishop Perrins	20 June, 1873	"Perrins's Patent Hydraulic Cement," composed of limestone and bluestone, or limestone and any basaltic rock, in the proportions stated, pulverized, mixed with water, moulded into bricks or slabs, subjected to pressure, baked, and then reground.	21 July, 1873	1875	89
427	Robert Künstanan	7 April, 1874	Improved kiln, entitled the "Sure and Self-feeding Economical Kiln," for burning and drying bricks, tiles, pipes, and earthenware generally, consisting of—(1) Self-feeding apparatus for introducing fuel without admitting draught; (2) utilization of surplus heat for drying and intensifying purposes; (3) construction of chambers for reception of unlimited produce.	26 June, 1874	1877	71
444	Patrick Hayes	2 Sept., 1874	"Improved concrete for building walls and roofs of houses, &c., consisting of an admixture of cinders or coke and lime ground together, wetted with liquid silicate of soda, mixed with cement and sand, sprinkled with oil, and then, with the aid of moulds, set in the position it is to occupy.	10 Nov., 1874	1877	113
527	Eugene Dominique Nicolle and Thomas Sutcliffe Mort.	24 April, 1876	Improvements in machinery, &c., the manufacture of artificial stone and tiles, entitled, "Nicolle and Mort's Artificial Stone and Tile Apparatus,"—consisting in—(1) The mode of effecting the cohesion of the particles employed in the manufacture of artificial hydraulic stone, by compression within rigid substances during the process of "felting," and without the application of heat or any chemical agency; (2) the mode of feeding the mould, of promoting the escape of air from under the felting hammer, of turning the stone out of the mould, and of lifting the stone with pneumatic suckers—fitting it with bolts—and using it in its green state; (3) the form of the artificial stone tile.	12 June, 1876	1879	83

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
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22. Bricks and Tiles, Artificial Stone and Cement—*continued.*

535	Eugene Dominique Nicolle and Thomas Sutcliffe Mort.	23 June, 1876	Improved process for manufacturing artificial stone without using the more costly cements, such as Portland, &c., and natural hydraulic lime, consisting in an admixture of clean sand, lime, silicate of alumina, and hydraulic lime made for the purpose.	4 Aug., 1876	1879	103
652	Henry Gurney	28 Nov., 1877	Improvements in kilns for drying, burning, and cooling bricks, pottery, tiles, and other articles or substances, consisting in—(1) a movable floor or bed supported on wheels or trucks running on rails, or trams; (2) supporting the roof from bearers by toggles and bolts; (3) making the movable floor or bed air-tight, while passing through and in the kiln, by a sand joint; (4) the feeding of fuel up through the bottom of the kiln.	4 Jan., 1878	1881 vol. 2	1
809	Russell Barton and George Hardie.	28 Jan., 1880	Improved process for manufacturing hydraulic cement, consisting in the use of Wianamatta or other sedimentary shales, mixed with lime in the solid or liquid state, pulverized, dried in pieces, burnt in a kiln, and ground.	11 Mar., 1880	1882 vol. 2	59
869	Charles O'Neill	30 June, 1880	Improved artificial stone, moulded in flags or slabs, for paving, kerbing, guttering, sets for roads, &c., projections, cornices, &c., entitled "O'Neill's Patent Caithness Concrete Flagging," consisting of a mixture of sand and gravel, or scoria or granite, &c., with Portland cement or hydraulic lime and water, and (if desired) with colouring matter, pieces of flat or hoop iron being introduced into the centres of the slabs or blocks to strengthen them during the manufacturing process.	25 Aug., 1880	1882 vol. 2	247

23. Plating and Coating Metals with Metals.

4	Edmund Morewood and George Rogers, (by E. C. Weekes.)	Not dated; received, 22 Aug., 1855.	Improvements in the manufacture of iron into sheets, plates, corrugated, or other forms; in coating iron with copper or alloys of copper; in preparing it for coating and for other purposes.	14 Jan., 1856	1866	13
248	James Partridge	18 July, 1870	Invention of a machine for facilitating the galvanizing of iron, consisting of circular plates or bars of wrought iron fixed together at the ends by bolts and nuts connected to two wells, which machine is fixed in the inside of the galvanizing bath and covered for the greater part with molten metal when in use.	23 Aug., 1870	1872	89

24. Pottery.

[No Inventions under this Class yet registered; but several Patents under Class 22, Bricks, &c., applicable to Pottery.]

25. Medicine, Surgery, and Dentistry.

141	Isaac John Josephson	6 Aug., 1866	Invention of an ointment compounded from the leaves of the following indigenous gum-trees,—the red, white, blue, iron-bark, stringy-bark, blood-tree, mahogany, black-butt, and box, with the geebung, cullebung, and marsh mallows, and lard and beeswax, termed the "Australian Ointment."	12 Sept., 1866	1870	45
149	Charles Florent Sarpy and Edward Henry O'Neill.	9 Jan., 1867	Invention of an ointment, tincture, and lubricating oil, viz. :—Ointment compounded from the leaves of the pepperment-tree (<i>Eucalyptus Odorata</i>) with lard and beeswax; tincture, made from leaves of same tree, steeped in spirits of wine; essential oil, extracted from same tree.	26 Feb., 1867	1870	63
370	John Christian Lyons and Frederic John Christian Lyons.	8 May, 1873	Invention of a deodorizing and disinfecting, antiseptic and preservative agent, entitled—"Lyons's Chloro-alkaline Deodorizer and Disinfectant," consisting of—(1) A natural product found on the sea-shore, composed chiefly of chlorine, iron, alumina, and silica, mixed with dolomite, or native carbonate of lime, and magnesia, and made up in powder or solution; (2) apparatus for applying same in various ways.	15 July, 1873	1875	81
604	Jacob Edwin Sackett	25 May, 1877	"Sackett's Shoulder-brace and Chest-expander for Men, Women, and Children," consisting of a chest-expander, with supporting belt or braces for the back combined with ordinary suspending braces, and with waist-belt for women and children.	18 July, 1877	1881 vol. 1	131

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25. Medicine, Surgery, and Dentistry—*continued.*

741	Frederick William Elliott.....	9 May, 1879	Invention for utilizing broken camphor, and consolidating sublimed camphor, by pressing the same into solid blocks, in moulds, by hydraulic, screw, or other mechanical power.	2 July, 1879	1882 vol. 1	55
836	David Johnson	14 April, 1880	Improvements in aerated and other beverages for restorative and medicinal purposes, consisting in the manufacture of a series of beverages, aerated or otherwise, termed "zoedone," in which syrups or fermented or unfermented liquors are mixed with nerve tonics.	28 May, 1880	1882 vol. 1	143

26. Music and Musical Instruments.

[No Invention under this Class yet registered.]

27. Oils, Fats, Lubricants, Candles, and Soaps.

20	Willis Humiston.....	Not dated; received, 12 May, 1859.	Improvements in machinery for making mould candles, consisting in (1) constructing the pistons for forcing the candles from the moulds with a longitudinal sliding joint, so that when the top part of the piston is slipped up, the bottom part may be brought up against it suddenly, with the effect of a blow, and push the candle clear of the mould; (2) employing clasp boards for holding the candles in such position till the next pouring has set.	6 July, 1859	1866	93
76	George Lough	10 July, 1863	Improved apparatus and process for manufacturing paraffine and paraffine oil from coal, shale, resin, pitch or tar, or turf, by the application of superheated or decomposing steam.	25 Aug., 1863	1866	369
112	Hayden Hezekiah Hall	8 May, 1865	Improved apparatus for extracting mineral oils, comprising (1) a vaporizer, (2) a refiner, and (3) an agitator, with various adjuncts to each, entitled "Hall's Mineral Oil Apparatus."	12 July, 1865	1868	55
202	Frederick Lambe, Arthur Charles Sterry, and John Fordred.	2 Dec., 1868	Improved processes for treating petroleum or earth oil, also the oils obtained by the destructive distillation of coals and shales, of different kinds of peat, of lignite or brown coal, of bitumen, and also paraffine, for the purpose of obtaining such substances in a purified state, consisting in (1) the treating petroleums and other liquid and solid hydrocarbons (a) with Fuller's earth, or its equivalent of marl clay, in a finely divided state, or (b) by distillation in a still in contact with the same substances; (2) the use of silicate of soda or potash applied to the hydrocarbons.	24 Feb., 1869	1870	217
231	Frederick Salisbury and James Morten.	22 Dec., 1869	Improved apparatus for lubricating the axles of railway engines and carriages, and other machinery, consisting of a wheel or wheels kept revolving by the action of the journal or shaft, and feeding the lower surfaces of the journal or shafting.	9 Feb., 1870	1872	37
320	Henry Francis Howell	8 June, 1872	Improvements in apparatus and process for washing, cleansing, and purifying petroleum, &c., applicable to the clarification of the oil obtained from the cruder kinds of petroleum and the residuum from ordinary distillation after settling, consisting chiefly in the mode of setting or suspending the stills—of a stirring or agitating apparatus—and of a combination of stills and settling tanks.	23 July, 1872	1874	75
321	Henry Francis Howell	8 June, 1872	Improved apparatus and process for the continuous distillation of naphtha and oil from cruder petroleum and other kinds of inferior oils, consisting in (1) one or more condensers or dividers communicating with tank stills and with each other; (2) still made of a boiler; (3) vacuum in still; (4) atomizing or destroying the molecular condition of the oil by steam jet striking or impinging against the stream of oil as it enters the still, or by other means; (5) arrangement of tanks, still tanks, dividers and tanks, still, condenser, air-pump, and piping.	23 July, 1872	1874	79

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
27. Oils, Fats, Lubricants, Candles, and Soaps—continued.						
466	Reginald Scaife	17 Feb., 1875	Improvements in apparatus for, and in method of extracting oleaginous, fatty, and resinous matter from textile materials, whether animal or vegetable, and from other substances, consisting in the application of the spirit vapours, of certain substances named, in closed vessels, communicating with other closed vessels in which the spirit vapours are condensed, the circulation being assisted in some cases by a force-pump.	19 April, 1875	1878	31
549	Patrick Hayes.....	4 Sept., 1876	Improved process for manufacturing oil, the product being called "Hayes's Oil for lubricating machinery and other purposes."	13 Oct., 1876	1879	143
601	Patrick Hayes.....	31 May, 1877	Improved process for extracting oil from cocoanut, or, as it is commonly called, "copra."	6 July, 1877	1881 vol. 1	123
792	John Walker	9 Dec., 1879	Improved process for manufacturing a lubricating oil, and invention of a cup for applying such lubricant, entitled the "Alexandra Lubricant."	19 Jan., 1880	1882 vol. 2	9
862	James Knox Newton.....	30 June, 1880	Improved process for manufacturing a lubricating oil and invention of a cup for applying such lubricant, entitled "The Eureka Lubricating Company's Lubricant and Cup."	13 Aug., 1880	1882 vol. 2	229
896	Alexander William Winter and William Tell Colman.	27 Oct., 1880	Improved process for bleaching, refining, and purifying animal fats and oils and certain vegetable oils.	9 Dec., 1880	1882 vol. 2	325

28. Spinning; including the preparation of Fibrous Materials and the Doubling of Yarns and Threads.

75	John Platt and William Richardson.	16 Dec., 1862	Improvements in machinery or apparatus for cleaning wool and other hairs of animals from burs and other extraneous matters, consisting chiefly in a roller, against which is placed a fixed blade, between which and a reciprocating blade the wool, &c., to be cleaned is introduced; also spike rollers or other such opening or carding apparatus, working in a dish, and a transferring comb in conjunction with such spiked roller and fixed spikes, to draw off the material in detached tufts, and present it to the said rollers and blades.	9 July, 1863	1866	365
162	James Henry Bryant.....	24 Aug., 1867	Invention of processes for converting maize and millet plants and the bark of the tree known as stringy bark, into fibrous substances, either for use in the manufacture of paper, or for being spun for use in the making of coarse fabrics, such as sheeting, packing-cloth, bagging, matting, and rope, or for use by upholsterers and others in stuffing mattresses and such like articles.	4 Nov., 1867	1870	97
175	John Watson Burton..... (Application was made by John Benson Wilson, the assignee of grantee.)	20 Jan., 1868	Improvements in processes for the treatment of fibrous materials, and in means and apparatus to be used in such treatment, and in utilizing waste products therefrom, including claims for the use of—(1.) The compound or improved soap described and ordinary soap; (2), ammonia, urine, and alkalies; (3), the means and apparatus described; (4), the fabrication of inventor's "velvet cloth," "silk cloth," and "Leeds alpaca cloth;" (5), the utilization of the waste liquors, and the treatment and utilization of the seeds from burs and cotton seeds; (6), the saponifying of fibrous materials for spinning.	23 Mar., 1868	1870	127
255	William Joseph Lande	1 Oct., 1870	Invention of a new composition for bleaching wool, composed of the following parts (by weight):—Common soap, 16; hot water, 80; cyanide of potassium, 1; which composition is to be prepared for use by mixing one part in fifty parts of water heated to 80° Fahrenheit, dipping the wool therein for two minutes, and then washing it water.	18 Nov., 1870	1872	113
265	William Rea	21 Jan., 1871	Improvements in machinery and processes for washing, drying, and preserving wool, or fabrics of woollen, linen, or cotton texture, consisting in the use of a machine called a dash-wheel, and of another machine called an Improved Hydro-Extractor, and in the employment as chemical ingredients of salt and water, or salt-rock and water, or sea-water, and occasionally sulphurous acid in addition to any of the common washing ingredients.	24 Feb., 1871	1873	5

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28. Spinning; including the preparation of Fibrous Materials and the doubling of Yarns and Threads—continued.						
285	Paul Toepler	4 Sept., 1871	Improved process for cleaning all kinds of wool, woollen yarn, woollen waste, cotton yarn, cotton waste, and such like fibrous materials, and in separating the grease therefrom by means of amyl alcohol consisting in placing the material in a bath or vessel of amyl alcohol leaving it there till the grease is extracted, distilling the alcohol for use again in the same way, taking out the stearine from the grease that is left for candle-making purposes, and using the residuum for lubricating purposes.	26 Sept., 1871	1873	61
349	Thomas Routledge	24 Jan., 1873	Improvements in machinery and processes for treating fibrous substances for textile purposes and for the manufacture of paper stock, consisting in—(1) Steeping such substances in an alkaline bath and afterwards subjecting them to a fermentative steeping; (2), continuous system of boiling; (3), continuous system of bleaching; (4), peculiar construction of apparatus; (5), utilizing the lye or secondary products.	18 Mar., 1873	1875	15
388	John Thomas Stamp	6 June, 1873	Invention of a machine for laminating and crushing bark by direct percussion, consisting of a mill with two cages revolving in opposite directions on the same axis which drive the bark freely towards the periphery by centrifugal action, the bars of one cage holding the bark, whilst those of the other cage break it into small pieces.	24 Nov., 1873	1875	135
407	William Alfred White	13 Feb., 1874	Improved combinations chiefly of silica, for cleansing and bleaching wools and other fibres and fabrics, paintwork, floors, casks, and other articles and utensils, also for washing sheep, consisting of—(1) Neutral Soap No. 1; (2) Neutral soap No. 2; (3) a third combination.	26 Mar., 1874	1877	27
478	Robert Hall	4 June, 1875	Improvements in machinery for cleansing wool, consisting of—(1) Machinery for washing; and (2), machinery for drying the wool—the principal claims being for the peculiar arrangement and construction of the lifting forks, balance or weighted pulley, endless inclined creepers, washers, and travelling drying tables.	8 July, 1875	1878	71
539	Charles Carson Coleman	26 July, 1876	Improved machinery and process for preparing the fibre of ramie, flax, and other textile substances directly from the stalk, so as to render it marketable by a single operation; consisting of a series of rollers, fluted and plain for pressing and drying, of tanks containing different chemical solutions, and of belts for leading the stalks and fibre from one place to another while under treatment.	28 Aug., 1876	1879	117
719	Pierre Puech	10 Dec., 1878	Improved process for washing, scouring, and bleaching the wool upon sheep and other such skins, in order to obtain flocky, Rosibaisienne half-combed, and fleecy wool, consisting in a series of operations described, having reference to steeping the skins in warm baths, the use of certain chemicals in the wash, and the employment of pressing rollers for cleansing the skins and the staple.	30 Jan., 1879	1882 vol. 1	11
831	John Warren and John Hogarth.	21 Jan., 1880	Improvements in apparatus for washing or scouring wool, applicable to double, threefold, or manifold crank machines, consisting of troughs, brakes, crank-frame, cranks, combs, regulating crank and rod, eccentric shaker and delivering belt, as described.	25 May, 1880	1882 vol. 2	131

29. Lace and other Looped and Netted Fabrics.

[No Invention under this Class yet registered.]

30. Preparation and Combustion of Fuel.

1	Christopher Kingsford (by his attorney, C. D. Hays)	1 June, 1854	Invention of a machine for compressing and solidifying peat, coal, and such-like substances, consisting of a mill for grinding coal, of kilns for drying and heating the same, and of presses for consolidating the produce.	15 Jan., 1855	1866	1
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30. Preparation and Combustion of Fuel—continued.						
16	Thomas Woole	24 Dec., 1856	Improved grate for burning wood in fire-places, consisting of a cast-iron platform laid flat on the hearth, and of a casing, arch, and flue of peculiar construction, for promoting radiation of heat and draught.	8 Feb., 1859	1866	75
25	John Russell	Not dated; received, 3 Aug., 1859.	Improvements in cooking-stoves and ships' ranges, consisting in—(1) Introducing a flue at the back of the stove; (2) making the stove pipe larger, and supporting it with a separate cast-iron oblong pipe attached to the back of the stove; (3) introducing a cast-iron perforated fire back or shield in the fire-pot.	14 Dec., 1859	1866	113
48	Jean Baptiste François Mazeline and Gustave Adrian Couillard.	Not dated; received, 13 Aug., 1861.	An improved mode of an apparatus for treating, mixing, and moulding materials for the manufacture of artificial fuel (parts of which apparatus are applicable to moulding bricks and other analogous articles), consisting in treating such substances as coal-dust or small coal, peat, turf, lignite, resin, pitch, tar, or other resinous, carbonaceous, or combustible matters or substances—softening and mixing the ingredients by the use of steam or hot air, whether under pressure or not, admitted into the mass and distributed among the ingredients while the mass is in motion—and then moulding off the matter into blocks.	14 Nov., 1861	1866	261
133	Edward Carr Fortescue.....	7 June, 1866	Invention of a smoke-consuming furnace, consisting of a long horizontal fire chamber with upper (perforated) and lower door at one end, and smoke plate at the other end to force the smoke downwards through the flame in passing from the furnace to the flue.	20 Aug., 1866	1870	21
403	William Henry Cory and Edward Cory.	9 July, 1873	Improvements in process for the manufacture of artificial fuel into blocks, and in machinery for compressing the blocks, which machinery is also applicable to compressing other materials into blocks, consisting in compounding and agglomerating small coal, coal-dust, or other carbonaceous matter into blocks by mixing with it plastic cement, fire-clay, or other plastic clay, together with a solution of silicate of soda, or silicate of potash, and consisting also in the use of improved moulding machinery.	18 Mar., 1874	1877	17
422	Daniel Thomas Casement ...	8 April, 1874	Improved method of burning fuel and generating steam, consisting in the combination of a stratum of balls, blocks, or broken pieces of metal or other substances, with a furnace, stove, range, grate, or other burner, in such manner that the gases and products of combustion will pass upwards through the interstices between these substances and by communicating heat to them promote combustion and radiation; also, the use of fire and ball grates, the circulation of water through hollow bars, &c.	1 June, 1874	1877	63
436	David Barker	3 July, 1874	Improvements in machinery and processes for manufacturing artificial fuel, consisting in the treatment and utilization of coal, lignite, peat, coke, charcoal, and other carbonaceous substances, when in a powdered state, so as to produce a solid and smokeless or comparatively smokeless fuel, specially adapted for smelting and other purposes in which the fuel has to bear a great burden at a high temperature; in the use of the material mentioned, to give the fuel cohesion; and especially in the use of a solution of sulphate or chloride of alumina.	31 Aug., 1874	1877	97
446	Robert Kunstman and Charles Hoyt.	12 Aug., 1874	Improvements in the mode of, and apparatus for, manufacturing artificial fuel out of coal-dust, waste, slack, turf, and lignite, consisting in automatic arrangements working in combination for measuring, mixing, moulding, and pressing, drying, and finishing, in the round or egg-shaped form of the fuel; in the employment of clay or lime, in lieu of pitch or tar, as agglomerating substances; and in waterproofing the fuel by applying to it resin dissolved in benzine.	10 Nov., 1874	1877	117
500	Michael Raleigh.....	4 Nov., 1875	Improvements in Colonial ovens, for the purpose of better equalising the heat, consisting in introducing a horizontal flue under one of the shelves, such flue being formed in two sections, the draught entering at (say) the left-hand of one section, passing thence into the right-hand end of the other section, and thence into the chimney at the left-hand end of the latter.	9 Dec., 1875	1878	129

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30. Preparation and Combustion of Fuel—*continued.*

524	Edward Taylor, William Brown, and Peter Langwill.	3 April, 1876	Improvements in apparatus for washing coal slack for making coke, consisting in forcing a current of water upwards, by the aid of pistons or plungers, through perforated sieves in which the slack to be washed is placed and acted on by "bashes," &c.	3 May, 1876	1879	73
787	August Louis Schultz	8 Nov., 1879	Improvements in the method of and apparatus for the combustion of fuel, consisting chiefly in introducing the fuel underneath or sideways, so that it forms a heap, the top of which is consumed first—the apparatus being automatic and continuous in its action, and the combustion being assisted by air or blast pipes, &c.—which apparatus is adapted for smelting furnaces, steam-engines, locomotives, and traction engines.	18 Dec., 1879	1882. vol. 1	187

31. Raising, Lowering, and Weighing.

42	Thomas Chester	13 Dec., 1860	Improvement in the winch, consisting in surrounding the journals of the axis in each plummer-block with friction rollers, whereby friction is reduced when the pressure is against the upper rollers.	19 June, 1861	1866	195
71	Robert Napier.....	20 Feb., 1863	Invention of a friction brake for windlasses and other machines of that class, called the "Differential Brake," consisting in utilizing the friction arising from—(1) The contact of a wheel and strap or wheel and segment; (2) connecting the ends of a brake-strap or segment to a lever or bell-crank, or differential pulley; (3) the same arrangements for preventing backward motion as a substitute for or in conjunction with pawls, and with or without friction regulators; (4) Any of these arrangements as a substitute for friction-cones or clutches.	22 April, 1863	1866	345
198	William Thomson, John Sharp, Edwin Bull, John Holme Jones, George Moore, Stephen Bartlett, and William Errington.	24 Nov., 1868	Improved apparatus for raising sunken vessels or material, or sustaining weights afloat, consisting of—(1) Gas receivers or balloons; (2) the use of hydrogen or any other light gases (except atmospheric air) as the lifting or flotative power; and (3) the mechanical arrangements for producing the gas under water and conveying it to the receivers or balloons.	19 Jan., 1869	1870	205
242	Joseph William Wilson ...	21 Jan., 1870	Improvements in hydraulic lifts for raising floating bodies, consisting in the employment for such purpose of buoyant vessels, instead of rams, in columns or hydraulic cylinders; two parallel lines of hollow columns or hydraulic cylinders are set with their heads at the same level above water, at such a distance apart as to admit a vessel between them; all cylinders in the same row are connected by hollow girders, which thus form a series of water tanks; these tanks are connected by a horizontal pipe; a pendant pipe with a sluice-cock or valve runs from the horizontal pipe down into each cylinder; within each cylinder is an inner floating cylinder of a little less diameter having an air chamber beneath to support it; each pier of floating cylinders is connected by two intercommunicating girders resting on cross-heads; on this series of cross-girders rests the vessel to be supported, which is raised by letting the water run by gravitation from the tanks into the cylinders, and lowered by pumping it back again.	8 June, 1870	1872	69
275	Thomas Walters.....	2 May, 1871	Invention of a self-acting tilting machine, designed for the more easy and regular tilting of casks and other heavy articles.	7 June, 1871	1873	43
289	Stephen Roff, William Brooks Hoffman, and Joseph Lukey.	4 Sept., 1871	Invention of a new method of indicating the weight of the contents of any vessel afloat, consisting in introducing a column of water at the centre of gravity and noting or registering its rise in a pipe or tube, by means of a floating ball with a weighted chain passing over a pulley having a dial and indicator attached.	30 Oct., 1871	1873	71

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
31. Raising, Lowering, and Weighing—continued.						
306	Henry Hudson, Robert Hudson, William Hudson, and George Hudson (trading as "Hudson Brothers").	25 March, 1872	Invention to dispense with sash-weights in hanging sashes by making one sash balance the other, the sashes being connected at each end by a rope, chain, or band passing over a sheave.	8 May, 1872	1874	31
481	Samuel McCaughey (agent of P. J. Stryker, assignee of Benjamin Slusser).	5 Dec., 1874	Improvements in excavating machines, for dam-making, &c., consisting in an apparatus on four wheels, having a scoop-shaped excavating tool supported on the front carriage, which scoop can be lowered and set at the requisite angle; a receptacle for the excavated earth supported on the back carriage; and an elevator between the two, for carrying the earth from the excavating to the receptacle.	7 Aug., 1875	1878	79
486	William Lockhart Morton...	25 June, 1875	Invention of a water-tank excavator, consisting of a central carriage bearing an excavating tool and having six wheels, and of two detached carriages of similar construction to each other, each bearing an adjustable scoop and running on two wheels; the excavating tool, which is attached to cranks on the central axle, is formed of steel plates or diamond-pointed chisels, and is double-acting; the three carriages are attached to each other by chains, and the whole apparatus is worked by being drawn backwards and forwards, the central axle of the excavating carriage being placed low down so that the carriage balances on it and tilts downwards in the direction in which it is being moved.	3 Sept., 1875	1878	95
498	David Wright Brayshay ...	23 Aug., 1875	Improvements in the construction and arrangement of excavating machines, consisting in making such machines without earth receptacles, but with means for delivering the excavated earth on to the lower end of an elevator or endless travelling table with side delivery, by means of which it is raised and deposited on the sides of the cutting; also, in an excavating tool, in contrivances for raising and lowering the same, in an adjustable regulating or guide-wheel, and in India-rubber coating for roller of elevator.	9 Dec., 1875	1878	123
499	Friedrich Bockhacker	4 Nov., 1875	New or improved mode of and hydrostatic apparatus or balance for ascertaining the loss of wool in weight by the process of washing, designed to enable the purchaser to buy wool according to its degree of fineness and profitableness.	9 Dec., 1875	1878	127
602	George Wyatt and George Charles Fay.	4 June, 1877	Improvements in scoops for excavating earth and for making tanks, &c., consisting of a scoop resting on a carriage having a pivoted guide-wheel in front—such scoop swinging on trunnions supported by the bent arm of a lever, by means of which it can be raised clear of the ground and used as a vehicle for transporting the excavated earth.	6 July, 1877	1879	125
603	Alexander Cairns	8 June, 1877	Improvements in machinery for excavating and transporting earth and other substances, consisting in—(1) Combination of excavating scoops, with rope, wire, or chain ways, travelling over drums, wheels, or pulleys, supported on horizontal axles in such manner that the return line travels under the forward one; (2) constructing ways in which there are four lines of ropes, wires, or chains travelling over the peripheries of double-grooved wheels or pulleys; (3) combinations of one or more series of mechanical diggers with and working ahead of the scoops; (4) method of supporting such scoops.	18 July, 1877	1881 vol. 1	127
606	Robert Savage.....	16 June, 1877	Improvements in machines for excavating and removing earth, consisting of—(1) Removable excavating tool, formed like a double-breasted ploughshare, attached to the lower end of a long inclined iron trough, up which the excavated earth is carried by scrapers attached to endless chains, and which is supported by a three-wheeled carriage, the trough is adjusted by a hand lever, and the scrapers are operated by a chain band passing over a pulley on the front wheel; (2) detachable earth-receiver or dobbin, mounted on three wheels, and swung in such manner as to be top-heavy, so that it can be tilted by releasing a spring.	27 July, 1877	1881 vol. 1	133

No	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
31. Raising, Lowering, and Weighing—continued.						
743	Samuel M'Caughey.....	28 May, 1879	Improvements in the construction of excavating machines for loose or ploughed earth (being an improvement on Registration No. 481), consisting of a four-wheeled carriage, drawn by horses or oxen, supporting a scoop balanced on trunnions; the carriage frame can be raised or lowered by operating a treadle, and the scoop can be inverted by pulling a lever rod, and is self-adjusting.	2 July, 1879	1882 vol. 1	59
751	William Dent Priestman and Samuel Priestman (by their attorney, Owen Blacket).	16 June, 1879	Improvements in and appertaining to self-acting grapple-buckets, forks, &c., consisting of (1) buckets for lifting loose material, and grabs with long tines for hard material; the ends of the buckets and grabs fits into side frames worked upon joints and held together in a frame; to the side frames are attached levers connected with barrels fixed upon a barrel shaft, by means of which levers the buckets or grabs are opened or closed; the buckets are worked by two chains, one filling and lifting chain attached to a barrel on the barrel shaft, the other fixed to the side of the bucket; (2) various methods for working the buckets and grabs by means of a crane.	22 July, 1879	1882 vol. 1	83
801	William Skinner (assignee of John Vinecombe.)	6 Jan., 1880	Improved portable elevating and tipping machine for facilitating the loading of drays, railway waggons, or vessels, with bags, sacks, bales, trusses, or bundles.	20 Feb., 1880	1882 vol. 2	29
818	David Lindsay Waugh ...	21 Feb., 1880	Improvements in machinery for excavating and removing earth, consisting of a long narrow trough or scoop sharpened at one end, for cutting the earth and fitted with a sliding cutter on the front of the lower end for cutting off the earth at the bottom when the scoop is sufficiently filled, the whole block of earth being cut out without breaking or crushing it, and conveyed away in the body of the implement; (2) framing having both lateral and forward and backward motion, together with a tipping contrivance for canting the excavator.	15 April, 1880	1882 vol. 2	91
840	Thomas Herbert (by his agent, Henry Halloran).	24 April, 1880	Improved scoop or excavator, called "Herbert's Improved Earth Scoop and Excavator," consisting of—(1) a rigid scoop having an adjustable cutting edge in front, and a door or flap at the back for discharging the earth; the scoop is suspended between two iron girders bolted to a carriage by chains, and furnished with means for adjusting it to the required position for excavating, for hoisting it above the surface of the ground when filled, and for discharging the same; (2) carriage on which the apparatus is supported, with seat for the driver, and handles for regulating movements of scoop within reach of driver without leaving his seat.	16 June, 1880	1882 vol. 1	163
885	John M'Nevin (Assignee of William Whitton Davies).	21 Aug., 1880	Improved excavating machine, consisting of a plough or ploughs to break and raise the earth, in conjunction with a revolving wheel carrying forks, shovels, or other implements to throw the earth back from the ploughs, an elevator to raise the earth, and a box to contain the earth, the whole being mounted on a wheeled carriage to be drawn by animal or other power.	19 Oct., 1880	1882 vol. 2	293

32. Hydraulics.

18	Edward Peter Capper	24 Mar., 1859	Improved horse-power well-bucket, entitled the "Scaturiginosum," consisting of a bucket with self-acting filling valve in bottom, and discharging spout made to turn up at side; also framework and gear for horse-run.	19 May, 1859	1866	83
100 & 101	Frederick Arundel Down- ing.	Not dated; re- ceived, 8 Nov. 1864.	Improvements in apparatus for obtaining motive power by means of water, consisting in—machine No. 1: Overshot water-wheel, having the half of the wheel upon which the water falls boxed in, so as retain the full weight and force of the flow; machine No. 2: high-pressure water-power engine, with small pallet-wheel, having pallets guided by grooves in disc, and by projecting abutment in side of circular box in which wheel contained.	10 Dec., 1864	1868	1

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
32. Hydraulics--continued.						
109	Frederick Arundel Downing.	Not dated; received, 2 May 1865.	Improvements in hydraulic and steam motive power engines, and apparatus for measuring fluids, consisting of a wheel or disc rotating concentrically within a fixed case of larger diameter, and having pistons or pallets, actuated by cams or inclines, so as to project from and withdraw within the rotating wheel at certain points, pass an abutment, and thus receive the pressure of the fluids (whether water, steam, or other elastic body); also induction and eduction passages; also (if the machine is for a fluid meter), a counting and recording train and indexes.	31 May, 1865	1868	35
211	Alfred Cullen and Alfred Dale.	11 Feb., 1869	Improved pump, useful for various lifting and forcing purposes, called "The Australian Mining and Squatters' Pump," consisting of a perpendicular band-lever, hinged at foot, and having a short arm at right angles to the hinge, to which arm is pivoted the pump-rod, which is a pipe terminating in a piston with puppet-valve, working into a cylinder which is in free communication with an adjoining chamber also having a puppet-valve, the cylinder and chamber being immersed—which arrangement gives a pump with great mechanical power, a solid beaded piston each way of the stroke, and a continuous flow through the goose-neck head of the pipe.	30 April, 1869	1870	237
400	Lewis Goodwin and Samuel Alexander West.	7 Jan., 1874	Improvements in the construction of rotary lift and force pumps, consisting of an eccentrically mounted piston revolving upon its shaft within a cylindrical case, the piston being connected with the operating eccentric by means of conical or other shaped friction rollers, either with or without centres, whereby the friction is greatly reduced; also, in the employment of a rubber packing upon the outside or inside cylinder or both, and a rolling contact of the parts, which gives smoothness and a close fit.	9 Mar., 1874	1877	13
414	Daniel Thomas Casement...	13 Dec., 1873	Improved pressure-regulator for fluids, applicable to all liquids, steam, and gases, that are subject to pressure requiring to be limited, reduced or otherwise controlled, consisting of a perpendicular lift-valve of conical or equivalent form, in the vertical member of an elbow of the pipe leading from the source to the place of use or consumption—the stem of the lift-valve being weighted with pieces of piping as required, and elongated so that it can be acted upon by a push-pin or spring in the top—there being also a safety-valve in the cap of the vertical arm—a combination of such pressure-regulators differently weighted giving different pressures from a constant source, and constant pressure from a variable source.	11 May, 1874	1877	37
421	George Bradford M'Farland	17 April, 1874	Improvements in rotary pumps, consisting of a piston-wheel eccentric to the case, which has curved receiving and discharge parts, and a partition; also applicable to motive power engines and water meters.	29 May, 1874	1877	59
553	Charles Ernest Clarke and William Clarke.	7 Sept., 1876	Clarke's improvements in steam pumps, to be called the "Pulsometer Pump"—in which machine the steam is caused to act by direct pressure upon the water, and is directed alternately upon two chambers having a common steam and delivery pipe, controlled by tilting valves in such manner as to direct the steam alternately upon each chamber, one being filled by water while the other is being emptied; also, connected with the suction and discharge pipes an air chamber or reservoir (or air chambers or reservoirs) permitting the condensation to proceed uninterruptedly by preventing the water chambers from getting heated.	23 Nov., 1876	1879	147
669	Frank Thomiar and John Coghlan.	20 March, 1878	Improved hydraulic feed-motion machine applicable to the working of the diamond-drill boring machine, or other machinery requiring rotary motion or otherwise, and doing away with counter-shafts, feed gears, and feed screws, consisting of (1) two hydraulic cylinders, to one of which is bolted a swivel head, whereby one machine is capable of drilling or working at any angle required; (2) safety-valve relieving over-pressure of water in cylinders, preventing accidents to and derangement of machinery, and registering pressure of bit on material to be bored through, and indicating its nature; (3) pressure gauge and safety-valve registered to same pressure.	9 May, 1878	1878	41

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
32. Hydraulics—continued.						
706	Frederick York Wolseley (assignee of Walter Gibbons Cox.)	20 Sept., 1878	Improvements in pumps, for raising water, sludge, and other fluid matters, as well as quartz tailings, sand, &c., when mixed with water, consisting of screw propellers in a perpendicular or zig-zag barrel, there being two shafts, each carrying two or more horizontal screws, working in alternate spaces, and revolving in opposite directions.	25 Nov., 1878	1881 vol. 2	14 3
713	William Cooper	5 Nov. 1878	Improved hydrant standpipe for street-watering purposes, consisting in the adaptation of a universal motion to the upper portion of the standpipe, by the combination of two joints.	27 Dec., 1878	1881 vol. 2	159
762	William L. Horne (by his attorney, Guy H. Gardner).	26 July, 1879	Invention for governing or regulating the pressure of fluids, especially the flow of gas to burners, and likewise the flow of water and steam, consisting in governing a normally balanced valve, controlling the flow, by a changing column of fluid of greater specific gravity than the fluid to be regulated, which is carried in a vessel superimposed upon the valve, and which communicates through a primed siphon with a body of the same fluid contained in an open reservoir on a lower level, and exposed to the pressure of the fluid to be regulated on the induction side of the valve, whereby the fluid is automatically pumped into and out of the vessel on the valve by the siphon, according as the pressure in the main increases or decreases, and the valve in consequence throttled more or less, so as to maintain a uniform given pressure in the service pipe under a varying pressure in the main.	12 Sept., 1879	1882 vol. 1	107
33. Railways and Tramways.						
32	Edward Bell	8 June, 1860	Invention or improvement in railways and in locomotive engines, consisting in the combination of wooden and metal rails in the construction of railways; and the drawing or propelling of carriages, trucks, and other rolling stock, along the metal rails by engines, whose propelling wheels run on the wooden rails; and the guiding of such engines along the wooden rails by other guides running in contact with the said metal rails.	5 Sept., 1860	1866	147
88	Mark William Carr.....	29 Jan., 1864	Improvements in wooden sleepers for railways, consisting in attaching the rail to the transverse sleepers of wood, by means of groove and key, without any assistance from chair, spike, nail, "dog," screw, treenail, straps, or other like contrivance.	26 Feb., 1864	1866	421
*91	Philip William Phillips and John Samuel Eve.	30 Mar., 1864	Improvements in railways or tramways and the mode of traction thereon, and in apparatus for propelling carriages on such roads and on common roads, and the traction of agricultural implements and propulsion of vessels in water, parts of such invention being applicable to other useful purposes, consisting of—(1) Universal traction rail in centre of line between running tracks; (2) wooden rails (square) for vehicles to run upon; (3) chain of levers (forming a zig-zag), worked by the reciprocating action of the piston, for multiplying the length of stroke; (4) two rods attached, one to each end of chain of levers; (5) travellers attached to end of rods for gripping traction rail, or legs or feet may be used in their stead; (6) central rod connecting piston with zig-zag; (7) adaptation to the chain of levers to common road vehicles, agricultural implements, and marine propulsion.	31 May, 1864	1866	431
*236	George Elphinstone Dalrymple.	19 Nov., 1869	Improvement in tires for wheels of locomotives, tractive engines, or steam carriages for railways or tramways, consisting in making the tires of the driving wheels of India rubber (vulcanized or otherwise, or in combination with leather, gutta percha, or felt).	14 Mar., 1870	1872	55

*Should have been classed under "Aids to Locomotion," p. 43.

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
33. Railways and Tramways—continued.						
520	John Saxby and John Stinson Farmer.	7 Jan., 1876	Improvements in the means and apparatus employed in interlocking and securing the safe working of railway points and signals, relating to—(1.) Apparatus whereby, when any one lever of a system of levers employed for working the points and signals of railways is moved, or about to be moved, other levers of the system are prevented from being moved; and when the said lever has been fully moved over, some other levers of the system are released so that they may be moved. (2.) Mode of rendering the action of such of these levers as are employed for bolting the points dependent on the position of the lever that works the points, and of relating the action of the switch locks, when such are employed, to that of the point bolts.	24 April, 1876	1879	61
742	Samuel Aldred and Spielmann.	8 April, 1879	Improvements in rails and chairs for tramways, and in the method of laying them, consisting in—(1) Making the rail in two similar sections, whereof the broad head of one is used for the tread and the narrow head of the other for the guard, capable of being taken up and reversed or renewed without interfering with the road paving, and keyed together in the chair without requiring punching or fastenings; (2) the peculiar construction of the chairs for supporting such compound rails; (3) the special method of laying such rails so as to suspend them, and so as that the joints of the rails are broken in the chairs, and then only half in one place.	2 July, 1879	1882 vol. 1	57
744	Walter Holland, Samuel Telford Dutton, and Thomas Clunes.	15 May, 1879	Improvements in machinery or apparatus for working or interlocking points and signals for railways, being an improvement upon Imperial Patent No. 1,963, of 30 July, 1866, but differing therefrom in placing the axes of the locks in front of instead of behind the levers to be interlocked, consisting in—(1) Placing the axis of the locks in front of the levers to be interlocked, the said locks and the cams by which they are actuated turning upon independent axes; (2) arranging the cams and locks of the locking apparatus upon the same axis, the said axis being in front of the levers; (3) peculiar construction of joints, by which the lever, cams, and locks are connected with their respective axes; (4) making the lever quadrant double, or in two parts, one fixed, the other movable.	2 July, 1879	1882 vol. 1	61
*810	Peter Hevner (by his attorney, J. B. Carter).	21 Jan., 1880	Improvements in railway systems, consisting in the combination of two continuous rods or rails, or two continuous lines or rails with couplings to connect them together, forming a double elevated track, with a series of endless traction ropes so arranged that hangers or carriages, to which the loads are suspended, may be caused by the said endless ropes to traverse the track continuously; also, alternate driving and tightening stations, and tightening device, to be used in connection therewith.	15 Mar., 1880	1882 vol. 2	61
846	George Trotter Evans	14 May, 1880	Invention of self-acting tramway points, consisting of a lever-box with lid and water-way, two points coupled together at one end by a deviating rod, and fastened to the bed-plate at the other end, connecting link, hand lever, India-rubber rings and metal washers on rod within box to force back the points to their place after the motor or car has passed through them when shunting.	25 June, 1880	1882 vol. 2	177
*880	Andrew Smith Hallidie.....	5 July, 1880	Improvements in street traction railways, consisting in propelling cars and other land vehicles along a road, tram, or track, by means of an endless rope, cable or chain, actuated by a stationary steam-engine or other motive power—a portion of which invention is also applicable to propelling boats and vessels in water.	19 Oct., 1880	1882 vol. 2	261
*886	Alexander Barclay Farquhar & William Galpin Lock.	27 Aug., 1880	"Lock's Radial Point and Improved Carrier Hook and Roller," based on a principle and mode of connecting one line of trams or rails with another line running at right or any other angle to it; and consisting in conveying goods and materials by a single carrier hook from one line of rails or trams on to other lines at any angle or curve, without lifting, detaching, reloading, or rehooking in transit—particularly applicable to dealing with meat without handling it in abattoirs, markets, refrigerating cars and chambers, and freezing depôts.	19 Oct., 1880	1882 vol. 2	297
						311

* Should have been classed under "Aids to Locomotion," p. 43.

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
33. Railways and Tramways—continued.						
892	David Smith	17 Aug., 1880	Improvements in railway rails and tramway rails, consisting of several descriptions of rails constructed of wood, combined with iron or steel.	6 Dec., 1880	1882 vol. 2	
34. Saddlery, Harness, Stable Fittings, &c.						
34	Thomas Beverley Hall and William Maddison Alderson (assignees of William Colburn Mayne).	9 July, 1860	Improvements in breaking-in saddles, consisting of two metallic horns, fixed on the saddle-tree, and covered with leather, &c., which act as a fulcrum for the rider on each side, and render him secure in his seat if the horse should give a sudden jump, or make any violent motion.	5 Sept., 1860	1866	155
86	James Smith	24 Nov., 1863	Improvements in connecting, attaching, and joining the various parts of harness, consisting in the use of rivets or screws of metal, instead of sewing.	21 Jan., 1864	1866	413
178	Henry Charles Brookes.....	22 May, 1868	Invention of an elastic-top horse-collar consisting in substituting an elastic coupling for a strap and buckle fastening or close top.	24 June, 1868	1870	139
495	Robert Charles Thomson ...	29 Sept., 1875	Improvements in the construction of hobble buckles, consisting in forming them in such manner that the rings at either end of the connecting chain may be attached to the buckle instead of to the straps, thereby preventing the leather from getting twisted and the animal from being hurt by the friction of the rings.	3 Nov., 1875	1878	115
35. Roads and Ways.						
40	Horatio Appleton	7 Feb., 1861	Invention of a stone-breaking machine, consisting of a pair of jaws with corrugated faces, set upright and slightly inclined towards each other at the bottom, one fixed, the other movable, and having imparted to it a powerful vibration through a small space, the jaws and sides forming a hopper-shaped vessel through which the stone is passed.	9 April, 1861	1866	183
284	Jonas Brown Rider	8 Aug., 1871	Improvements in machinery for breaking and cubing stone, consisting in imparting an oscillatory or vibratory motion to the upper part of a vertical lever or hammer in the centre of the machine, by means of a cam; a jaw is attached to each side of the lever or hammer, and opposite to each of the movable jaws is a fixed jaw; the movable and fixed jaws have horizontal as well as vertical corrugations or ridges, and also recesses behind such ridges.	15 Sept., 1871	1873	59
485	Samuel Norris.....	12 July, 1875	Improvements in wood pavements for streets and other ways, and for similar purposes, and in apparatus to be used in laying the same, consisting in—(1) A pavement constructed with a plank or broad foundation whereon are placed wooden blocks in rows separated by a flexible or other wooden strips, which are packed with cement, &c.; (2) shouldered blocks in combination with the other parts of the invention; (3) hammer or weight on wheels; (4) contrivance for raising and automatically releasing or dropping the said hammer.	26 Aug., 1875	1878	91
731	William Lockhart Morton...	26 Feb., 1879	Improvements in self-acting gates for common roads, consisting in appliances by which an individual on horseback or driving can without dismounting or alighting, open a gate while distant 100 yards or more therefrom, and in like manner close it again at a similar distance after passing through, which is effected by moving a hand-lever attached to a post about 6 feet from the ground, on either side of the road.	21 April, 1879	1882 vol. 1	35
869	Charles O'Neill	30 June, 1880	Improved artificial stone, moulded in flags or slabs, for paving, kerbing, guttering, sets for roads, &c., projections, cornices, &c., entitled "O'Neill's Patent Caithness Concrete Flagging," consisting of a mixture of sand and gravel, or scoria and granite, &c., with Portland cement or hydraulic lime and water, and (if desired) with colouring matter, pieces of flat or hoop iron being introduced into the centres of the slabs or blocks to strengthen them during the manufacturing process.	25 Aug., 1880	1882 vol. 2	247

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
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36. Bridges, Viaducts, and Aqueducts.

[No Inventions under this Class yet registered.]

37. Writing Instruments and Materials.

[No Inventions under this Class yet registered.]

38. Railway Signals and Communicating Apparatus.

471	Austin Chambers	17 Mar., 1875	Improved mode of and apparatus for railway signalling, consisting in substituting pneumatic for mechanical connections between signalling-boxes stations, or places and semaphores or arms with or without lenses and lamps, and actuating the same by suitable apparatus in connection with a collapsible vessel and pipes, tubes, or passages.	10 May, 1875	1878	45
538	Austin Chambers	23 May, 1876	Improvements in pneumatic signalling apparatus for railways, consisting of devices (including the use of an electro-magnet) for combining simplicity of construction with ease and rapidity of working, and for precluding the assumption of the "safety" or "pass on" position by the signalling object or body in the event of breakage or failure of the intermediate parts of the apparatus.	23 Aug., 1876	1879	113
824	Joseph Stokes Williams...	15 Mar., 1880	Improvements in railway crossings and switches and in apparatus to be used in connection therewith, consisting in—(1) The employment of shifting pieces at parts where the crossing line continues at both sides of the undivided or immovable rail, in combination with the switches or shifting pieces described at other parts of the line; (2) shifting piece with bearing surface for the tread, and with channel or passage for the flange of the wheels; (3) connecting or combining with the shifting parts of the crossing, adjusting, holding, and locking mechanism; (4) shifting piece with bevelled or inclined face, used in combination with a tapered rail of the side line; and (5) various details of mechanism for working switches and signals—including an arrangement whereby the moving parts are actuated by the switchman when no vehicle is on the rails, and by the wheels of vehicles when such are passing.	5 May, 1880	1882 vol. 2	103
839	Joseph Stokes Williams...	23 Feb., 1880	Improvements in railway crossings and switches, and the means or apparatus for signalling upon or operating mechanism connected with lines of railway, which improvements are applicable in combination with, and partly are improvement upon, or modifications of the last described patent (No. 824); also improvements in the construction of supports or posts for railway signals, telegraph lines, and for other purposes, consisting in making the supports of metal, such as malleable iron or steel of light weight, combining the necessary stiffness with cheap cost.	15 June, 1880	1882 vol. 2	155

39. Furniture and Upholstery.

22	Thomas Chuck	Not dated; received, 1 July, 1859.	Invention of new description of spring for beds, chairs, sofas, &c., and improvements in the manufacture of iron bedsteads and mattresses, consisting in—(1) Wire bent into a spiral and two wings almost at right angles with each other; (2) making the framing of iron bedsteads of hoop-iron instead of angle iron, by passing the hoop-iron over the top and bottom bars in an endless band riveted together, and interlacing and riveting the cross-pieces; (3) introducing graduated springs between the top and bottom of the hoop iron frame, placing the largest spring in the middle, and lacing the springs in their places; (4) suspending such framing or using it as a palliasse or mattress.	18 Aug., 1859	1866	101
137	Alfred Crownson	16 July, 1866	Invention of portable camp or bush bedstead, consisting of fourteen cedar rods with brass knuckle and other joints, capable of being put up or taken down or fitted with mosquito curtains in a minute.	22 Aug., 1866	1870	35

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
39. Furniture and Upholstery—continued.						
215	John Tracey	3 May, 1869	Improvements in the manufacture of Venetian window blinds, consisting in suspending the laths by chains instead of by tapes, and in dispensing with piercing the laths for the standing and raising lines.	18 June, 1869	1870	247
409	Thomas Cornish	11 Feb., 1874	Improvements in the construction of mattresses, couches, seats, and life-buoys, for general use at sea, and which would be available in saving life in cases of accidents by fire, shipwreck, or other disaster, consisting in making same with a stuffing of cork shavings, ground cork, or cork dust, combined with good pine or deal shavings of rush-pith, also strong bands of webbing, longways and crossways, to afford a hold for the bands and a means for fastening a number of mattresses, &c., together to form a raft.	27 Mar., 1874	1877	33
463	James Boon	13 Feb., 1875	Improvements in the manufacture of bedsteads, consisting in combining wooden posts with metal fittings—such posts to be turned on the lathe, and provided with iron studs for vases, iron or brass knees for dovetails, and iron or brass castors socketed or screwed on, and to be painted or otherwise ornamented.	24 Mar., 1875	1878	23
564	George Goodall, Robert Simpson, and William Lang.	27 Nov., 1876	Improved apparatus for cleaning knives, forks, and plate, consisting in—(1) Board, to which are hinged two wooden flaps, which are padded and covered with leather and made to swing upright till their faces meet, in which position they are held together by an elastic binder, and the knives are cleaned between them; (2) box fixed on the same board, to the lid of which is attached some emery paper for sharpening knives, and having within it three pads projecting above the top of the box when the lid is open, for cleaning spoons and forks.	10 Jan., 1877	1881 vol. 1	3
626	William Childs Monday Pettit.	10 Sept., 1877	Improved window-blind fittings, consisting of a top-piece, blind, roller, and a cord at each end—each cord being fastened to a ring at the end of the top piece, passed down round the roller and up through a ring at the same end, and then along the top-piece and down through another ring in the centre, and terminating in a weighted tassel.	23 Oct., 1877	1881 vol. 1	171
745	Charles Hugh Leycester ...	4 June, 1879	Improvements in hammocks and shelter tents, consisting of—(1) Framing for such tents made by securing four trestle legs to a horizontal pole, the legs are mounted upon tubular sockets or eyes so as to be turned to any angle or folded close together; (2) combination of hammock and of covering fabric with the above framing; (3) three arrangements of awning.	8 July, 1879	1882 vol. 1	62
770	Richard Schiering	30 July, 1879	Invention of an apparatus for the extermination of flies, consisting of—(1) A rod, upon which is exposed a certain compound for luring and destroying the flies; (2) a concave plate, with a hole in centre in which the rod stands, and with draining holes communicating with (3), in vessel, into which the rod dips, and which receives the drainings and dead flies; and (4) a plug or stopper in bottom of vessel. The apparatus is set by inverting it while the compound smears the rod.	3 Oct., 1879	1882 vol. 1	131
777	Ezra Hinckley and James Knox Newton, assignee of one-half interest.	13 Sept., 1879	Invention of combination and fastening clips to be used in the construction of spring mattresses and seats, for the purpose of holding in position spiral steel wire springs, copper-covered and arranged and locked in frame by flat or round metallic bands.	6 Nov., 1879	1882 vol. 1	157
40. Acids, Alkalies, Oxides, and Salts.						
122	Charles Watt and Saul Samuel.	18 Jan., 1866	Improvements for the utilization of the acid tar obtained by treating with sulphuric acid the products of distillation of various carbonaceous minerals and petroleum, consisting in—(1) The decomposition of the acid tar by means of heat for the preparation of sulphurous acid, to be subsequently converted into sulphuric acid, and the distillation from that acid tar of a quantity of oil, to be applied to various useful purposes; (2) the treating of acid tar with iron, or oxide of iron, for the formation of sulphate of iron and incidental production of Nordhausen sulphuric acid.	1 Mar., 1866	1868	93

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
40. Acids, Alkalies, Oxides, and Salts—<i>continued.</i>						
228	Johann Christian August Bock, Peter Taysen, and Thorkild Nicolay Brandt.	29 Nov., 1869	Improvements in the manufacture of stearic and oleic acids, consisting in eliminating the black substances from fatty acids, and producing these acids of a colour as light as if they were saponified by lime, without distillation, by agitation and boiling with certain chemical oxidizing agents, and by subsequent washings.	14 Jan., 1870	1872	31
346	Theophilus Kitchen	3 Jan., 1873	An improved method of purifying or decolourizing stearic acid, consisting in the use of a mineral oil,—such as kerosene, petroleum, or paraffine as a hardening and (in the event of its being of a light colour) a decolourizing agent—applied as follows :—The black acids, having been made by the sulphuric acid saponification process, are subjected to pressure to remove the oleic acid; then the stearic acid is melted, and mixed with the mineral oil, and again pressed, when it comes out white and ready for use, without distillation.	18 Feb., 1873	1875	9
502	Jehosophat Davy Postle ...	22 Nov., 1875	Improvements in apparatus for recovering salts from their solutions, consisting of—(1) A revolving disc (or more than one), mounted on a spindle, resting on a trough containing the solution, which solution is kept hot by a steam coil of tin lined with copper; the disc is turned by hand or other power, and the moisture adhering to it is evaporated according as its surface emerges from the solution, leaving the salt loosely attached to the disc, from which it is rubbed off by permanent wipers and dropped into troughs; (2) the method of recovering the moisture from the air after it has passed over the evaporating surface, by causing it to pass through or ascend a cylinder, down which there are descending jets of water, the air entering at the bottom and leaving at the top, where the coldest water is descending.	7 Jan., 1876	1879	5
699	James Cosmo Newbery and John Lister Morley.	7 Sept., 1878	An improved process of collecting the solidifiable portions of the fumes arising from furnaces and from metallurgical operations, such as those in which the solids consist of oxide of antimony, arsenic, bismuth, lead, and zinc, and the partly gaseous of sulphurous and carbonic anhydride (sulphurous and carbonic acids), &c., which process consists in directing the fume with considerable velocity against a series of solid discs or other resisting surfaces, in successive chambers, and finally against a web of permeable material, through which the permanently gaseous fumes filter—the solid portions falling into receptacles in each chamber.	3 Oct., 1878	1881 vol. 2	127
842	James Pellatt Rickman and Jacob Baynes Thompson.	12 May, 1880	Improvements in process and apparatus for the manufacture of ammonia and its compounds, consisting in utilizing the chemical reactions that take place when carbonaceous matter undergoes slow combustion in the presence of air and waste vapour (whereby there is effected a combination of nitrogen from the air with hydrogen from the water), for the production of ammonium chloride, which can be afterwards decomposed to furnish ammonia or others of its compounds, or for the production of ammonium sulphate or chloride, or of an aqueous solution of ammonia itself, viz.,—The manufacture of ammonium chloride by subjecting carbonaceous matter—whether mixed with common or other haloid salt or not—to slow combustion in a slow combustion furnace or producer, in the presence of air and water vapour, and condensing the fumes resulting from the combustion by causing them to pass through water in a series of successive cells.	21 June, 1880	1882 vol. 2	171
41. Aeronautics.						
[No Inventions under this Class yet registered.]						
42. Preparation and Use of Tobacco.						
115	William Woodman Huse ...	Not dated; received, 21 Aug., 1865.	Improvements in machinery for pressing and cutting tobacco, consisting in—(1) Pressing machine, that can be used as a cutting machine, while the tobacco is in it, by changing the position of some of the parts; (2) setting the knives with the cutting face inclined outward from the edge to the back, so as to prevent the blades from ‘gumming’ with tobacco juice; (3) feed motion, for adjusting knives to proper gauge.	21 Sept., 1865	1868	79

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
42. Preparation and Use of Tobacco—continued.						
164	Prosper Vincent Ramel (by his attorney, Ferdinand Mueller, Victoria).	4 Sept., 1867	Invention of process for preparing the leaves and bark of plants belonging to the genus Eucalyptus, and of other plants of the family of Myrtaceæ, for the purpose of using them as tobacco, and snuff, consisting in expressing the juices, evaporating the essential oil, and then treating the residue as in the manufacture of tobacco and snuff—the simple process of treating the leaves being to dry them, bleach them by means of hot water or steam, and then dry them again and manufacture as before.	8 Nov., 1867	1870	105
208	Frederick Harold Erle	15 Dec., 1868	Invention of an instrument for cutting tobacco, to be called "The Smokers' Companion," consisting of a flat holder, with a cutting blade, which is pivoted at one end and kept open by a spring at the other end; attached to the cutting blade is a guiding blade, up to which the tobacco is fed whilst being cut; when the instrument is in use, it is put resting on its side with its blade upwards, and the blade is operated by the thumb of the right hand.	30 Mar., 1869	1870	233
525	Hugh Dixon, the younger	29 Mar., 1876	Invention of a machine for pressing and cutting plug tobacco, consisting of a pair of rollers, between which the tobacco is pressed into a continuous ribbon, being fed by a belt or belts working in a trough, and of knives at the discharging side of the rollers, for cutting the tobacco into the forms known to the trade as "nips, brakes, plugs, and cakes."	3 May, 1876	1879	77

43. Books, Portfolios, Card-cases, &c.

[No Inventions under this Class yet registered.]

44. Lamps, Candlesticks, Gaseliers, and other Illuminating Apparatus.

54	William Johnson and John Downes Owens.	28 Aug., 1862	Invention of safeguard in the use of kerosene and other inflammable oils and spirits, designed for protecting the same from ignition or explosion, by contact with the flame of a lamp, or of any light used during the filling or replenishing of a lamp, &c., consisting in—(1.) The use of a metallic tube, of any shape, the sides perforated or solid, leaving the passage to the wick unimpeded, but at the same time completely preventing the return of flame or the accidental ignition of the contents of the reservoir; (2) also, in the use of a metallic perforated sheet or screen of wire gauze, inserted permanently in the apertures of lamps and of vessels for filling lamps and for storing inflammable liquids.	30 Sept., 1862	1866	287
74	James Schwartz	29 April, 1863	Improvements in reflectors for gas or other lights, consisting in constructing the reflectors of corrugated or fluted glass, backed with tin or other metals, and made in the form of a hollow truncated pyramid or cone, the sides of which may be rectangular, polygonal, or perfectly circular, and the faces of which sides or circles (that is, that portion of the reflector which is exposed to and reflects the light) may be either convex or concave, or (by preference) perfectly flat.	9 July, 1863	1866	361
203	James Andrew Penson	23 Jan., 1869	Improvements in reflectors for gas and other lights, termed a "Sunlight Reflector," consisting of a truncated pyramid with the top half inverted, thus forming a double reflector, of which the faces may be set at the most effective angle in each case; the supply pipe comes down through the apex and terminates in a crowbar supporting a ring of gas-jets; the reflecting surfaces are covered with glass enamelled with a mixture compound of 3lbs. of white flake and 1 oz. each of isinglass and gelatine.	8 Mar., 1869	1870	221
*217	Wilhelm Vett	22 June, 1869	Improved gas-burner, for reducing the consumption of gas without impairing the quality of the light, consisting of a small burner screwed into the bottom of a larger pipe or vessel into the top of which is screwed the outer burner, a self-acting plate or valve being also introduced to regulate the supply.	23 July, 1869	1870	255

* Should have been classed under "Production and Applications of Gas," p. 47.

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
44. Lamps, Candlesticks, Gaseliers, and other Illuminating Apparatus—continued.						
*701	Alphonse Bèchet.....	29 Aug., 1878	Improved gas-burner, entitled "The A. Bèchet improved Gas-burner Purifier, Check Regulator," for burning gas produced from coal, oil, wax, tallow, &c., as well as carburetted hydrogen gas, consisting of—A pivot stand, with top slightly reduced or tapered; check regulator, consisting of small adjustable tube, closed at the upper end and having two or more longitudinal slots at lower end; gas pressure distributor, formed of wire gauze in the shape of a capsule fitting over the regulator and the upper end of the pivot stand; reservoir or receiver, fixed or screwed to pivot stand, and fitted with flame consumer at upper end; a diaphragm of wire gauze in receiver, to equalize or distribute the gas before it reaches the burner; a paper washer to act as a non-conductor of heat between receiver and fittings; the burner is of refractory stone, and the heat from it is communicated to the receiver, which causes the gas within it to expand and thus is produced a more brilliant, even, and steady flame.	3 Oct., 1878	1881 vol. 2	133
707	Alphonse Bèchet.....	†.....	Improvements in lamps, consisting of—(1.) A non-combustible porous wick, composed of certain materials mentioned, by the use of which the oils or liquid consumed burns on a clear surface without creating any carbon, and gives a light of increased brilliancy during the whole time the lamp is lighted; (2) the arrangement of the burner, which being connected by small tubes only to the oil reservoir and surrounded by air or draught passages, cannot communicate heat to the oil in sufficient degree to cause explosion; (3) having the small groove or pipe to admit air to the oil reservoir totally unconnected with the burner, and placed in such a position as to prevent any gases that might be developed in burning volatile oils from reaching the flame and causing an explosion.	25 Nov., 1878	1881 vol. 2	145
737	Joseph Breeden	24 April, 1879	Improvements in holders or galleries for globes and shades for gas and other lights, consisting of three arms pivotted upon cars attached to the central tube of the burner, each arm having a toothed testor gearing into a worm upon a sleeve, also on the central tube, so that by rotating the sleeve the arms are made to describe arcs of equal lengths, and thus embrace globes or shades of any size.	28 May, 1879	1882 vol. 1	45
*814	Arthur Selby	4 Mar., 1880	Improved gas-burner, entitled "Selby's improved Gas-burner," consisting in the combination of two or more burners which separately give a flat flame in such a way that the resulting flame is a flat one of increased size and intensity.	6 April, 1880	1882 vol. 2	77
820	Christopher Tester	6 Mar., 1880	Improved automatic candle-extinguisher, consisting of an ordinary extinguisher with a spring clasp capable of receiving a candle of any size, and a spring connection between the extinguisher and the spring clasp; this admits of the extinguisher being strained to the side of the candle, and when the candle is burnt down to the required point automatically extinguishing it.	21 April, 1880	1882 vol. 2	95
*847	John Ellis (by his attorney, J. B. Carter).	25 May, 1880	Improvements in gas-burners, consisting in providing the burner-base with an internal screw-threaded socket at its lower end for attaching it to the gas pipe, and with a screw-threaded shank and a shoulder near its upper end for supporting the casing which forms the outer chamber, and with a shouldered upper end for supporting the inner chamber; the said burner-base being also provided with a transverse regulating plug for cutting off the flow of gas, said screw being so constructed as to be flush with the external surface of the lower portion of the burner-base, whereby the collar of a lamp-shade can be made to pass over it.	25 June, 1880	1882 vol. 2	179
864	James Andrew Penson	17 June, 1880	Improved reflector oil lamp, termed the "Improved Sun-light Reflector," consisting of a fountain supplying branch burners with oil, and arranged with a double opal glass sun-light reflector.	13 Aug., 1880	1882 vol. 2	235

*Should have been classed under "Productions and Applications of Gas," p. 47.

† Report in this case not furnished, as the papers cannot be found.

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44. Lamps, Candlesticks, Gaseliers, and other Illuminating Apparatus—*continued.*

894	Quentin Leon Brin.....	5 Oct., 1880	Improvements in process and apparatus for producing light and heat, consisting in projecting currents of oxygen upon carbon sticks or carbonaceous bodies, and producing light and heat by igniting the oxygen when in contact with the carbon.	6 Dec., 1880	1882 vol. 2	317
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45. Needles and Pins.

[No Inventions under this Class yet registered.]

46. Carriages and other Vehicles for Railways and Tramways.

38	Edward Bell	22 Dec., 1860	Improvements in the construction of wheels for railways and tramways, consisting in making such wheels with wooden peripheries, having the end or cross-grain of the wood presented to the periphery, to give a better hold upon the rails, and having metal flanges or rims to act as guides, and which improvements are applicable to locomotive engines, tenders, carriages, and other rolling stock, whether the motive power is steam, or horse, or other power.	19 Feb., 1861	1866	175
51	James Richard Davies	15 Feb., 1862	Improved undercarriage and wheels for railway and tramway locomotives and goods and passenger vehicles, and rails for the same, consisting of—(1) The regulating, directing, or guide wheels, with grooved or flanged peripheries, fitted at any angle, and to suit any kind of rail; (2) springs for guide wheels; (3) an axle for each wheel instead of for each pair of wheels; (4) flangeless-bearing wheels; (5) wooden rails.	12 May, 1862	1866	275
73	Frederick Collier Christy...	17 April, 1863	Improvements in brake gearing, applicable to rolling stock for railways, consisting of the following arrangement on each side of the train:—A tension-rod, with brake blocks attached, which blocks are held in contact with the wheels, a little below the centre, by the action of an adjustable spring at one end of the rod, a chain attached to the other end of the rod being carried round a drum revolved by a perpetual screw in the vehicle attached, which drum can be set free to revolve on its axis by a hand-lever releasing the coupling and thus letting slack the chain, when it is required to put on the brake instantly.	3 June, 1863	1866	357
80	William Elsdon	12 Aug., 1863	Improvements in the construction of wheels and rails applicable to railway vehicles of every description constructed to run on rail or road, consisting of—(1) Wheels with tires or hoops of two diameters, the larger for running on common roads, the smaller for running on rails, and the former for acting as a flange in the latter case—the tread of each tire or hoop having the necessary width, and cant or inclination bevel or round given; (2) movable frame for five wheels to adapt vehicle for common road traffic; (3) inclined plane for running carriages on or off of rail track; (4) crossing adapted for wheels of two diameters.	20 Oct., 1863	1866	387
231	Frederick Salisbury and James Morten.	22 Dec., 1869.	Improved apparatus for lubricating the axles of railway engines and carriages, and other machinery, consisting of a wheel or wheels kept revolving by the action of the journal or shaft and feeding the lower surfaces of the journal or shafting.	9 Feb., 1870	1872	37
317	John Grantham	17 May, 1872	Improvements in steam carriages for tramways or other roads, consisting of a combined locomotive and railway carriage, adapted for running on rails, or by lifting the flanged wheels for running on asphalted or common roads.	26 June, 1872	1874	65
351	Nicholas Trengrouse	27 Feb., 1873	Invention for promoting safety of trains running on narrow gauge railways, consisting in the use of safety wheels mounted in side-wings, and revolving vertically under but not quite in contact with flanges attached to the sides of the rails.	7 April, 1873	1875	23

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
46. Carriages and other Vehicles for Railways and Tramways—continued.						
373	Jacob Heberlein	16 June, 1873	Improvements in apparatus for working brakes for railway, tramway, or other carriages, singly or in train, consisting of an improved system of brakes worked by the frictional contact of drums fixed on certain of the running axles with other drums which are brought in contact with them, and which are thereby caused to revolve and to wind up chains attached to the brake levers, and so to press the brake blocks against the wheels.	25 July, 1873	1875	91
595	James Cleminson	20 April, 1877	Improvements in mounting the wheels and axles of railway or other carriages or waggons, and the attachment of the same together, whereby a more perfect mode of articulating and radiating the said wheels or axles is secured by means of the combined swivelling motion of the end axles and the transverse movement of the intermediate axle or axles when passing round curves, and to adapt brake mechanism to such articulating and radiating axles—the said adaptation of brake mechanism also being applicable to railway or other carriages or waggons having fixed or parallel axles which do not radiate.	2 July, 1877	1881 vol. 1	103
599	Samuel Milligan	22 May, 1877	Improvements in railway brakes, consisting in converting the onward motion and weight of a train into a motive force for pressing the brake blocks, by having a screw or worm on one of the axles of the vehicle, in the groove of which may be dropped one end of a lever, having its other end connected to a crank which operates a cross-bar or double crank, to which the ends of the two rods which carry the brake blocks are attached, whereby the brakes may be thrown on to both wheels at once; each vehicle has its own brakes; all the vehicles are connected by a series of rods or other connections terminating in a hand-lever at either end of the train; the arrangement may be duplicated for trains that run without turning by having two sets of levers, either of which can be hung clear of the groove.	2 July, 1877	1881 vol. 1	119
654	Honorable John Woods (by his agent, Edward Waters)	10 Dec., 1877	Improvements in railway brakes, consisting in the application of hydraulic pressure stored in carriage accumulators held in check by counter-pressure in a main line of piping common to all such accumulators, so that when such counter-pressure is withdrawn, that in the accumulators is free to apply the brake-blocks to the wheels—such hydraulic pressure being supplied by means of the engine-pump or injector.	14 Jan., 1878	1881 vol. 2	7
689	George Westinghouse, jun.	26 July, 1878	Improvements in railway brakes worked by means of compressed air or other fluid, or by atmospheric pressure acting against rarefied air, consisting in various modifications in existing British patents for brakes of this description.	28 Aug., 1878	1881 vol. 2	83
698	John Hardy and John George Hardy.	20 Aug., 1878	Improvements in railway brakes, relating to brakes operated by the pressure of the atmosphere, acting upon a piston working in a cylinder from which, at the opposite side of such piston, the atmospheric resistance is removed, by the production of a vacuum, by means of an ejector, air-pump, or other suitable air-exhausting apparatus, consisting in various devices in the specification described.	3 Oct., 1878	1881 vol. 2	119
708	Augustus Gross	7 Oct., 1878	Improvements in brakes for railway rolling stock, or other wheeled vehicles, consisting in the construction and adaptation of a circular friction brake to railway rolling stock and wheels of every description.	28 Nov., 1878	1881 vol. 2	149
*768	George Westinghouse, jun...	12 July, 1879	Improved system of apparatus for regulating and increasing the efficiency of brakes for railway trains, and for controlling and indicating the speed of locomotive wheels, consisting in improvements in pneumatic apparatus for that purpose, the use of governors, &c.	29 Sept., 1879	1882 vol. 1	121
832	Thomas Welton Stanford and Samuel Milligan (assignees of Samuel Milligan and Olaf Spencer Wheeler.)	9 Mar., 1880	Improvements in railway brakes, consisting (1) in the application of electricity in the shape of electro-magnets to the wheels of railway rolling stock as a brake power; and (2) in making the cases which contain the electro-magnetic brake blocks automatically release themselves by their own weight.	25 May, 1880	1882 vol. 2	135

* Modification of No. 689, *supra*.

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46. Carriages and other Vehicles for Railways and Tramways—*continued.*

863	Edwin Robins Thomas and George Cowdery.	28 May, 1880	Improvements in coupling and uncoupling apparatus, enabling rolling stock of every description to be coupled automatically by merely running the vehicles together with the ordinary force, and to be uncoupled instantaneously by the action of levers on either side worked without passing between the rolling stock, consisting in—(1) The use of a tumbling hook and adjustable link fitted to the draw-bars; (2) the manner of locking and unlocking the hooks or links by means of levers fitted to the draw-bars and the stops.	13 Aug., 1880	1882 vol. 2	231
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47. Umbrellas, Parasols, and Walking-sticks.

[No Inventions under this Class yet registered.]

48. Sugar.

7	Ralph Mayer Robey	Not dated; received, 22 April, 1858.	Improved apparatus for drying sugar, consisting in running the crystallized sugar into pneumatic pans with perforated false bottoms, connected by pipes with iron vacuous tanks into which the syrup flows after being forced by atmospheric pressure from the crystals; the sugar thus heated is placed in similar pneumatic pans in a chamber, the heated air from which rushes amongst the crystals, thus drying and rendering the sugar fit for market.	8 June, 1858	1866	31
8	Ralph Mayer Robey	Not dated; received, 22 April, 1858.	Improvement in refining sugar for the production of syrups therefrom at a low temperature, consisting in heating the sugar and water in a suitable pan or vessel by means of a system of pipes, containing steam or hot fluid, which may be removed when not required, and in introducing (by preference, through perforated pipes) numerous streams of air below the liquor.	8 June, 1858	1866	35
10	Conrad William Finzel	Not dated; received, 3 Sept., 1858.	Improvements in the manufacture of sugar, consisting in—(1) A mode of applying steam or liquids to machines used for separating syrups or fluids from sugar by means of centrifugal force, for the purpose of clearing and keeping clear the meshes or apertures in the periphery of the revolving cylinders; (2) a mode of preparing such sugars as require mixing with liquid before being operated upon in such centrifugal acting machines; and (3) in saving a portion of the saccharine matter now evaporated in the ordinary process of boiling.	29 Oct., 1858	1866	43
61	Richard Wright	3 Nov., 1862	Improvements in the manufacture and refining of sugar and an apparatus employed therein, consisting in the combination of rotating discs for evaporating purposes, with two vessels so arranged one above the other that the water in the lower vessel cannot touch the bottom of the other, nor be raised to a higher heat than 212° Fahrenheit, thus enabling operations to be carried on at a lower temperature than that of boiling water.	3 Dec., 1862	1866	315
189	Thomas Egenton Hogg	15 Sept., 1868	Improvement in the construction of centrifugal sugar-washing machines, consisting in the introduction of a cylindrical cone or wall-former, for the purpose of making a wall of dry sugar around the inner periphery of the rotating tub, by means of which the cleansing and purifying of crude dry brown sugars may be effected without recrystallization.	3 Nov., 1868	1870	175
193	Robert Tooth	19 Nov., 1868	Improved mode of and apparatus for evaporating liquids, with the view of obtaining the saccharine, saline, or other products in a dry or crystalline state, consisting—(1) When the liquids are not liable to deterioration by exposure to air, in bringing currents of cold or heated air into contact with descending streams of the liquids to be concentrated; and (2) in dealing with saccharine liquids, which are liable to deterioration by operating upon them in a vacuum.	17 Dec., 1868	1870	187

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Date of publication.	Page.
48. Sugar--continued.						
197	Alfred Fryer	4 Dec., 1868	Improvements in the mode of treating cane, beet-root, and other saccharine juices, and other solutions and liquids, chiefly for evaporating and concentrating purposes, and in the construction of apparatus for such purposes, consisting in—(1) Exposing such juices to heat in shallow trays, and then in a revolving cylinder, for the purpose of obtaining sugar in a non-crystalline or semi-crystalline solid state, otherwise called "Fryer's concrete"; (2) in the method of using steam or vapour about or below the temperature of 212° Fahrenheit, for heating the air to be passed through the above-mentioned cylinder; (3) in the use of the products of combustion from the evaporating furnace, by bringing them into direct contact with the solutions to be operated upon; (4) in the use of the gases given off by limestone during the process of roasting, by bringing them also into direct contact with the same solutions; (5) in the neutralization of the alkali contained in the solutions, by exposing them to the action of carbonic acid in combination with the products of combustion; and (6) in methods of and apparatus for drying crushed cane or megas for use as fuel.	12 Jan., 1869	1870	199
229	Wilson Hardy	6 Dec., 1869	Improved apparatus for the manufacture of sugar, termed a "Saccharator," consisting—(1) In a flue constructed of any material and heated by steam, fire, or hot air, crossed at intervals by iron tubes in tiers connected at alternate ends, each tube having beneath and attached to it a serrated iron plate; (2) in the use of hot air for heating these tubes, which air after winding through the whole series makes its exit through the top of the flue, thereby increasing the draft; (3) in the use of a liquor supply pipe, perforated on the under side, placed over each tier of tubes, and connected with the liquor supply cistern or clarifier; (4) in the liquor passing through the supply pipes, dropping on to the first series of tubes, thence from the points of the attached serrated iron plates to the next series, and so on to the receiving coolers; (5) in a fan at the top for increasing the blast of the steam jet, and carrying off the vapour as rapidly as formed; (6) in applying from beneath when required a hot-air blast, or in closing partially or wholly the bottom of the flue, and drawing off the vapour with the vacuum pump or fan blast.	2 Feb., 1870	1872	35
253	Alexandre Manbré	16 Aug., 1870	Improvements in treating cereal and other vegetable substances, and in apparatus to be employed for the purpose, consisting in—(1) The process of treating and preparing grain, vegetables, and other substances containing starch, by stripping, crushing, and grinding in water, and separating the husk, bark, skin, &c., whereby the whole amount of starch they contain can be extracted; (2) in subjecting the starch to a process of conversion, whereby pure fermentable saccharine matter can be produced, free from gum and other substances, and which is suitable for producing beer and many other fermentable drinks, also for making syrups, confectionery, pastry, &c., for sweetening tea and coffee, and for many dietary and diatetic purposes; (3) in cutting or crushing the said saccharine matter, when in solid form, into pieces or powder, as may be required; (4) in the construction of a vessel or apparatus capable of sustaining a heavy pressure, for converting starch into pure fermentable matter.	21 Oct., 1870	1872	105
332	Robert Tooth	27 April, 1872	Improvements in the mode of and apparatus for manufacturing sugar, consisting in a process known as the diffusion process, the object of which is to wash out the saccharine matter, in contradistinction to expressing it from the cane, consisting—(1) In the combination of a slicing apparatus and a series of communicating tanks, fitted with immerser, together with a rake or rakes, an elevator or elevators, and squeezing rollers; (2) in the use of the sacrate or saccharine preparation of the hydrocarbonate of lime for the purpose of clarifying saccharine juices, syrups, or raw sugar, and in the use of this compound for extracting sugar from molasses; (3) in an improved charcoal filter, which constantly renews the charcoal and removes the saturated material.	30 Sept., 1872	1874	111

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
48. Sugar—continued.						
440	Benjamin Kisch Cohen de Lissa (assignee of Paul Laurent Edmond Icery).	28 July, 1874	Improvement in the process and apparatus for the manufacture of sugar, by means of the production of mono-sulphite of lime and its application to the juice of canes, of sugars, and syrups, consisting chiefly—(1) In a special manner of manufacturing mono-sulphite of lime; (2) the application of the mono-sulphite of lime to the purpose of discolouring and purifying juices of canes and all sugars; (3) the construction of an apparatus with various contrivances and combinations.	29 Oct., 1874	1877	101
451A	August Friedrich Wilhelm Partz.	7 Dec., 1874	Improvements in mode of and apparatus for the manufacture of loose granular sugar into solid cubes or flat square blocks, partly applicable also to converting granular sugar into cakes, slabs, or bars, consisting in—(1) A compound mould, by means of which granular sugar coming from a centrifugal machine may be directly formed into rectangular blocks; (2) a machine for expeditiously depositing and compressing the loose granular sugar in moulds by means of rollers instead of a platen press; (3) trays and forms for carrying on continuous operations; (4) the mode of drying sugar in forms or moulds by passing them through a chamber against a current of heated air without entering the chamber.	14 Jan., 1875	1878	1
452	Joseph Grafton Ross	21 Nov., 1874	Improved process and apparatus for the manufacture of sugar, by means of the direct action of sulphur fumes upon the juice of sugar-cane, for improving the colour, checking fermentation, and rendering the manufacture easier, consisting in a stove in which sulphur being burnt, the fumes pass through a pipe to a funnel, through which the juice from the mill rapidly flows, thus causing a current which draws away the fumes produced, and thoroughly charges the juice therewith.	12 Jan., 1875	1878	5
567	Charles Eastes, Gresly Lukin, and Alexander Jenyns William Boyd.	20 Dec., 1876	Invention of a process for the better clarification of cane and other sugar juices, and for the manufacture of raw sugar, and for the refining of raw and low sugars, and for the conversion of the crystallizable matter contained in molasses into sugar, consisting in—(1) The Easte's Process, for producing sugar without molasses, and securing perfect clarification thereof by the use of hypochlorite of sulphur mixed with a portion of juice and powder into the clarifier, the contents of which are kept stirred to cause thorough admixture; (2) the use of all the various compounds of chlorine and sulphur, &c.; and (3) extracting the crystallizable matter from molasses, by heating it to a liquid state and clarifying it by the use of the above-mentioned chemicals or agents.	6 Feb., 1877	1881 vol. 1	7
622	James Duncan (assignee of Moretz Weinrich).	20 Sept., 1876	Improved process for the treatment and purification of sugar and saccharine matters, and in the apparatus employed therein, consisting in—(1) Causing powdered, crushed, or crystallized sugar to be mixed and coated with ultramarine blue, for the improvement of its colour; (2) causing the sugar so treated to be submitted to the action of steam, at the requisite temperature and pressure, in a centrifugal machine; (3) boiling down the syrups or secondary products from the centrifugal machine, neutralizing their alkalinity, and running them into moulds to solidify, the mass thus obtained being subjected to the action of steam in a centrifugal machine, in order to obtain from it a further quantity of refined sugar and to extract the molasses.	4 Oct., 1877	1881 vol. 1	163
629	Benjamin Kish Cohen de Lissa (by his attorney and agent, J. L. Newbury).	21 Sept., 1877	Improved process for the manufacture of sugar, consisting in the application of magnesia in all its forms and combinations to the clarification of cane-juice, syrups, and molasses, applied either singly or in conjunction or combination with any other known mode or process in use for the clarification of cane-juice or molasses, the quantity of such chemical compound or substance to be used depending upon the circumstances of each particular case.	29 Oct., 1877	1881 vol. 1	177

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
48. Sugar—continued.						
718	Joseph William Sutton.....	19 Dec., 1878	Invention of process and apparatus for the rapid evaporation of liquids, by preference saccharine liquids or juices, consisting in—(1) The use preferentially of steam-jacketed or steam-coiled pans, to which are added a perforated pipe or pipes, or perforated plate or plates, placed below the surface of the liquids or juices, through which cold or heated, dry or moist, air is blown in currents, by a fan, air-pump, or other suitable contrivance, driven by preference by a small independent steam-engine—very little driving power being required in comparison with the amount of extra evaporation secured—whereby the currents ascending through the juices cause violent agitation, and thus increase the evaporation; (2) the use of blowers, known as “Rotary Pressure Blowers,” for effecting rapid evaporation.	30 Jan., 1879	1882 vol. 1	9
740	Alexander Richard Mackenzie.	4 April, 1879	Invention of apparatus, called “Mackenzie’s Ejector Vacuum Pan,” consisting in—(1) The use of a steam ejector for securing a partial vacuum in any pan or column used for more economically reducing, clarifying, or evaporating sugar-cane, beet-root juice, or syrup, with or without the admission of gas or atmospheric air through the juice to be reduced, clarified, or evaporated, such pans or columns being formed of curved iron plate corrugated circumferentially; (2) the use of the exhaust steam from the ejector, combined with the vapour extracted by the ejector from the contents of the pan, for heating the steam-coil or jacket of the pan.	2 July, 1879	1882 vol. 1	51
746	Alexander Richard Mackenzie.	3 June, 1879	Invention called “Mackenzie’s Vacuum Curing-box,” consisting of a box or column having around it a warm water jacket for maintaining the sugar at a sufficient temperature, and fitted with a dished bottom and an inner perforated bottom covered with fine wire or gauze, and having a centre shaft furnished with knives or arms for circulating the sugar in the box; below the box and connected with it by a glass tube is a receiver with dished top and bottom ends, and containing a partition or preferably a smaller receiver; an ejector supplied with high pressure steam is attached to the receiver for the purpose of securing a partial vacuum in it; this is effected by the steam rushing into an exhaust pipe thereby drawing an induced current of air through a connecting pipe from the receiver; the partial vacuum so secured causes the molasses to be rapidly drawn into the receiver, from the box above, through the connecting glass tube; the attendant can by looking at the tube decide whether the molasses should be permitted to flow into the outer or inner receiver.	9 July, 1879	1882 vol. 1	69
779	Robert Tooth	7 Oct., 1879	Process for treating the juice of the sugar-cane and manufacturing sugar therefrom (being an improvement upon previous registration by same applicant, No. 332, of 30 September, 1872), consisting in treating the juice so as to preserve it from decomposition, or purify it; and in the manufacture of sugar from juice so treated, by the addition of carbonic acid gas to the juice which has previously been treated with lime, so as only to carbonate about two-thirds of the lime, thereby causing the residue to form with the sugar the compound known as tri-sucrate of lime, which compound, after re-boiling with the juice, and undergoing several other processes, concluding with filtration through animal charcoal and evaporation in the usual way, produces a superior sugar.	13 Nov., 1879	1882 vol. 1	163
782	Robert Tooth	7 Oct., 1879	Improvements in the mode of and apparatus for manufacturing sugar, based on the system known as the “diffusion process,” <i>i.e.</i> , washing out instead of expressing the juice from the cane, consisting in—(1) A novel arrangement of diffusion apparatus; (2) a chemical process for purifying the cane-juice; and (3) an improvement in the charcoal filter; the invention comprising chiefly a slicing apparatus, series of connected tanks, each fitted with immerser, or rake or rakes, an elevator or elevators, and squeezing rollers; also, the manufacture and use of the sucrate or saccharine preparation of the hydrocarbonate of lime, whether for the treatment of saccharine juices, syrups, or raw sugar, or the extraction of sugar from molasses; and, lastly, means for maintaining the efficiency of the charcoal filter.	17 Nov., 1879	1882 vol. 1	173

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
49. Steam Engine.						
99	John Langlands, Henry Wilson Langlands, and Edwin Hart.	28 Aug., 1864	Improved method of manufacturing engine-packing, consisting in winding around the piston-rod the following substances in successive layers, viz., wire gauze or cloth, gasking, or other suitable fabrics (as many layers as may be required), India-rubber, and again wire gauze or cloth, all fastened together with wire and wooden pegs; the packing being taken off, and immersed in a boiling solution of tallow and ground black lead, and then allowed to cool, is placed in the stuffing-box.	3 Nov., 1864	1866	457
133	Edward Carr Fortescue.....	7 June, 1866	Invention of a smoke-consuming furnace, consisting of a long horizontal fire chamber, with upper (perforated) and lower door at one end, and smoke plate at the other end, to force the smoke downwards through the flame in passing from the furnace to the flue.	20 Aug., 1866	1870	21
136	William Sellers	19 June, 1866	Improved construction of the "Giffard Injector," for rendering it self-regulating, consisting in the use of the overflow water to control the admission of the water or steam or both to the injector, so that the pressure inside the chamber, caused by an overflowing jet, diminishes the supply of water, or increases the supply of steam, or affects both, whilst the water which has escaped at the point of overflow to produce this effect being retained in contact with the jet, is drawn in again whenever the supply of water is too small or the supply of steam is too great, thus producing a partial vacuum in the overflow chamber, reversing the previous operation, and re-adjusting the instrument to the new conditions without any waste at the point of overflow.	22 Aug., 1866	1870	31
232	William Galloway and John Galloway.	7 Jan., 1870	Improvements in steam boilers, consisting in (1) the construction of steam boilers having water spaces connected by conical or tapering water tubes so formed that the flanges of the smaller ends thereof pass through the holes formed to receive the larger ends; (2) providing the flues with side pockets or side water chambers.	10 Feb., 1870	1872	39
270	George Warsop	30 Mar., 1871	Improvements in obtaining motive power by means of air and steam, and in apparatus employed therein, consisting in (1) Combing air-forcing apparatus with an engine suitable to be worked by steam or other fluid, such air-forcing apparatus taking in air in a cold or comparatively cold or unheated state and forcing it through a pipe or passage heated by a furnace externally, and thence into a boiler, whence in a heated state and in combination with steam generated in the boiler it passes to the engine, which it actuates; (2) so arranging the air-forcing apparatus employed in combination with a condensing engine that it may aid in withdrawing the air from the condenser.	11 May, 1871	1873	25
287	Edmund William Wright and Alfred Watts.	1 Sept., 1871	Improved method of and apparatus for consuming smoke, economizing fuel, preventing smoke, arresting the formation and emission of cinders and sparks, and preserving various parts of locomotive and other steam-engines, by the utilization of waste and spare or live steam, waste and spare heat, and waste or spare momentum of locomotive or other steam engines, consisting in the introduction of atmospheric air, steam, and carbonaceous material either separately or conjointly into furnaces or fire-boxes, by means of pipes, tubes, or other channels passing into such furnaces or fire-boxes, and projected on, into, or under the fuel so as to prevent the formation of smoke and thus more perfectly utilize the fuel and promote its combustion.	30 Oct., 1871	1873	63

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
299	Norman Selfe	7 Dec., 1871	Invention styled "Selfe's Direct-acting Stamper," for use with steam or compressed air, or gases, or water pressure, consisting of (1) steam-hammer or stamper, or crusher, or rock-drill, actuated by a piston within a cylinder so constructed that a continuous pressure of steam, or air, or a spring overcomes the weight of the hammer or stamper and acts with a constant force to raise it, while the intermittent power of steam, or compressed air, or gas acting on the upper surface of the piston, and regulated by a valve, causes the piston to descend and strike a blow by which arrangement steam is only used in proportion to length of blow, no power being consumed in lifting the hammer; (2) slide valve constructed with pistons of varying diameter and area so as to work independently of levers, rods, or gearing of any kind; (3) apparatus or arrangements for causing the piston and hammer to resolve on their axis when at work; (4) arrangement for lowering the cylinder on its fastenings or frame to regulate the length of stroke.	9 Feb., 1872	1874	9
304	Henry Francis.....	11 Mar., 1872	Improvements in steam-boilers, for preventing the formation of scale and of deposits in the interior of the same, consisting in introducing the water to be converted into steam through a vessel entering low down in the boiler, passing up through the water and steam spaces, and discharging at the highest point, at or about the same temperature as the water already in the boiler, thus disengaging the gases and precipitating the alkaline matters in the vessel, whence they can be removed through a mud hole.	11 April, 1872	1874	29
406	Theodore Frederic Sandbach Tinne.	18 Feb., 1874	Improvements in motive-power engines, specially adapted for pumping, blowing, sawing, stamping, mixing paints, &c., and polishing and lead lapping purposes, consisting in (1) The use of engines with pistons and cylinders so arranged and combined, (a) that either piston or cylinder or both may partake of a continuous rotary and reciprocating motion, or (b) that the piston may reciprocate while the cylinder rotates, or <i>vice versa</i> ; (2) applying the same principles to high or low pressure cylinders; and (3) a new kind of governor.	24 Mar., 1874	1877	23
467	Andrew Sutherland Low ...	12 Mar., 1875	Invention of a smoke-consuming and heat-concentrating furnace, consisting in so constructing the furnace that the smoke and gases generated at two or more fires, urged by a blast, are concentrated therein and consumed, thus obviating the necessity for having a chimney or stack and increasing the heat.	3 May, 1875	1878	35
482	George Clinch	22 June, 1875	Invention of an apparatus for superheating steam and converting it into hydrogen gas for steam purposes, consisting of the following parts, viz., a pipe conveying steam from the steam chest to a superheater in the back of the furnace, containing a series of pipes placed one within the other, and so formed by elbows or joints or unions that the steam in passing through them may be violently agitated, and (the pipes being red hot) be converted into thoroughly dry heated steam or hydrogen gas, which being ejected from the superheater is conveyed beneath the fire-bars to the front of the furnace and there by a fan-tail jet discharged with great force a short distance above the burning fuel, where it mingles with the carbon or smoke and destroys it by combustion.	7 Aug., 1875	1878	83
496	Robert Vaile ...	21 Sept., 1875	An improved rotary engine for applying the motive power of steam, water, atmospheric air, and similarly acting motive powers, consisting in causing a drum or cylinder attached to a shaft to revolve within an external cylinder; the steam or other motive power (being confined within these two cylinders, and acting on slides or pistons caused to alternately project and recede from the surface of the internal cylinder) compels the internal cylinder and its shaft to revolve, thus giving the rotary motion desired.	3 Nov., 1875	1878	117

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
49. Steam Engine—continued.						
510	Henry Handyside	27 Jan., 1876	Improvements in locomotive engines, and in apparatus for accomplishing the safe ascent and descent of steep inclines, and for facilitating the passage of sharp curves, consisting in the combination with an ordinary locomotive engine of a separate and distinct cylinder or pair of cylinders for driving either direct or through the intervention of gearing a winding drum mounted in the framing in conjunction with self-acting gripping struts made with hinged jaws, which grip the top and sides of both rails, whereby a train may be held in any position on an incline, or when a gradient has to be ascended the locomotive may be brought up first, paying out on its way a rope or chain connecting it with the train, and then the gripping apparatus having been brought into action and a winding drum set in motion the train may be hauled up to and connected with the locomotive again.	7 Mar., 1876	1879	27
515	Henry Davey	3 Feb., 1876	Improvements in apparatus for working the slides of steam or water pressure engines, consisting in—(1) The application, without the use of eccentric cams or other rotating parts, of the differential movement of a lever, one end of which is worked from the main piston, the middle portion being connected with the main slide, while the other end is worked from the piston of a subsidiary cylinder, the slide of which latter is worked by the movement of the abovementioned lever; (2) regulating the speed of the slide by connecting the piston of the subsidiary cylinder with a piston in a "cataract" cylinder acting as a governor; (3) the combination with all the foregoing of a second subsidiary cylinder and "cataract" cylinder, with rack, sleeve, and worm, for shifting the fulcrum of a secondary lever so as to regulate the pause of the main piston at each stroke; and (4) working a double bent shut-off valve from the main slide.	21 Mar., 1876	1879	49
529	Henry Baldock	18 April, 1876	Invention of apparatus and process for preventing smoke and economizing the use of fuel, entitled "Baldock's Smoke Preventer and Fuel Economizer," consisting of a hollow box, bridge, or pipe, of iron or fire-clay, or both, adapted to the size and shape of the boiler of furnace, such receptacle being filled or partly filled with turnings, borings, filings, scraps, or other oxidizable metal or matter.	19 June, 1876	1879	89
563	David Mackenzie Barry ...	27 Nov., 1876	Improved spark-arrester for locomotives and steam-boats, consisting of an open-mouthed cage attached to the top of the funnel, and leading to a down-pipe for conducting the sparks and steam to the track below, which down pipe is placed outside the funnel so as not to interfere with its draught; also, the case is hinged, so that it can be thrown back when passing under bridges or through tunnels.	10 Jan., 1877	1881 vol. 1	1
630	Thomas Adams	17 Sept., 1877	Improvements in safety-valves and gearing connected therewith, consisting in—(1) Spring loaded valves so constructed that the valve may be lifted from its seat without varying the strain upon the spring and at the same time turned round to dislodge foreign substances; (2) opening the passage wide to facilitate the sudden escape of the steam when the valve is up, and closing it as suddenly when the steam falls below the pressure at which the valve is gauged; (3) gearing for working and regulating, protecting, and supporting the spring.	29 Oct., 1877	1881 vol. 1	179
726	William Menzies and Charles Blagburn.	31 Jan., 1879	Improvements in steam boilers, relating more particularly to marine boilers, and designed to promote the circulation of the water in the boiler and thereby equalize the heat, prevent chemical or galvanic action or priming, and increase the evaporative efficiency thereof, consisting in the application to and use in steam boilers of water-circulating passages or tubes of an elongated section or of a round or other section, and employed in clusters or series so as to obtain an equivalent aggregate sectional area, such passages or tubes extending from about the level of the water in the boiler (but below the same) to any convenient point below the level of the fire-bars.	13 Mar., 1879	1882 vol. 1	31

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
49. Steam Engine—continued.						
739	Violet Louis and Ophelia Gee.	12 May, 1879	Invention of a composition for the prevention of incrustation in boilers for steam-engines and for other purposes, consisting in the use of a composition prepared from wattle bark or other equivalent material infused in boiling water, with the addition of gum arabic or other equivalent material.	11 June, 1879	1882 vol. 1	49
750	Ernest Boisson and Henry Coutonly.	28 May, 1879	Improved composition for preventing and removing incrustation in steam boilers, consisting in the use of a combination of wattle bark and starch and water boiled for about two hours and stirred so as thoroughly to mix them; if necessary the liquid may be evaporated and the composition reduced to powder.	22 July, 1879	1882 vol. 1	81
776	George Bowman Mackenzie	6 Oct., 1879	Improved compound engine, for use with steam, air, or other elastic and expansive fluid under pressure, called "Mackenzie's Differential Compound Engine," consisting of a cylinder and of a piston or plunger with a greater area on one side than on the other, so connected that the elastic fluid produces a stroke in one direction, then (a slide-valve having been opened) it expands and likewise fills the space on the other side of the piston, the area of which being larger enables the fluid to act differentially and give the return stroke, either with or without the assistance of a fly-wheel.	3 Nov., 1879	1882 vol. 1	153
849	James Wavish.....	19 May, 1880	Improvements in or applicable to locomotive, marine, and other steam boilers, based on what is known as Wavish's system, consisting in constructing the cover of the furnace chamber hollow, and connecting it with the water space in the boiler in such manner that the water may circulate through and protect it from injury by heat and contribute to the available heating surface of the boiler.	30 June, 1880	1882 vol. 2	185

50. Paints, Colours, and Varnishes.

63	Alexander Borthwick	29 Oct., 1862	Improvements in the method of preparing paints, designed for preserving, without the use of copper sheathing, ships' bottoms, buoys, or piles, or other material of wood or iron, subjected to the action of either salt or fresh water, or in contact with the earth, consisting in the several combinations and mixtures, and in the mode of applying the same, as the specification described.	18 Dec., 1862	1866	323
123	James Charlesworth and Charles Cooling Sharp.	10 Mar., 1866	Improved composition, consisting of a combination of tallow resin, and white lime, and process for applying the same to ships' bottoms, wood, iron, &c., for the purpose of preserving the same from the effects of exposure to the atmosphere, to fresh or salt water, to earth, or to insects.	14 May, 1866	1870	I
151	William Webb and John Thomas Hobbs.	14 Mar., 1867	Invention for making paints, entitled "Australian Patent Metallic and Silicious Paints," for painting iron, wood, stone, or brick, for colouring plaster, and to be used as an anti-corrosive composition for ships' hulls, consisting in a preparation of per-oxide of iron, granite, and silica, to which is added a small portion of sulphate of copper, and when mixing for use the necessary quantity of oil.	28 May, 1867	1870	67
239	Olof William Blackwood ...	30 Mar., 1870	Improvements in the manufacture of pure metallic paints (most of which paints are known in commerce as Roman ochre, Venetian red, black, raw Turkey umber, and burnt Turkey umber), consisting in—(1) Breaking the ore, working it about, and subjecting it to repeated washings in water till it is reduced to powder; then saving the pure oxide of iron, and rejecting the granite or silica; (2) applying heat at different temperatures to the pure oxides, which has the effect of changing them into the different colours mentioned.	19 May, 1870	1872	61

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
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50. Paints, Colours, and Varnishes—*continued.*

627	Thomas Griffiths	17 Sept., 1877.	Improvements in white pigments, and in the manufacture thereof, for producing a pigment not liable to decay or peel off, or to become discoloured by sulphuretted hydrogen, and having great covering power, consisting in—(1) The use of a soluble sulphide or sulphides of calcium, as a precipitant of zinc; (2) a pigment composed of a mixture of sulphide of zinc, and sulphate of lime or baryta, with or without magnesia; (3) production of a sulphide of zinc by precipitation from a solution of a salt or salts of zinc, by means of sulphuretted hydrogen or of a soluble sulphide of an alkali or alkaline earth, and then calcining the same; (4) the use of magnesian oxide or a salt of magnesia in pigments composed in large parts of sulphate of barium or calcium, or sulphide of zinc, or both.	23 Oct., 1877	1881 vol. 1	173
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51. Toys, Games, and Exercises.

127	George Selth Coppin	9 May, 1866	Invention of a roller and ice skate, for use on floors, or upon real or artificial ice.	29 June, 1866	1870	9
142	Leipold Burmeister	31 Aug., 1866	Improvements in the construction of roller-skates, consisting in the adaptation to them of guides and brakes.	8 Oct., 1866	1870	47

52. Ventilation.

17	Edward Teillard and Eugene Dominique Nicolle	1 Jan., 1859	Improved mode of constructing sun-blinds, consisting in using a tubular iron frame-work for supporting the canvas, which frame may be set at any angle by winding it up with a key, the box containing the mechanism being attached to the front of the house, thus dispensing with the use of awning-posts and ropes for supporting blinds.	7 Mar., 1859	1866	79
106	Joseph Jules Lachaume ...	Not dated; received, 11 Nov., 1864.	Invention of a machine called the "Mephiticosenon," for creating a prolonged current of fresh air without manual exertion, in sick rooms, nurseries, &c., consisting of a revolving fan, attached to a horizontal arm supported by a movable stand, and driven by clock-work.	4 May, 1865	1868	19
456	Henry Hudson, Robert Hudson, and William Hudson (assignees of Alfred Roberts).	29 Oct., 1874	Improved window-frame and sashes for ventilating purposes, consisting of a frame the head of which is glazed, to throw the draft upwards, and of two pivot hung sashes connected by a rod and parallel to but not in contact with each other; the windows open and shut together; when they are shut, in consequence of the sashes been somewhat shorter than the opening, the current of air passes under the bottom of the outer sash, up between the sashes, and in over the top of the inner sash.	3 Feb., 1875	1878	13
618	Henry Hudson, Robert Hudson, and William Hudson.	6 Aug., 1877	Improvements in windows, called "Hudson's Movable or Noiseless Window," for houses, and railway carriages, omnibuses, or other vehicles, consisting in fixing India-rubber rollers or castors on each side of the window-frame to press against the sash and deaden sound, and when the windows are heavy a catch or bolt operated by a spring is used to afford additional support, thus dispensing with counter-balance weights; also for use in railway carriages, metal weatherings and a spring on the head-rail for holding down the sash firmly.	17 Sept., 1877	1881 vol. 1	157
705	John Pease (by Henry Halloran, agent.)	10 Sept., 1878	Improvements in window-blinds, consisting of a portable low Venetian blind, suspended from a knob with pulley at each side of the window, so fixed that by turning one of such knobs the laths may be set at any angle.	13 Nov., 1878	1881 vol. 2	141

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
52. Ventilation—continued.						
771	Henry Bell, James Bell, and Joseph James Coleman.	15 Sept., 1879	Improvements in processes and apparatus or arrangements for cooling and regulating the temperature and dryness of air in holds, saloons, and cabins of ships, and in railway vehicles, hotels, theatres, halls, factories, hospitals, slaughter-houses, and other interiors, consisting in—(1) The combination of refrigerative processes in which compressed air is first cooled by injecting water during compression, and by intermingling opposite currents of water with the air immediately after compression; by passing the air in contact with extended metallic surfaces for the deposition of moisture, re-expanding the air against resistance, and passing the air in contact with moisture-deposition apparatus; (2) arrangement and combination of steam-engine, air-compressing, compressed-air-cooling, and air-expansion apparatus; (3) arrangement of the moisture-depositing and re-expanded air-distributing apparatus; (4) placing the moisture-depositing apparatus in casings or in hollow partitions provided with inlets, outlets, or connections and valves for controlling the passage in contact with the said apparatus of whatever current or currents of air are found suitable; (5) construction of a chamber in which a temperature below or not much above freezing point is to be maintained; (6) combination of supplementary circulation apparatus with the refrigerating machinery, such apparatus comprising a jaw or blower drawing air from the interior, and re-distributing it therein by pipes, ducts, or passages; (7) construction of the pipes, ducts, or passages for the supplementary circulation currents contiguously to or so as to cover the main pipes, ducts or passages through which the cool or re-expanded air is passed.	17 Oct., 1879	1882 vol. 1	133
800	Henry Melvill Williams (by his agent Oswald Brown)	22 Dec., 1879	Improved ventilating apparatus for tops of ventilating shafts and chimney flues, so designed that the action of the wind in passing over or through them creates an upward current in the shaft or flue, and prevents injurious downward draughts, consisting of a tube with a hollow spheroidal enlargement surmounted by a cap having a curved or conical upper surface, and a flat or nearly flat under surface, the diameter of the said cap being less than that of the hollow spheroidal enlargement, but greater than that of its upper orifice.	10 Feb., 1880	1882 vol. 2	27

53. Farriery; including the Medical and Surgical Treatment of Animals.

29	George Jaques.....	Not dated; received, 17 April, 1860.	An improved preparation of tobacco, for destroying vermin, and removing certain cutaneous diseases upon sheep and other animals, consisting chiefly in successive processes of evaporation and concentration, by means of which all the active principles of the tobacco, volatile as well as soluble, are retained.	21 May, 1860	1866	135
65	Patrick Hayes.....	29 Jan., 1863	Improved specific for scab and foot-rot in sheep, cattle, &c., called "Hayes's Concentrated Specific," consisting in—(1) A solution in water of any of the following ingredients:—Oil of tar, fat of tar, spirits of tar, oil of coal, the oil or gum of the grass tree, the tar or oil obtained from the blue, red, and white gum-trees, Stockholm tar, pitch, resin, or tallow; (2) a quantity of waste meat or waste carcasses boiled down, to which is added caustic soda (or potash, soda ash, or soda made caustic); (3) mixing and boiling the whole of the foregoing ingredients, with sulphur added; and (4) dissolving the specific in boiling water, and then mixing with cold water for use.	23 Feb., 1863	1866	333
161	John Falconer.....	28 Aug., 1867	Invention of instruments for inoculating and spaying cattle, consisting in—(1) Inoculating instrument: composed of a hollow metal lancet needle, of conical shape, with a hole or holes at or near the point, through which the virus or lymph is ejected, containing an inner needle projecting a little beyond it at the point, and fitted with a ball valve and spring inside, and small disc or ring to regulate depth of incision outside; the needle screws into a flexible cylindrical or globular reservoir which also serves as a handle; (2) spaying instrument: composed of an artificial steel or metal nail or thimble for the thumb or finger, secured to the hand by tapes, &c.	3 Oct., 1867	1870	95

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
172	James Andrew Bolton Higham.	24 Dec., 1867	Improved apparatus for shearing or clipping wool or hair from sheep or other animals, consisting of an instrument to which steam or compressed air or water is conducted by a flexible pipe, and acts on a turbine wheel or rotary engine which drives a rotary knife or cutter travelling over a comb or jinger-bar, forming part of the instrument, which has also a handle.	2 Mar., 1868	1870	119
185	Lewis Lawrence Smith Higham.	4 Sept., 1868	Improved horseshoe and method of applying the same, entitled, "The velox or anti-concussion horseshoe," consisting in—(1) A shoe made of irregular shape, in order to lessen its weight and give it a firmer hold of the ground; (2) an elastic substance introduced between the foot and the shoe, to prevent concussion; (3) blending together (when desired) the hoof, the elastic layer, and the shoe, by the use of an adhesive substance.	28 Sept., 1868	1870	167
207	William Wright and Henry Dale Edwards.	13 Jan., 1869	Improvements in the construction of sheep washing machinery, consisting—(1) in controlling the supply of water by means of plugs in the bottom of the tank, which plugs are operated by a spindle worked by a handle; (2) regulating the thickness of the stream of water by means of two or more weights connected together by a spindle and each acting on a lever connected with a movable jet-piece.	30 Mar., 1869	1870	231
240	James Eglinton Anderson Gwynne.	21 April, 1870	Improvements in apparatus for shearing or clipping animals, the said apparatus being also applicable to shaving skins, consisting of a column turning in a socket secured to the ground, supporting a balance arm by means of a swivel joint, on which arm is mounted a fly wheel with handle and grooved periphery; also a universal joint arrangement pendent therefrom, to which is attached a revolving cutter with serrated disc—the whole constituting a universal joint apparatus driven by hand power by means of an endless band passing over the pulleys and by bevel wheel gearing.	25 May, 1870	1872	63
269	Henry Dale Edwards and William Thomas Gore.	14 Feb., 1871	Improvements in soaks or dips for washing or dipping sheep, consisting in constructing the apparatus with an adjustable false bottom, so as to form two distinct chambers when required, for the purpose of facilitating the removal of the dirt resulting from washing or dipping and retaining the great body of the water or lay in which the sheep have been washed or dipped.	13 April, 1871	1873	23
307	Thomas Forrest Cumming	6 Mar., 1872	Apparatus for supporting sheep when being washed under a jet or spout of water, consisting of two cylinders which are supported by adjustable standards, and are set horizontally and nearly in contact with each other and have a jet of water falling between them; the sheep are placed on top of the cylinder, from which position they cannot escape by reason of the motion which they themselves impart to the cylinders.	8 May, 1872	1874	33
362	Charles Sargeant.....	8 April, 1873	Apparatus for closing the points of worn sheep-shears, consisting in placing the neck of each shear in a rest and holding it in position by a slot while a lever is made to descend on the semi-cylindrical portion of the handle with a gradual pressure sufficient to give the necessary bend at the neck.	4 July, 1873	1875	55
405	David Brown and James Fulton.	18 Feb., 1874	Improvements in sheep-shears, consisting in—(1) making shears with blades separate from the handle but connected therewith by screws or rivets; (2) making the handle with an arm projecting from each end for connection with the blades; (3) making a slot or series of holes in the blade or in the arm for adjusting the points.	24 Mar., 1874	1877	21

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
53. Farriery; including the Medical and Surgical Treatment of Animals—continued.						
455	John Johnston Smart, assignee of Charles H. Dana.	28 Nov., 1874	Improved sheep and cattle label and machine for making the same, consisting in—(1) a metal strip forming a link-shaped label, bearing either a name, or a number, or both, which is attached to the ear by passing both its ends through holes or slits therein or through a slit and round the edge thereof, and then closing the ends so as to leave no open space between the strip and the ear; (2) machine for making such labels, in which the several operations of numbering, lettering, cutting off, and binding are performed by means of dies, cutters, formers, and jaws.	3 Feb., 1875	1878	9
489	John Henry Caton and William Henry Allen.	12 July, 1875	Invention of a solution for curing the fluke in sheep, consisting in injecting directly into the region of the liver a solution formed of cyanide of potassium, carbonate of iron, bicarbonate of soda, iodine, and water, which is applied by means of a sub-cutaneous syringe.	20 Sept., 1875	1878	105
578	Robert Savage and Frederick York.	19 Feb., 1877	Improvements in apparatus for shearing sheep and clipping horses and in contrivances for driving such apparatus, applicable also to other useful purposes, consisting in—(1) making the driving spindle of revolving shearing and clipping machines in two parts which can be thrown in and out of gear by the thumb; forming the cutter of a metal disc with sharpened periphery revolving in contact with a comb; sharpening instrument; springs and friction rollers for keeping the cutter or knife to its work; (2) flexible connections made in lengths connected by rigid metal joints; (3) circular shearing table slightly dished let into an ordinary table, and capable of being turned round and set at any angle.	28 Mar., 1877	1881 vol. 1	55
591	William Little	7 April, 1877	Improvements in the manufacture of cleansing and disinfecting fluids for washing sheep and for other such purposes, entitled, "Little's Chemical Fluid and Disinfectant," consisting in the combination of the distilled products from gas-tar (or other such like products) with resinous matter, oleate of potash, and solution of soda, and bisulphite of carbon, so as to make a liquid chemical combination, and not a mixture, in which the component parts are held in suspension, mixable in any proportion with water, for preventing the attack of maggot or blue fly.	8 June, 1877	1881 vol. 1	101
645	Frederick York Wolseley...	16 Nov., 1877	Improvements in machinery for shearing sheep and clipping horses, with rotatory cutters, consisting in driving such machines with round belting or cord passing over, around, and between pulleys, the length of such belting being regulated, as required, by being led around a weighted pulley, so that the machine may be freely used on any part of the animal; also in various mechanical arrangements.	12 Dec., 1877	1881 vol. 1	217

54. Artists' Instruments and Materials.

[No Inventions under this Class yet registered.]

55. Skins, Hides, and Leather.

5	Charles F. P. Funcke	Not dated; received, 2 July, 1857.	Improvements in the method of tanning skins and hides, designed to expedite the introduction of tannic acid into the interior of the same without simply hardening the surface, consisting in—(1) passing the un-haired skins or hides through a solution of soda and water, and then partially drying them; (2) steeping them in a diluted mixture of certain vegetable acids and extracts of bark or other vegetable substances containing tannic acid, and then repeating the process in a modified manner with a stronger acid containing a solution of sugar; (3) subjecting the skins or hides to the action of a liquid containing tannic acid reduced in strength, for the purpose of improving the colour, by the addition of some sulphuric acid and salt.	13 Nov., 1857	1866	23
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No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
165	Moritz Michaelis, Isaac Hal-lenstein, Arthur Cleghorn, and Edward Waters.	8 Oct., 1867	Improved method of treating hides in the process of tanning and apparatus for the purpose, consisting in—(1) imparting to the hides a continuous motion during the whole time they are submerged in the tan liquor; (2) mechanical arrangement for communicating the necessary motion to the hides.	8 Nov., 1867	1870	107
201	Jean Baptiste Chatain	6 Jan., 1869	Improved method of preserving the skins of animals and of removing the wool or hair from the same, consisting in—(1) when the skins are to be preserved, and also the wool or hair removed, treating the hides with oxy-sulphuret of calcium or other sulphuret; (2) when the wool or hair only is to be removed, as in the case of hides intended for immediate tanning, placing them in a bath of water and lime, and passing a current of gas of sulphuretted hydrogen acid through the bath, preparatory to finishing by the usual methods.	24 Feb., 1869	1870	213
252	George Alfred Bartleet	16 Aug., 1870	Improved method of treating the bark and leaves of tannin-yielding trees, shrubs, and plants, especially mimosa or black-wattle, for producing therefrom an extract for tanning purposes, consisting in—(1) grinding the materials to about the condition of coarse sawdust; (2) subjecting the materials so ground to the action of steam or water till all the tanning material has been extracted, and utilizing the residue for fuel or paper-making purposes; (3) purifying and in part decolourizing the liquor so obtained by causing it to percolate through, or have thoroughly mixed with it, common fire, clay, or potter's clay, or other suitable material in a dry powdered state, thus producing a liquor enabling tanners to manufacture leather similar in colour to that tanned with oak bark; (4) concentrating the purified infusion or liquor thus obtained till the extract has the consistency of molasses or if desired prolonging the process till it can be formed into blocks, in which condition it may be used for making liquor of any required strength.	21 Oct., 1870	1872	103
324	Jules Watteau.....	25 June, 1872	Improved depilatory composition for hides and skins, to be used for loosening the wool or hair and facilitating its removal by hand or machine, consisting in a sulphosel or double sulphide of calcium and sodium, compounded from lime, soda ash, and sulphur, mixed together in cold water and boiled; when cold the composition is ready for use.	1 Aug., 1872	1874	91
376	George Rawle and William Nathaniel Evans.	9 July, 1873	Improvements in the manufacture of leather, designed for quickening the process of tanning, consisting in protecting the grain side of hides and skins, by rubbing them over with grease and oil (preferably cod oil and tallow) previously to tanning, or by placing together the grain sides of two skins, after which they may be suspended at once in a strong tannin solution, instead of in successive weak solutions gradually increased in strength as at present.	11 Aug., 1873	1875	99
503	Henry Malcolm Caldwell ...	25 Sept., 1875	Improvements in treating hides, skins, and pelts, and removing the hair or wool from the same, and making the pelts into white or tawed leather, consisting in the employment during the process of tanning of petroleum, shale oil, or other liquid hydro-carbons, with or without sulphide of lime or other sulphide, applied when possible under either hydraulic, atmospheric, or mechanical pressure, which treatment increases the strength of the skins.	20 Jan., 1876	1879	9
545	Phillippe Joseph Dussaud and Joseph Duchez.	26 July, 1876	Improvements in tanning, and in apparatus connected therewith, designed for quickening the process of tanning, consisting in various operations, the principal of which are conducted in a closed vessel under pressure, for the purpose of forcing the liquor into the hides.	6 Sept., 1876	1879	135

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
55. Skins, Hides, and Leather—<i>continued.</i>						
774	George Harrisson	19 Sept., 1879	Apparatus for scraping, cleaning, and preparing hides and skins, and for dressing and finishing leather, consisting of revolving cylinders, carrying knives ranged around them in reverse spirals, for scraping, slicking, finishing, or performing any other operation required, the hides, skins, or leather being drawn past the knives in such manner that any flesh or other superfluous matter on the hide or skin can be cut, scraped, or removed, and any description of leather prepared, smoothed, and finished.	3 Oct., 1879	1882 vol. 1	145
895	Heinrick Trenk, Jean Ballatschano, and Constantin Ballatschano.	25 Aug., 1880	Improved processes and compositions for the tanning and condensing of hides or skins, consisting in treating the skins with certain tanning fluids either in single baths or in solutions in a certain order, or by a mixture of the same, according to the species of animal and strength of the skin, and the purpose for which it is to be used.	6 Dec., 1880	1882 vol. 2	321
56. Preparing and Cutting Cork; Bottling Liquids; Securing, Opening, and Stoppering Bottles, &c.						
242A	Edward Hogben and Henry Barrett.	2 June, 1870	Improvements in apparatus for supplying the syrup in the manufacture of aerated beverages and other liquids (also applicable to other purposes), and in stoppering bottles such liquids, consisting in—(1.) Pump or apparatus for supplying the required quantity of syrup in making beverages (also applicable to such other purposes as measuring, or forcing to another place, any required quantity of liquid; (2.) Stopper in the form of a cylinder or plug of wood of greater specific gravity than water, having a groove for receiving an India-rubber washer; this stopper is applied by forcing it into the bottle, which is then filled while in an inverted position, and the air-pipe being withdrawn the stopper falls into the neck of the bottle where it is held by the force of the gas till the bottle is opened by pushing it in.	13 July, 1870	1872	73
387	Hiram Codd.....	9 Oct., 1873	Improvements in bottles for aerated liquids, and in apparatus for making and for filling such bottles, consisting in—(1.) Stoppering by means of a glass ball introduced into the neck of the bottle when forming it; the neck is contracted at top and bottom to keep the ball from falling into or out of the bottle; against the top shoulder or flange is fixed a ring of India-rubber to act as a pad; within the neck are also formed some ridges to keep the ball from falling into the mouth of the bottle when pouring out the contents; the bottle is opened by pushing down the stopper. (2.) Machine for making bottles of this kind. (3.) Machine for filling such bottles.	21 Nov., 1873	1875	131
389	George Gledhill (by his attorney, Henry Hartlebury Staite.)	28 July, 1873	Improvements in bottles for aerated liquids, entitled "Gledhill's Patent Aerated Water Bottle and Stopper," consisting in—(1.) Using as a stopper an India-rubber ball within the bottle, such ball being held in position against the aperture in the top of the bottle, which is formed hemispherically, by the force of the gas. (2.) Machine for filling such bottles. (3.) Instrument for opening the bottle by pushing the stopper into it.	24 Nov., 1873	1875	139
435	Thomas Andrew Walker ...	4 June, 1874	Improved cork and apparatus for bottling aerated liquids, entitled "Walker's Valve or Tongue Stopper Cork and Apparatus for bottling aerated and gaseous beverages," consisting in—(1.) A bottle with rim cut through on opposite sides; a stopper cork with two catches, which is put on the bottle by passing the catches down through the cuts in the rim, and turning it partly round to engage the rim; in the stopper is a hole, and underneath it is fixed an India-rubber washer with a corresponding hole, and attached to the underside of the washer is a tongue or valve which is kept closed by the pressure of the gas. (2.) Machine for supplying such bottles with aerated liquids, called a "bottling machine." (3.) Apparatus for introducing the required quantity of syrup into such bottles, called a "syrup-meter."	26 Aug., 1874	1877	93

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
56. Preparing and Cutting Cork; Bottling Liquids; Securing, Opening, and Stoppering Bottles, &c.—continued.						
449	Frederick George Dunn ...	16 Sept., 1874	Invention of a key-stopper and bottle or jar, entitled "Dunn's Key Stopper and Bottle or Jar," consisting in a bottle or jar with dished lip, projections in neck, and removable stopper; this stopper fits accurately and projects far enough above the top of the bottle to afford a hold for the fingers; it has a collar of India-rubber held in a groove, for pressing against the lip of the bottle; and it terminates in a key for engaging the projections in the neck.	13 Nov., 1874	1877	123
548	Henry James Cole	25 Aug., 1876	Invention of a combined siphon tap and stopper for aerated waters, consisting in—(1.) A tube attached to another tube which passes through the bottle-neck, the latter tube being surrounded by a short length of rubber tube which can be expanded by impinging against a cone at one end, and by abutting against a cap which carries it at the other; the cap is capable of being forced down by a screw, button, or plate which rests upon the cap, and the rubber tube which is expanded acts as a stopper and hermetically closes the neck of the bottle against escape of the liquid or the gas with which the liquid is charged. (2.) The second tube is surmounted by a head in which is a valve capable of being removed from its seating by turning a button on the outside of the head either from above or from the side, in order that the liquid can pass out through a nozzle into any vessel placed to receive it. (3.) Instead of the valve being in the head of the tap it may be in the bottom of the second tube, the first-mentioned tube in that case being dispensed with, as also the head.	11 Oct., 1876	1879	141
555	Peter Tyrer	5 Oct., 1876	Improved instrument for extracting corks from bottles, consisting of two strips of round or flat steel wire, crossed and soldered together in the middle, and strengthened with wire whipping, the ends being gathered and fastened into a hole in a piece of iron to form a cross-handle.	13 Dec., 1876	1879	157
607	William Whitfield Horner..	5 Dec., 1876	Improvements in the stoppering of bottles for aerated liquids, consisting in a nozzle made to fit on the edge of the mouth of the bottle, descending inside about $\frac{3}{8}$ ths of an inch, and bending sufficiently over the outside to give it a firm hold; from the outside descend two or more strips of metal, each having an eye through which the fastening wire is to pass; around that part which is placed in the mouth of the bottle is an India-rubber washer, which reaches a little below the edge of the metal; the nozzle is to be used with an internal stopper; loops of metal may be substituted for the descending strips, cork or cement for the India-rubber, and a flat stopper may be hinged to the bottom of the nozzle.	27 July, 1877	1881 vol. 1	137
646	Hugh Thomas Smith	16 Oct., 1877	Improved stopper for bottles for aerated liquids, entitled "Improved thimble for bottle-stoppers for aerated liquids," consisting of a stopper or plug with a shoulder at one end, and of a thimble having a shoulder also which fits on the stopper or plug.	12 Dec., 1877	1881 vol. 1	122
694	Edwin Langley, assignee of Robert Irwin and William Fowler Maddox.	22 Aug., 1878	Improvements in stoppering aerated water-bottles and in apparatus connected therewith, applicable to bottles in which the stopper is held by internal and gaseous pressure, consisting in—(1.) Bottle with screw thread on inside of neck. (2.) Spring hand-tool with screw-threaded core attached for making such screw-thread. (3.) Contrivance for stoppering such bottles by the combination of a flexible washer and wooden ring fitting the said thread. (4.) Stoppering such bottles by a cut metal capsule screwed on to the outside of the neck compressing an India-rubber washer on top of the neck, or an earthenware capsule may be used applied in like manner, or a sheet metal capsule pressed into the screw threads.	16 Sept., 1878	1881 vol. 2	103

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
56. Preparing and Cutting Cork; Bottling Liquids; Securing, Opening, and Stoppering Bottles, &c.—continued.						
736	John Starkey, assignee of William Warren Bird.	22 June, 1877	Improved method of stoppering aerated water bottles, consisting in—(1) Placing around the neck of an ordinary aerated water-bottle an iron wire hoop having on either side of it an eye, into which eyes are fixed the ends of a loop of similar wire, forming an arch over the mouth of the bottle; (2) stopper of wood or other material (preferably earthenware) about 1 inch in length and having an India rubber or gutta-percha washer fixed in a groove cut around it; above the groove is a head whose lower end is just larger round than the mouth of the bottle; to the head is attached a ledge upon which rests the hoop abovementioned; there is also a wire pin fastened to the head and hoop by a chain, to prevent loss of stopper; the bottle is opened by removing the wire hoop from the ledge.	9 May, 1879	1882 vol. 1	41
748	Alfred Felton and Frederick Sheppard Grimwade, assignees of Lambton Le Breton Mount.	26 May, 1879	Improvements in stoppering aerated water-bottles, consisting in—(1) Making the neck of the bottle with an inner face in the shape of a truncated cone; (2) washer of India-rubber, cork, or other compressible material (by preference of even thickness throughout), having its face in the shape of a truncated cone and its base either enlarged outwardly or not; the neck of the bottle has an inner ledge on which to rest the washer, and also recesses to receive base of the washer when enlarged; (3) stopper of any kind, provided it be circular in horizontal section, but preferably spherical, and capable of being easily passed into the neck of the bottle when the washer is not in its place.	17 July, 1879	1882 vol. 1	77
785	William James Grant and Frederick William Elliott.	1 Oct., 1879	Improvements in stopping aerated water-bottles, entitled "Grant's Aerial Stopper, Bottle, and Filling Machine," consisting in—(1) bottle with groove or flange near the orifice; (2) stopper or ball, hollow or solid, hard or flexible, that will float on the surface of the liquid and thus recede from instead of falling into the neck when emptying the bottle; if the stopper or ball be hard an India-rubber ring is placed in the groove or against the flange to form a pad; if the stopper be elastic or flexible no ring is required; (3) machine for filling such bottles without inverting them.	8 Dec., 1879	1882 vol. 1	181
786	Alfred Felton and Frederick Sheppard Grimwade, assignees of William Boyd.	29 Oct., 1879	Improvements in and relating to aerated water-bottles, consisting in—(1) Bottle with projections at regular intervals in the shoulder to catch the stopper when once forced into it, and prevent its return to the mouth until the bottle is nearly quite or perpendicularly upside down; (2) capsule of white metal sitting the rim of the bottle with its upper edge pressing an India-rubber ring let into a recess in the mouth of the bottle, its lower edge being pressed under a projection in the outside of the rim of the bottle.	11 Dec., 1879	1882 vol. 1	185
882	Henry Barrett (by his agent, Edward Waters).	16 June, 1880	Improvements in bottles and stoppers, and in apparatus for filling or charging bottles containing aerated or gaseous liquids, consisting in—(1) hollow spherical stopper of vitreous material, having inherently a greater specific gravity than water, and which is raised to its seat when the bottle is filled by a vertical tube; (2) internal stopper, being a circular or slightly elliptical disc of glass, porcelain, ivory, pearl, &c.; (3) internal stopper, forming a combined disc stopper and seating, consisting of a ring of vulcanized India-rubber surrounding a disc of hard material; (4) floating stopper, formed of a disc of compressed cork, on each side of which is placed a disc of hard material provided in the centre with a piece of steel, combined with a seating adapted to the interior of the mouth of the bottle; (5) stopper having in its centre a piece of steel or other metal which is brought to its seat in the neck of the bottle by the employment of a rod provided with a magnet; (6) disc stopper flexible in one direction and stiff in the transverse direction; bottle and filling apparatus adapted for use in connection with these several descriptions of stoppers.	19 Oct., 1880	1882 vol. 2	283
900	Dan. Rylands	3 Nov., 1880	Improvements in stoppering bottles or other hollow articles, consisting in metal shoes or slides on ends of arms attached to stopper, and projections on bottles and on stoppers, and arrangements of indents and arms, combined with various previous inventions in bottles and stoppering.	29 Dec., 1880	1882 vol. 2	337

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
57. Brushing and Sweeping.						
461	Andrew Bogle.....	7 Dec., 1874	Improvements in machinery for brushing boots and shoes, and for polishing, grinding, and sharpening cutlery, consisting in an oblong frame supporting two horizontal shafts one above the other, the lower fitted with crank and treadle at one end and fly-wheel at the other, and also with a grindstone; the upper shaft is driven by a belt from the fly-wheel, and is fitted with two circular brushes for cleaning boots and shoes which are held on an elastic last for the purpose, and with pads for cleaning knives; a wheel for sharpening cutlery may be substituted for the end brush on the upper shaft; alongside the upper shaft upon the same level, and parallel with it, is another shorter shaft fitted with compressible collars, friction rollers, pads, &c., for knife-cleaning purposes; this second shaft can be thrown out of gear when required, the combination described forming a household "Help."	8 Mar., 1875	1878	15
474	Andrew Bogle.....	21 April, 1875	Improvements in machinery for brushing boots and shoes, and for polishing, grinding, and sharpening cutlery, being an improvement on Registration No. 461 (previous entry), consisting in—(1) Making the frame of the machine of cast-iron; (2) using only one shaft, instead of two, in the knife-polishing contrivance; (3) knife-polisher made of sole-leather, in the form of a circular brush, fixed on the shaft, and enclosed in a casing which is provided with a mouth the lower lip of which consists of the edge of a piece of India-rubber or a soft brush for cleaning the knife from dust as it is drawn out.	7 June, 1875	1878	65
795	Charles Adolphus Watkins.	10 Dec., 1879	Improvements in the manufacture of certain kinds of brushes and in the apparatus employed therein, consisting in—(1) Manufacturing brushes by first securing the bristles to a handle by tying or binding, then inserting the brush in a ferrule or socket; (2) in manufacturing oval brushes employing a feather or blade across the handle, when the bristles are secured to such handle by tying or binding thereto before inserting them into the ferrule or socket; (3) in manufacturing brushes known as "dusters" or "ground brushes," forcing the ferrule or socket on to the bristles, the handle, and the block in lieu of driving the handles into the partially formed brush; (4) vice or machine with two or more sliding plates or jaws for holding the brush during tying or binding, being either used alone for hand-tying or combined with a rotating mandril; (5) combination of a ferrule-holder with a screw press; (6) combination of a vice and of a screw-press; (7) method of manufacturing brushes having one or more knots of bristles or fibre by forcing a ferrule or ferrules on to the knots and handles, or <i>vice versa</i> , in lieu of winding wire or string round the knot, or round each knot separately.	19 Jan., 1880	1882 vol. 2.	19
58. Nails, Rivets, Bolts, Screws, Nuts, and Washers.						
580	John F. Wiles (by his agent, Frederick Lark).	30 Jan., 1877	Invention of a mode of locking nuts, applicable to nuts used in railways and in machinery generally, consisting in an ordinary nut cut horizontally nearly through its full width, which enables the nut to be compressed on the cut side, and thus locked to the thread of the bolt by means of a set screw through it on that side.	3 April, 1877	1881 vol. 1	63
644	Richard Jones, junr.	31 Oct., 1877	Invention of a lead washer-cutting machine, consisting of (1) Casting-plates for making sheet lead; (2) die, cutter, and frame, the cutter being supported by a spiral spring, operated by a weighted lever handle, and having a channel and shoot for discharging the waste metal.	12 Dec., 1877	1881 vol. 1	215
682	Francis Bianchi and Robert Maxwell Fabris.	27 June, 1878	Improvements in nails and other like articles, applicable to nails, spikes, brads, tacks, pins, &c., made of any description of malleable metal, and whether produced by cutting, punching, rolling, &c., consisting in—(1) Nails the shanks of which are formed either of rolled metal, or wire, or rods of triangular cross-section, or of wire or rods of round, or square, or flat section; (2) forming oblique notches, ribs, or depressions in one, two, or all of the sides of the shank, for increasing the hold of the nail.	5 Aug., 1878	1881 vol. 2	65

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58. Nails, Rivets, Bolts, Screws, Nuts, and Washers—*continued.*

811	Alfred Buckingham Ibbotson and Frederick John Talbot.	5 Feb., 1880	Improvements in screw-bolts and their nuts, and other articles with screw-threaded holes, and in the manufacture of implements for punching these holes, consisting of—(1) Screws or bolts, and nuts or taper holes, with their screw-threads made relatively in such manner that the male and female parts do not fit, portion of the screw-threads in a nut or tapped hole being of too small diameter to admit the bolt, or <i>vice versa</i> , in which case the smaller threads have to be forced through or over the larger threads, thus securely fastening the bolt and nut together; (2) not grooved or slotted so as to form cutting edges on its screw-threads; (3) screw or screw-bolt grooved or channelled so as to form cutting edges on its screw thread; (4) modifications of the above; (5) steel punch with a projection or projections for forming the said grooves or slots in the bolt-holes.	19 Mar., 1880	1882 vol. 2	65
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59. Hinges, Hinge-joints, and Door Springs.

[No Inventions under this Class yet registered.]

60. Locks, Latches, Bolts, and similar Fastenings.

303	John Imray	20 Jan., 1872	Improvements in locks and latches, consisting of several descriptions of locks and latches, which are enclosed in tubular casings for insertion in round holes, instead of in rectangular casings for insertion in oblong mortices, or the equivalents of either.	1 Mar., 1872	1874	25
582	James Falconer Marshall (assignee of Henry John Levey).	30 Jan., 1877	Invention of a window stop and fastener, consisting of a metal plate with ledge on left-hand side, such plate being wedge-shaped at top and having in it a longitudinal slot inclined slightly from left to right; also, a recess on the same side near the bottom; the plate hangs by a flat-shouldered screw working in the slot, and the sash can be held in any position by pushing up the plate to act as a wedge between the window and the frame, or the sash can be fastened by allowing the plate to swing aside and engage a pin in the recess above mentioned.	10 April, 1877	1881 vol. 1	65

61. Cooking, Bread-making, and the Preparation of Confectionery.

25	John Russell	Not dated; received, 3 Aug., 1859	Improvements in cooking stoves and ships' ranges, consisting in—(1) Introducing a flue at the back of the stove; (2) making the stove-pipe larger, and supporting it with a separate cast-iron oblong pipe attached to the back of the stove; (3) introducing a cast-iron perforated fire back or shield in the fire-pot.	14 Dec., 1859	1866	113
41	John Daughlish.....	Not dated; received, 15 Mar., 1861	Improvements in the method of preparing and applying carbonic acid gas for the purpose of raising or vesiculating dough, consisting of—(1) Combined apparatus for preparing dough under a pressure of carbonic acid gas, for making bread with water supersaturated with such gas, the spongy or vesicular character being imparted to the dough by the escape of gas from the water without producing fermentation or decomposition, and without the necessity of handling the dough; (2) combined gas-holder for saving the excess of gas after each operation; (3) combined apparatus for securing a supply of carbonic acid.	9 May, 1861	1866	189
82	Ebenezer Stevens	23 Sept., 1863	Improvements in machinery for preparing dough and paste, suitable for making bread, biscuits, pastry, cakes, and similar articles; also, improvements in ovens, hot plates, and cooking apparatus, consisting of—(1) Hoppers, sifters, mixing vessels, and apparatus used in connection therewith, and other machinery for preparing dough or paste without handling the materials; (2) various improved forms of ovens, hot plates, and cooking apparatus.	3 Nov., 1863	1866	397

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
111	John Daughlish.....	Not dated ; received, 25 May, 1865	Improvements in the manufacture of aerated bread, and in apparatus to be used for the purpose, consisting of a close mixing vessel, discharging the dough from the mixer into troughs or pans, while still retaining it under sufficient pressure to control the expansion of the dough, and release it from pressure at such time and in such manner as may be desired so that the vesicular structure of the dough may not be injured, instead of, as formerly, allowing it to expand suddenly upon leaving the mixture.	29 June, 1865	1868	47
500	Michael Raleigh	4 Nov., 1875	Improvements in Colonial ovens, for the purpose of better equalising the heat, consisting in introducing a horizontal flue under one of the shelves, such flue being formed in two sections, passing thence into the right-hand end of the other section, and thence into the chimney at the left-hand end of the latter.	9 Dec., 1875	1878	129
826	Charles Lewis	25 Mar., 1880	Improved steam cooking apparatus, consisting of cooking chambers varying in number and size, built one over the other, and made of wrought sheet iron or other material, each chamber having a separate door and being supplied with steam by a separate pipe connected with a main pipe from a boiler ; the doors of the chambers fold downwards on hinges, forming shelves supported by brackets, on which shelves the contents of the chambers rest for examination, &c. ; the apparatus stands in an iron dish surrounding the bottom of the chambers, and is intended to collect and convey away condensed steam from them.	11 May, 1880	1882 vol. 2	121
897	George Fletcher and John Smethurst Fletcher.	6 Oct., 1880	Improvements in " Exeter Cooking Stoves," consisting in—(1) Arrangement of internal flues so as to give a larger oven or baking space in the same size of stove ; (2) improved perforated fire-back, with sliding damper, to give a direct draught, and to regulate the heating of the oven ; (3) extra rings and covers on top of the oven-plate.	9 Dec., 1880	1882 vol. 2	329

62. Air, Gas, and other Motive Power Engines.

6	Frederick S. Peppercorne...	15 Mar., 1858	Invention of automatic engine, for producing motion by force of gravity, consisting of a cylinder containing mercury as a prime mover, and having an axis projecting from each end and spur-wheels keyed thereto, which axis rests on the periphery of friction wheels revolving loosely on fixed bearings ; these wheels serve as a movable inclined plane, on which the power is applied to a large wheel, whence it is transferred by a crank, &c., to the machinery to be driven.	31 May, 1858	1866	27
26	Frederick S. Peppercorne...	Not dated ; received, 8 Nov., 1859	Invention of atmospheric pressure engine, having the following features :—(1) Piston acting without friction against the sides of a cylinder from which the air is exhausted, and to the top of which piston or plunger are attached three or more plates of wood or metal ; (2) pneumatic or atmospheric press, constructed on same principle, for compressing wool, hay, &c., or with mercurial antifriction piston for raising water ; (3) inverted cylindrical or rectangular vessel or exhausting cylinder ; (4) application of same principle to an atmospheric steam engine ; (5) employment of water beneath the piston of atmospheric pressure engine.	14 Dec., 1859	1866	117
89	Henry William Sharp	20 Jan., 1864	Improvements in windmills, being an automatic contrivance for regulating their speed in heavy currents of wind, consisting of movable sails or drivers, made in one or more pieces, and having unequal surfaces ; which sails or drivers are carried on gudgeons or bearings affixed to the main arm, and are made to turn in a contrary direction to the pitch of the stationary sails or drivers by counteracting springs.	26 Feb., 1864	1866	423

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
259	Arthur Wellesley Parkinson and Joseph Ambrose Robinson.	3 Oct., 1870	Improved hand-power machine, consisting of a movable double-toothed rocking quadrant, swinging on a centre spindle, either above or below the main driving shaft, and worked by levers with pump-handle motion; the quadrant drives two pinions running loose on the main driving shaft, on which pinions are driving ratchets, which are right and left-handed, and which give a continuous rotatory motion to the shaft, through pawls acting on a pawl box secured to it, or by means of the ordinary right and left-hand clutches.	14 Dec., 1870	1872	127
378	Theodore Frederic Sandback Tinne.	26 Aug., 1873	Improvements in motive-power engines, consisting of—(1) Piston constructed with passages formed partly on and partly under the surface, so connected and operated that it partakes simultaneously of a reciprocating and rotating motion on its own axis, receiving, directing, and cutting off the impelling fluid, whether liquid or gaseous, without the employment of valves, and thus obtaining any required degree of expansive working; (2) hollow cylindrical casing, secured to the piston-rod, and enclosing a bush oscillating in an arm in combination with a crank pin attached to the main shaft, thus transmitting power to or from the same and ensuring the rotation of the piston; (3) expanding the portion of the piston containing the port and passages, thus compensating for wear and preventing leakage.	18 Sept., 1873	1875	103
408	Pedro Gamboni	23 Feb., 1874	Improved means of and apparatus for producing and maintaining motive-power, or assisting to produce and maintain such power, consisting in—(1) Double-ended hollow columns or bulbs, charged with water or other fluid, and connected by a tube through which the fluid flows from one bulb to the other alternately, and presses upon a flexible body in the bulb into and from which air may enter or leave as the bulbs are raised or lowered; these are attached by flexible or fixed tubing to air receivers and exhausters fitted with pistons the rods of which give motion to the main shaft; the bulbs are rocked up and down by a lever joined to the connecting rod of a steam or other power cylinder; (2) modifications of the above principle; (3) weights shifting automatically on a rocking lever, for producing power.	26 Mar., 1874	1877	29
462	Gottlieb Wilhelm Daimler.	20 Jan., 1875	Improvements in gas-motor engines, consisting in—(1) Effecting the motion of the slide and the raising of the piston by one and the same crank, arranged with a spring pawl, in combination with a ratchet wheel, lever, rocking shaft, and arms; (2) regulating the speed by a governor, acting directly upon the mechanism of the slide and piston, so as to keep such mechanism out of action when the speed of the engine shaft is above that required; (3) sundry improvements in working the governor, and in arranging the slide, so as to operate upon a single passage to and from the cylinder; and in a toothed ring and friction clutch apparatus; and in a guide for the piston rod.	11 Mar., 1875	1878	19
537	Jehosophat Davy Postle ...	14 July, 1876	Improvements in apparatus for the conversion of heat into motive power, through the medium of water and gases, such apparatus being suitable for the condensation and rarefaction of gases and vapours, consisting in—(1) The principle of re-generating steam from condensed water, or generating steam from fresh unused water by employing the latent heat of the steam last used after storing and absorbing it in a regenerator; (2) using for this purpose air or other gases at a higher pressure than the atmosphere; (3) injecting water into a cylinder for cooling the air, and charging it with water, &c.; (4) self-regulating pump; (5) displacer, piston, and tappet action; (6) regenerator, made with concentric cylinders; (7) rarefying and condensing gases and vapours by the direct intermittent expansions and contractions of portions of the gases, &c.	23 Aug., 1876	1879	107

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
62. Air, Gas, and other Motive Power Engines—continued.						
574	Joseph Wertheim	19 Feb., 1877	Improved combined atmospheric gas engine, consisting of—(1) Cylindrical explosion dome, connected by a siphon pipe with a reservoir, at the lower part of which pipe is a paddle-wheel for receiving and transmitting power; the reservoir and siphon are filled with water, oil, mercury, or other liquid, or air; (2) gas and air being introduced into the dome and lighted, the explosion drives the liquid under the paddle-wheel to the reservoir, and the atmospheric rebound drives it back again over the paddle-wheel into the dome, and by the repetition of this process the wheel is kept in continuous revolution.	20 Mar., 1877	1881 vol. 1	39
588	Robert Dines Bradley	20 April, 1877	Apparatus for generating, and engine for utilizing a motive gas, which is intensely energetic, non-condensing, and non-explosive, obtained from water commonly called "electric gas," consisting of—(1) One or more hollow vessels or cells called "intensifiers," preferably of spherical form, an interior pipe or gland provided with very minute perforations, through which water is injected upon the heated interior surfaces of the hollow vessels or cells, thereby creating the motive power gas, a furnace by which heat is applied to the vessel or vessels; a coil of pipes within such furnace for conducting the water in a heated state to the interior pipe or gland; (2) engine formed by arranging a number of permanent pistons upon a rigid frame, and by a heart-shaped block, having three or more cylindrical chambers or cylinders, and receiving a reciprocating motion upon these pistons, which reciprocating motion is converted into a rotary motion by a crank shaft, the said crank shaft also providing a means of supplying the proper quantity of water to the generator, and operating the valves for the induction and escape of gas from the cylinders.	11 June, 1877	1881 vol. 1	91
597	David Munro & Edmund Seymour Walter.	26 Sept., 1876	Improvements in windmills, consisting in—(1) Feathering the sails by means of their centrifugal tendency acting upon pins working in a spiral slot; (2) preserving the sails in their proper working position by means of a spiral spring, fixed around the spindle of the wind-wheel.	2 July, 1877	1881 vol. 1	111
623	David Munro (assignee of Wilnot Oakley).	6 Sept., 1877	Improvements in windmills, consisting in—(1) Supporting the spindle of the wind-wheel on a hinged casting, so that it may topple or swing over when the wind blows more strongly than is required to give motion to the mill; (2) combination of hinged casting, wind-wheel, spindle, and bevel wheel, with intermediate bevel wheels, and vertical spindle, for giving a rotary motion to such spindle; (3) combination and arrangement of springs, rods, and collars.	4 Oct., 1877	1881 vol. 1	167
653	Dugald Little	22 Nov., 1877	Improved means of and apparatus for producing or generating a new or improved hot expansive pressure fluid, and applying such fluid to the purposes of motive power, consisting in—(1) Construction of close pressure-proof furnaces, with openings, pipes, pumps, valves, and connections; (2) forcing hot gases and products of combustion from said pressure-proof furnaces into the boilers, to mix with the steam generated therein; (3) use of the resultant combined elastic fluid for motive power purposes in any reciprocating rotary engine or other motor.	10 Jan., 1878	1881 vol. 2	3
683	Nicolaus August Otto	29 June, 1878	Improvements in gas motor engines, consisting in—(1) Introducing a combustible mixture of gas or vapour and air into the cylinder, together with air or other gas that may or may not support combustion, in such a manner that the particles of the combustible mixture are more or less dispersed in an isolated condition in the air or other gas, so that on ignition, instead of an explosion ensuing, the flame is communicated gradually from one combustible particle to another, thereby effecting a gradual development of heat, and a corresponding gradual expansion of the gases, which enables the motive power so produced to be utilized in the most effective manner; (2) so constructing the engine that by one out stroke of the piston separate charges of combustible fluid and air are drawn into the cylinder, which charges are compressed by the in stroke, and then ignited so as to propel the piston, which by its return stroke expels the products of combustion.	5 Aug., 1878	1881 vol. 2	67

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
62. Air, Gas, and other Motive Power Engines—continued.						
805	Gottlieb Wilhelm Daimler	21 Jan., 1880	Improvements in gas motor engines, in which every alternate stroke of the piston constitutes the working stroke, consisting mainly in combining the high-pressure cylinders of two such engines with a third or low-pressure cylinder, in such manner that the gaseous products of combustion under pressure, after acting in the first-named cylinders, pass thence into the last-named cylinder, and by their expansion therein perform a further amount of work, which is transmitted to the same engine shaft to which the pistons of the high-pressure cylinders are connected; whereby an increased effect is obtained from the combustible gases employed as motive power, and a more uniform motion of the engine is attained.	2 Mar., 1880	1882 vol. 2	43
822	Edmund Seymour Walter...	23 Feb., 1880	Improvements in windmills, for automatically controlling or governing the speed of the wind-wheel, consisting essentially in a series of blades or fans revolving with the spindle of the wind-wheel, and retarding the revolution of the same by presenting resistance to the atmosphere, such blades or fans being kept to work by means of a coiled spring, the winding up of which causes the sails of the wind-wheel to feather until the speed lessens, such feathering not being at all occasioned by centrifugal action, or by the strength of the wind, but by the speed at which the wind-wheel revolves.	26 April, 1880	1882 vol. 2	101
63. Water-closets, Earth-closets, Urinals, &c.						
144	Frederick George Moule (agent of Henry Moule).	23 Aug., 1866	Invention of an apparatus called "Moule's Patent Earth-closet," for scattering dry earth upon human or other excrement in portable commodes or in buildings erected for the purpose, consisting of a hopper the discharge of earth from which is regulated by a fan, worked by the movement of the seat or by a hand lever; also a shoot for conveying the earth into a portable vessel under the seat of the closet.	6 Nov., 1866	1870	51
184	Henry James and Edward Drewett.	27 Aug., 1868	Improvements in water-closets, consisting in—(1) So arranging the handle by which the valve of the pan is opened at one side of the seat that it can be acted on in such way as to prevent the escape of any foul gases when the flap or lid which closes the pan is shut down air-tight upon its india-rubber seating; (2) trough around the pan for containing disinfecting and deodorizing material, and means of ventilating this trough by inlet and outlet air pipes, which are open when the flap or lid is down, and shut when it is open.	28 Sept., 1868	1870	163
514	Hugh Bell	20 Jan., 1876	Improvements in receptacles for fæces or excrement, including earth closets, in appliances for getting rid of the urine or liquids, consisting in—(1) Affixing a urinal or receptacle for urine in front of any receptacle for fæces, so that the urine voided may pass into the urinal, and the fæces into the receptacle or earth-pot; (2) application of perforated material or sieves of any form to the purpose of separating and conducting away the urine or other liquid from the more or less solid excrement.	16 Mar., 1876	1879	45
715	Alcide Bonnefin (by his agent, Henry Halloran).	5 Nov., 1878	Invention of a "filtering and deodorizing closet" on the dry earth principle, consisting of a perforated pail or box made of metal, wood, or earthenware, for the reception of excreta, fitting loosely into a framework or outer pail, the space between these vessels being filled with charcoal; the liquid drains from the inner or perforated pail through the charcoal into the outer pail, whence it can be drawn off through a tap; a small quantity of powdered sulphate of iron is to be added to the sifted ashes or dried earth cast into the closet, and also to be mixed with the charcoal composing the filtering substance.	27 Dec., 1878	1881 vol. 2	165
829	Victor Emile Etienne (by his agent, Henry Halloran).	15 Mar., 1880	Improvements in disinfecting and deodorizing apparatus for water-closets, urinals, &c., consisting of a receiver for holding disinfecting fluid, made concave on one side and convex on the other, the concave side embracing a portion of the pan or container, for the purpose of economizing space; inside the receiver is fitted a pump, the rod of which is connected with the rod or lever that works the plug for flushing the pan, so that the pump delivers the disinfecting fluid into the pan along with the flushing water.	11 May, 1880	1882 vol. 2	129

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64. Safes, Strong Rooms, Tills, and similar Depositories.

176	George Fletcher and Peter Percival Fletcher (assignees of George Dyke).	29 Jan., 1868	Improvements in the construction of iron safes and chambers, for rendering them more secure against fire and burglars, consisting of—(1) A composition formed principally of silicate of soda, together with lime, American chalk, sea-sand, or sawdust, alum, and water, mixed together, and placed in the hollow walls of iron safes or chambers, as a protection against the action of fire; (2) certain new mechanical arrangements for fastening the doors of safes or chambers, by which the bolts on either three or four sides are simultaneously actuated from one centre; (3) use of dovetails and sockets for obtaining additional security.	23 Mar., 1868	1870	131
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65. Wearing Apparel—Head Coverings.

52	Richard Day Ford	6 May, 1862	Invention for making hats, caps, or other head covers of great durability and lightness, and well adapted for resisting the rays of the sun and carrying off the moisture of the head, and which may be washed with great facility; consisting of an external part formed of any light washing fabric, and of an internal part formed of wool or cotton fabric or fleece, and a lining of cotton or linen; the article when made is washed, stiffened, dried, and pressed upon a zinc block; (2) an adjustable head-lining, which may be used or not as convenient.	4 June, 1862	1866	279
56	Smith Wallworth	29 Aug., 1862	Improvement in making head-linings, of any substance, and applicable to any kind of hat, cap, or other head covering, consisting in forming the lining double, or in two separate pieces joined at the top; (2) perforating the inner lining with holes, and fastening the outer circumference of the same to the inside of the hat.	8 Oct., 1862	1866	297
245	Charles Frederick Bosworth and Nathan Adolphus Baldwin.	30 June, 1869	Improvements in the mode of and apparatus to be used in sewing by machinery, specially adapted to the manufacture of straw hats and bonnets, and to manufactures in which braids or other materials are sewn together with a long stitch scarcely showing on the right side.	29 July, 1870	1872	77

66. Wearing Apparel—Body Coverings.

552	William Haspery Jeavons and William Walker.	15 Sept, 1876	Improvements in life-preserving apparatus for use in the water, consisting of a cuff or arm-covering of india-rubber, with an elastic band at each end, and a tube, &c., for inflating the same, to be worn on each forearm.	11 Nov., 1876	1879	145
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67. Wearing Apparel—Foot Coverings.

130	James Vickery (assignee of Albert Delfosse).	22 May, 1866	Improvements in machinery for and in the mode of manufacturing boots and shoes, consisting of—(1) Improved knife for cutting lifts for heels; (2) improved method of forming heels by the use of metal moulds and dies; (3) table for cutting heel leathers; (4) metal vice for finishing heels and soles; (5) shaping, curving, and pressing soles and middle soles by means of moulds and dies worked on a press; (6) various improvements in the said press; (7) improved boot and shoe rest.	31 July, 1866	1870	11
205	Richard Baylis	9 Dec., 1868	Improvements in machines having an arm-rest and hooked or barbed reciprocating needle, for sewing together the soles and uppers of boots and shoes, consisting in means for moving and adjusting the work while on the rest, so as to obtain a continuous stitch or seam without stopping; in devices for forming the stitch safely, regularly, and evenly; in the method of heating the wax; and also in the construction and combination of the several devices.	10 Mar., 1869	1870	223
322	Heinrich Kuhlmann (by his agent, William Bauer).	11 June, 1872	Invention for nailing or fastening the soles to shoes and boots mechanically by means of pegs, consisting in—(1) Machine for chip-guiding and for manufacturing the pegs; (2) motion of the awl; (3) motion of the hammer; (4) motion of the support; (5) mode of fitting up and working the machine.	24 July, 1872	1874	83

No.	Name of Applicant.	Date of Application.	Name of Invention.	Where granted.	Year of publication.	Page.
67. Wearing Apparel—Foot Coverings—<i>continued.</i>						
415	The Blake Sole-sewing Machine Company, Limited (assignees of Lyman Reed Blake).	9 Sept., 1872	Improvements in machinery for nailing or pegging the soles of boots and shoes to their vamps or uppers, consisting in—(1) Work-supporting horn rotating and yielding in a vertical direction; (2) presser foot and mechanism for cutting the nails or pins to the requisite length; (3) mechanism for supplying, sharpening, and driving the nails or pins; (4) means for automatically changing the position of the operative end of the driver; and in modifications of the same machine by means of which—(1) nails are automatically cut from a wire with similarly or oppositely inclined or beveled points; (2) nail tube and presser foot-bar or rod; (3) nail forming wire made lenticular in section, and with projecting spurs; (4) nail driver formed from round steel wire; (5) uniting the soles to the vamps or uppers, by nails pointed upon one side which assume the same inclined position, or by nails pointed alternately at opposite sides which assume alternately opposite inclinations, when driven into the leather.	11 May, 1874	1877	41
450	William Sheppard and Samuel M'Gregor.	16 Oct., 1874	Improvements in wax-thread sewing machines, consisting in—(1) The use of ordinary shoemaker's wax melted by the application of heat, and applied to the thread during its passage from the spool to the needle; (2) the peculiar application of heat to the shuttle and shuttle-holder, whereby the under thread after being waxed is kept soft and pliable, and adapted to the proper working of the machine.	26 Nov., 1874	1877	125

68. Wearing Apparel—Dress Fastenings and Jewellery.

[No Inventions under this Class yet registered.]

69. Anchors.

300	Thomas Thomson	12 Jan., 1872	Improvements in anchors, designed for the purpose of making them cant more readily, and of decreasing their liability to foul or be thrown out of the ground by the chain sweeping round them, consisting chiefly in—(1) Improvements to the crown, which may be either single or double fluked; the shank may be also single or double; (2) various improvements in the shape of the several parts, and in pinning and fixing them.	16 Feb., 1872	1874	13
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70. Metallic Pipes and Tubes.

760	Harry Oscar Choles	16 July, 1879	Improvements in stocks and dies, for screw-threading gas and other pipes, bolts, or rods, consisting in the combination with a hand-screwing stock and die of—(1) An internal ring of cutters placed beneath the die, so as to precede it in its action on the pipe; (2) guide adapted to screw on or in a leading or feed-screw fixed to the pipe to be screw-threaded; (3) tubular guide having an internal ring of cutters at its end, next the die; (4) leading or feed-screw formed partly on the other end of the said guide and partly on a collar fixed to the pipe to be screw-threaded.	12 Sept., 1879	1882 vol. 1	101
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71. Mining, Quarrying, Tunnelling, Well-sinking, and Boring; Mining Explosives and Blasting Appliances.

2	Thomas Oultram and Jacob Braché.	Not dated; received, 7 May, 1855.	Invention of a portable prospector, for searching auriferous lands and for geological purposes; consisting in hollow boring rods through which a core of the strata is brought to the surface; the machine is operated by hand or other power, and includes driving, steadying, and coupling gear.	23 May, 1855	1866	5
85	James Scott	12 Oct., 1863	Invention of a "compound hydraulic and pneumatic shaft-sinker," consisting in—(1) Employing an elevator like that of a dredging machine for excavating and bringing up soft earth or sludge, thus dispensing with labour at the bottom of the shaft till the curbing in its descent reaches imporous clay; (2) dispensing with pumping out in soft mineral sinking; (3) applying atmospheric pressure on top of the curbing for sinking it, instead of employing dead weights or levers for the purpose.	3 Dec., 1863	1866	409

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
71. Mining, Quarrying, Tunnelling, Well-sinking, and Boring; Mining Explosives and Blasting Appliances—<i>continued.</i>						
103	Thomas Martin	Not dated; received, 5 Dec., 1864.	Improvements in the method of preparing explosive compounds, to be used as substitutes for ordinary gunpowder, consisting of nitrate of potash, chlorate of potash, and nitrate of soda (the latter preferably in a crude form); the two nitrates in a state of solution, and the chlorate either dry or in a state of solution, are combined with sawdust, tan bark, peat, charcoal, &c., together with sulphur; these ingredients mixed in different proportions are suitable for blasting cliffs, and for mining, quarrying, and other such purposes.	5 Jan., 1865	1868	11
132	James Grafton Jones	26 April, 1866	Improvements in machinery employed in getting coal, stone, and other minerals (being the application of compressed air to this purpose), and in machinery for condensing or compressing atmospheric air; relating to that class of machine in which a pick or cutting tool turning on an axis is employed, moving along a rail in front of the face of the coal, &c., consisting in—(1) Mounting the axis of the pick on a cylinder carried on the bed of a truck or carriage, on which also is set a compressed air engine, and an arrangement by means of which the pick is made to cut outwards instead of inwards, and its position and proper angle readily adjusted; the machine is steadied by having a heavy roller attached; the valves of the cylinder are actuated by a weight or instrument moving freely on a rod along with the piston of the engine, and operating in case the resistance offered by the coal cannot be overcome by one stroke of the piston; (2) engine for condensing atmospheric air, the cylinder of which is contained in a trough of cold water, and the piston connected to and worked by the piston of a reciprocating steam cylinder; there is no fly-wheel, the change of motion being obtained by tappets or spindles; if necessary, a series of air reservoirs are connected with the supply pipe.	20 Aug., 1866	1870	17
183	James Lee Norton (by his attorney, T. S. Mort)	5 Aug., 1868	Improvements in sinking or forming wells, and in apparatus to be used for this and similar purposes, consisting in a conducting tube made of iron or other suitable material, and constructed either in sections or in one piece, pointed at the bottom, and having also for a short distance of its length from the bottom a series of perforations; the tube is forced perpendicularly into the soil till water is reached, being driven by means of an attached clip made of wrought iron in two parts, with a steel lining in which a screw-thread with ratchet-like teeth is cut; the driver, through which the pipe or tube passes, is hauled up by ropes and allowed to descend upon the clip, which is shifted from time to time as occasion requires; when the pipe is driven down to the water, a suction-pump is connected to its top, and means are adopted for preventing the tube from becoming choked by the sand or earth which may pass through the perforations into it, and for preventing the valves of the pump from being cut; a hollow boring-rod is also occasionally used in connection with a pump, through which the debris from the hole is drawn.	9 Sept., 1868	1870	157
188	Henry Manning	31 Aug., 1868	Invention entitled "the gold-finder," being an improved apparatus for use in prospecting wet ground, consisting of three or more tubes or casings of corresponding shape, and sufficiently large for a miner to operate within them; the tubes gradually decrease in size, and are sunk telescopically, the top flange of one resting on the bottom flange of the other; they are also fitted with interior strengthening bands, and with lugs by means of which they can be drawn out of the earth.	2 Nov., 1868	1870	173
195	Joseph Hafenegger (by his attorney, Edward Waters)	24 Nov., 1868	"Improved explosive compound and self-igniting time-match," to be used as a substitute for gun and blasting powder, consisting of—(1) A compound prepared in eight different varieties, and formed respectively of the following ingredients, viz.: chlorate of potash, sulphur, light charcoal (preferably willow charcoal), dry white sugar, ferro-prussiate potash, and gun-cotton; (2) a liquid termed "a self-igniting match or liquid," formed of one or two parts, more or less, phosphorous, and two parts bi-sulphur of carbon, the effects of which upon the explosive compounds treated with it are more or less instantaneous in proportion to the degree of saturation.	5 Jan., 1869	1870	193

No.	Name of Applicant.	Date of Application.	Name of Invention.	Where granted.	Year of publication.	Page.
71. Mining, Quarrying, Tunnelling, Well-sinking, and Boring; Mining Explosives and Blasting Appliances—continued.						
*200	John Lewis	17 Dec., 1868	"Improvements in buddles," consisting of an ordinary buddle having an inner and an outer chamber around the central vertical shaft, the former for feeding the machine with the material to be treated, the latter for supplying water; the water is discharged near the periphery of the buddle, the stuff about half-way from the centre, by pipes leading from the central reservoirs; a series of pins in the radial-arms act as scrapers, and work the pyrites over the edge of the buddle into an inclined shoot surrounding it, while the water carries the lighter particles to a discharge at the centre.	24 Feb., 1869	1870	211
257	Frederick Beer, M.D.	17 Oct., 1870	Improvements in rock-boring or rock-punching apparatus, consisting of an iron rod passing through guiding collars, such rod being furnished at one end with a punching tool, and connected at the other with a powerful spiral or other spring, or with an air-chamber or piston; the rod is raised by means of cams acting on a nut or tappet, which is fixed on a shaft running in a direction transverse to it and provided with a fly-wheel, the whole being mounted on a universal joint.	7 Dec., 1870	1872	121
315	Alfred Nobel	15 April, 1872	Improvements in the manufacture and use of an explosive compound called "dynamite," consisting of—(1) Nitro-glycerine mixed with solid substances, porous, or powdered, inert, explosive, or semi-explosive, viz.: nitro-glycerine mixed with such inert substances as silica, charcoal, carbonate of magnesia, sawdust, &c.; or nitro-glycerine mixed with such explosive or semi-explosive substances as powdered gunpowder, nitrates of potash or of soda, and chlorates combined with carbon or carbon compounds, or with resin, or coal, &c., to serve as a vehicle for converting the same into dry or pasty matter; (2) percussion cap lodged in the dynamite, and attached to the end of a common fuse.	30 May, 1872	1874	61
331	Charles Brook Longbottom	6 Aug., 1872	"Improved safety blasting powder," consisting in a compound of nitrate of potash, nitrate of soda, sulphur, charcoal, and bi-tartrate of potash, to which is added crushed Portland cement, or common coal, for the purpose of making the powder impervious to water, if necessary; the mixture, after being thus reduced to a pasty mass and dried, is ready for use.	30 Sept., 1872	1874	109
341	John Bell Muschamp.....	26 Nov., 1872	"Improved explosive substance and a new mode of manufacture therefor," consisting of wood (preferably hard wood), disintegrated and having all the sap and mineral salts either extracted therefrom or neutralized by boiling; the substance is reduced to the proper degree of shortness, dried, and steeped in an acid bath; it is then steeped in an alkaline solution, and again washed and dried with hot water or steam; after this treatment it is fit for use in shells or torpedoes or for blasting purposes; when necessary the compound may be made up into charges coated with water-proofing material.	19 Dec., 1872	1874	141
365	Frederick Edward Blacket Beaumont and Charles James Appleby.	7 May, 1873	Improvements in rock or stone drilling, tunnelling, and boring apparatus, consisting of—(1) Rock drill, with cutter formed of diamonds or gems set around a tubular holder, to which rotation is given, and which cuts an annular groove, leaving a cylindrical core, which may be broken off and taken out of the bore from time to time; (2) the cutter is formed of a cylinder of steel, thickened at the part where the gems are set, and having a small portion cut away afterwards, to expose the parts of the gems that are to operate; (3) tunnelling machine formed of a number of such drills mounted on a frame or carriage, running on rails laid in the tunnel, and moved by an engine driven by compressed air or other fluid; (4) combination and arrangement of parts for the purpose of applying the drills to sinking deep bore holes, to serve as wells, or to give indications of strata.	9 July, 1873	1875	61

* Should have been classed under "Metals and Alloys," p. 50.

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
366	Thoma Brown	5 June, 1873	Improvements in machinery for drilling or perforating rocks and other hard substances, consisting of a cylinder and piston driven by compressed air or steam, the principal features of which are, under one construction—(1) Passing the piston-bar or an attachment through the ratchet ring or rotating device; (2) the hollow valve with its chest; (3) the clamp, consisting of the box and two pieces; (4) the clasp-nut for holding the drill in place. Under another construction—(1) actuating the slide-valve by means of the pivoted or momentum piece in combination with the annular or elliptical tappet; (2) the feed-lever and qualifier acting in connection with the tappet; (3) the combination of the spiral and straight slots formed in the piston-rod; (4) the universal clamp, by means of which the machine is set and secured at any desired angle.	9 July, 1873	1875	67
371	John Melton Black (assignee of Jean Rodolphe Leschot).	15 April, 1873	Improvements in tools for boring rocks, for blasting, prospecting, and other purposes, and in apparatus for working the same, consisting of—(1) Boring tools constructed with a crown or ring, armed with diamond or equivalent cutters at the working end; (2) apparatus for imparting simultaneous rotary and advancing motion to the boring tools.	21 July, 1873	1875	85
416	The Honorable Thomas Holt, Andrew Garran, LL.D., and Edward Charles Cracknell.	26 Mar., 1874	Invention entitled "The Blasting Cartridge," consisting in the construction of cartridges by enclosing gunpowder, gun-cotton, nitro-glycerine, dynamite &c., either separately or mixed, either compressed or uncompressed, within iron, steel, copper, brass, or any other metallic casing, or a casing of glass or earthenware, which casing may be painted or oiled, coated or covered with tar, pitch, varnish, resin, enamel, or any other material, used either separately or mixed, heated or cold.	12 May, 1874	1877	49
428	Robert Brydon and James Shepherd Davidson.	11 May, 1874	Improvements in machinery or apparatus for drilling, boring, or cutting rock or other hard substances, applicable to a tool or drill carried by a rod actuated by steam or other fluid, consisting in—(1) Forming the valve in the head of a tappet-lever, worked by the piston in the actuating cylinder; (2) combination of a tube (through which the piston-rod works) having a spiral slot and ratchet with a detent; (3) combination of two gripping plates, situated respectively above and below or on opposite sides of a cylindrical rod or bar with a single set or tightening screw.	30 June, 1874	1877	75
511	William Firth.....	3 Feb 1876	Improvements in machinery for working and loading coal, for sinking shafts or pits, and for driving or cutting tunnels, consisting of—(1) Pick and cutting tools; (2) machinery for drilling and pressing down coal; (3) combined machinery for sinking shafts or pits, comprising a table or frame with mining machine arranged to cut a groove whilst traversing around the same; (4) combined machine for sinking shafts or pits, and for driving or cutting tunnels, comprising a central pivot with a mining machine arranged to turn around such pivot; (5) machinery for avoiding breakage in loading coal into waggons.	7 Mar., 1876	1879	31
554	George Wilkins	25 Sept., 1876	Invention for boring post-holes, consisting of a steel, cast-iron, or wrought-iron augur, of varying pitch and diameter, mounted on the end of a vertical shaft, to which rotation is given by a bevel-wheel and pinions, and which can be moved vertically by pitch-chains attached to a cross-head.	23 Nov., 1876	1879	155
556	Alfred Nobel	13 Oct., 1876	Improvements in explosive compounds, consisting in—(1) solidifying or thickening liquid explosive substances, such as nitro-glycerine, nitrate of methyle, and other analogous substances, by gelatinization; (2) employment of non-exploding or sluggishly exploding substances (soluble in nitro-glycerine), for the purpose of modifying the sensitiveness to concussion or tendency to rapid explosion, and lowering the freezing point of certain explosive gums; (3) incorporating with certain explosive gums or gelatinized compounds various other explosive mixtures, in order to lessen the cost or reduce the explosive force of the compound.	14 Dec., 1876	1879	159

No.	Name of Applicant.	Date of Application.	Name of Invention.	When granted.	Year of publication.	Page.
71. Mining, Quarrying, Tunnelling, Well-sinking, and Boring; Mining Explosives and Blasting Appliances—continued.						
583	Egbert Judson	12 Mar., 1877	Improvements in the manufacture of explosive compounds, consisting of—(1) A powder or explosive compound formed of particles or grains of a gas-producing substance or substances, which particles or grains are first made non-absorbent by being coated, cemented, or varnished, and then rendered explosive by the incorporation or admixture with them of nitro-glycerine; (2) process for coating, cementing, or varnishing with a non-absorbent substance the particles composing the dry mixture and subsequently adding thereto the nitro-glycerine; (3) explosive compound formed of dust-like or pulverulent particles of combustible substances, aggregated into grains by stirring and cementing, and rendered explosive by admixture with nitro-glycerine.	18 April, 1877	1881 vol. 1	67
637	Frederick Mann	30 Oct., 1877	Improvements in the process of manufacturing nitro-glycerine, consisting in crystallizing the nitro-glycerine by freezing it before it is separated from the acids in which it is made, and in subsequently separating such crystallized nitro-glycerine from the waste acids (by preference, in a centrifugal washer).	29 Nov., 1877	1881 vol. 1	199
647	William Wright and Henry Dale Edwards.	12 Nov., 1877	Improvements in machinery for boring the ground, and invention for converting the stem of the boring implement into a pump-barrel, consisting of—(1) Rotatory tubular borer, for cutting an annular hole, formed of iron tubes screwed together, the lowest tube having steel cutters at the extremity; rotary motion is imparted to the borer by a gripping contrivance and worm wheel; (2) cylindrical cap for taking up the core; it is slit at the sides and made to fit over the core which is removed by letting the cap fall into the annular hole, whereby the cap is tightened on the core by means of a ring and tappet, and then cap and core are hauled up together with the aid of an attached rope; (3) tubular barrel, which is dropped into the tubular stem; it contains a fixed clack-valve below and a movable bucket above, thus forming a pump.	12 Dec., 1877	1881 vol. 1	223
657	Frederick Mann	4 Feb., 1878	Improved process for manufacturing nitro-glycerine, consisting in—(1) Mixing the glycerine used in the composition with sulphuric acid; (2) mixing the sulpho-glyceric acid thus formed with a nitro-sulphuric acid; (3) removing by decantation or freezing the nitro-glycerine produced by such mixture.	4 Mar., 1878	1881 vol. 2	15
674	Alexander Stuart (assignee of the American Diamond Rock-boring Company.)	16 Jan., 1878	Improvements in machines and apparatus for boring holes in rocks and stones, for the purpose of ascertaining by the removal of a solid core the quality and peculiarity of the material bored through, or for making bores for blasting or other purposes, consisting in the use of hard substances, natural or artificial, as cutters; and which machines or apparatus embrace a platform on wheels, carrying motive engines, drilling mechanism, a steam pump, and a rock-borer; (1) the rock-borer is formed by the combination of a revolving hollow spindle with a screw-feed carried in a hinged frame and having mitre driving wheels working in connection therewith; the hollow spindle is revolved and fed forward, and provided with a chuck for holding a hollow drill rod; combined with the motive engines also is a hoisting device operated by a pinion on the engine-shaft; (2) annular core-lifter and tube or ring constructed with a tapering recess in its inner surface; (3) revolving rock-drill guide and core-barrel forming part of drill-rod, and constructed with external grooves, the outer surface of such drill-rod being armed with some hard substance natural or artificial; (4) combination of an inside barrel with a hollow drill-rod or outer-barrel, the latter being free to revolve around the former, which is also constructed with springs: water passes down through the hollow drill-rod to the bit or boring-head of the inside barrel connected with the said rod, by which means the core is protected from contact with the water; (5) frame with two clamping jaws, one of which is stationary and provided with serrated teeth, the other smooth and sliding downwards in inclined guide-ways, both being arranged to operate in connection with the drill-rod; (6) hollow coupling provided with screwthreads at each end, and carrying a loose ring of greater diameter than that of the drill-rods united by the coupling, such coupling being provided with a loose ring having longitudinal grooves and guiding the drill-rod by coming in contact with the sides of the bored hole.	3 June, 1878	1881 vol. 2	47

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
71. Mining, Quarrying, Tunnelling, Well-sinking, and Boring; Mining Explosives and Blasting Appliances—continued.						
675	Thomas Brown Jordan	8 Feb., 1878	Improved machine for drilling or boring rocks and other hard substances, consisting in—(1) Pneumatic cylinder fitted with a piston having a hollow piston-rod which is drawn towards the top of the cylinder by a revolving cam or cams fixed on a shaft which may be rotated by hand-power applied to a winch or by gearing with any first mover; (2) drill-bar, lifting cam or cams feed-mechanism, and stopping or retarding device.	25 June, 1878	1881 vol. 2	53
685	Frederick York Wolseley (assignee of Walter Gibbons Cox.)	29 June, 1878	Improvements in machinery for making holes in the ground, having reference to the cutting parts of such machines: (1) Machine for boring in soft or sandy ground, consisting of two scoops placed opposite to each other, face to face, in such way as to leave a space between their edges on either side; they are suspended from or supported by a vertical rod, the rotations of which cause the tool to bore into and scoop out the earth; in order to prevent suction the cutters project beyond the ends of the scoops, and thus make a hole of larger diameter than that of the scoops; they are also bent into a screw shape, so as to direct the excavated earth into the cylindrical space between them; in order to prevent the excavated earth when very loose from escaping through the spaces between the edges of the scoops, metal plates are bolted to these edges; and to prevent the escape of the earth at the bottom, there is a double flap-valve centered on a spindle and opening upwards; the scoops are raised and lowered by a derrick, by means of which also they can be swung round and discharged at any point: (2) modification of the same machine, for boring in hard ground, consisting of four equidistant steel cutters set in a circle at the bottom of the machine, and making an annular cut; also, a central rotatory cutting tool, for drilling a circular hole in the centre of the core, for the purpose of placing therein a charge of explosive to break up the core; the debris of the core is taken out of the hole and discharged into a vehicle or receptacle by the scoop-machine.	7 Aug., 1878	1881 vol. 2	75
700	Charles Wagemann	7 Sept., 1878	Improvements in explosive compounds, consisting in (1) Combining camphor, camphine, camphorated substances, turpentine, or terebenthine substances with nitro-glycerine and its compounds; (2) process of preparing nitrated cellulose for mixing with camphorated nitro-glycerine; (3) combining prepared nitrated cellulose or ordinary nitrated cellulose with camphorated nitro-glycerine, for producing a plastic non-elastic material capable of being exploded only by means of a powerful detonator; (4) improved process of producing a finely-grained powder formed of a hydro-nitrate of cellulose.	3 Oct., 1878	1881 vol. 2	129
747	Frederick Mann	11 June, 1879	Improvements in the process of manufacturing nitro-glycerine, an improved apparatus employed therein, and an improvement in the manufacture of nitro-glycerine compounds, consisting in—(1) Mixing together in a state of spray or mist the acids and glycerine from which nitro-glycerine is manufactured; (2) apparatus for accomplishing this mixing; (3) subjecting impure nitro-glycerine to the action of a solution of carbonate of ammonia, and to a certain heat for the purpose of removing the impurities known as "fumes"; (4) manufacturing nitro-glycerine compounds by mixing nitro-glycerine with powdered carbonized light wood as a substitute for infusorial earth.	17 July, 1879	1882 vol. 1	73
853	Raymond Cahuc (by his agent Edward Waters)	3 June, 1880	New or improved blasting powder, consisting of nitrate of potash, or other equivalent salt, sulphur, lamp-black, or soot, preferably soot from wood, dry spent tan, or sawdust, or the two combined in any proportion; these ingredients are finely ground and then mixed together in a boiler, and moistened with water in which sulphate of iron has been dissolved, till the mixture assumes the consistency of stiff paste; the mixture is then subjected to a degree of heat under which the whole mass, being constantly stirred with a wooden instrument, first liquefies and then solidifies, after which process the compound is subjected to a lower heat; it is then ready for use, and may be stored and carried about safely.	9 July, 1880	1882 vol. 2	197

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
71. Mining, Quarrying, Tunnelling, Well-sinking, and Boring; Mining Explosives and Blasting Appliances—<i>continued.</i>						
874	James Taylor	8 July, 1880	Improvements in lining for wells, consisting in making such linings of hollow earthen or pottery ware perforated from both sides into the hollow part, and filling such hollow part with a material, such as crushed charcoal or coarse sand, which will allow of the passage of the water, and yet keep back the drift or drift sand—such linings being made of a series of cylinders, and each cylinder being made by preference in segments.	7 Sept., 1880	1882 vol. 2	249
72. Milking, Churning, and Cheese-making.						
686	Carl Ludwig Sahl	9 July, 1878	Invention of machinery and of a process for converting tallow into a substance called "butterine" or "margarine," consisting of—(1) Steam process in which a machine is used for cutting up into pieces the clean fat of oxen, which is then passed into a crushing machine, where it is torn by rollers and carried into a vat having therein a steam coil, such vat being partially filled with water to which is added a small quantity of salt; the fat is then stirred at a temperature of from 110° to 120° until it becomes a bright yellow liquid and quite clear, when it is run off into a settling vat, and allowed to stand for about two hours; it is then drawn off into vessels, from which the casks are to be filled; the dregs may be passed into another vat and boiled, and parts of the produce of such boiling used to start the melting process described below, and part thrown into the tallow vats as ordinary tallow; (2) Dutch roasting, or fire process, in which the coarse or bloody parts are cut up, and melted first in clean fat—the whole being kept constantly stirred—in an iron pan set in brick-work and surrounded by fire; it is then passed through a sieve into a settler, thence into coolers, and then stirred like ordinary beef tallow.	12 Aug., 1878	1881 vol. 2	79
73. Masts, Sails, Rigging, &c.; including Apparatus for Raising and Lowering Ships' Boats.						
146	John Korff	3 Nov., 1866	Invention of a clutch liberator for lowering and disconnecting boats of all sizes from their tackles while in a sea-way, consisting of—(1) Self-acting liberating clutches, to supersede the ordinary hook and swivel attached to boats' tackles, and operating by taking hold of a circular or conical bolt-head in each end of the boat, and suspending the boat thereby; the clutches, which are made pear-shaped, so as not to hook any portion of the boat or boat's crew, are secured with a mousing pin, preventing them from opening whilst hanging in the tackles or whilst being lowered; when the boat reaches the water, the clutches are relieved by a thumb-spring lever or a lanyard, and immediately close and remouse themselves; a side lever is provided for opening the clutches if required; (2) clip-hooks (instead of clutches) for taking hold of eye-bolts in each end of the boat, hooked or unhooked, in the same manner as the clutches described above.	10 Dec., 1866	1870	59
298	William Reid Douglas	4 Jan., 1872	Improved apparatus for disengaging ships' boats, consisting of a ball and socket arrangement for swinging boats from their davits; a ball is attached to each davit, and a corresponding socket to the boat; one side of each socket is formed of the short end of a bent lever, and the long ends of the same levers are connected with each other by chains, ropes, or rods; when the ball attachments are lowered into place the boat may be engaged by tightening the lever rope, and it is disengaged by loosening the same rope.	9 Feb., 1872	1874	7
74. Casks and Barrels.						
[No Inventions under this Class yet registered.]						
75. Steering and Manœuvring Vessels.						
233	James Porter and Herbert Perkins.	30 Dec., 1869	Improved steering apparatus, entitled "Porter & Co's Patent Tiller," consisting of one or more tillers swung on pivots on fixed stanchions or bearings, and working in slots in a wrought iron yoke or crank around the rudder head, by means of which accumulative power is acquired for governing and directing the action of the rudder; also, various modifications of the same.	10 Feb., 1870	1872	43

No.	Name of Applicant.	Date of Application.	Name of Invention.	When granted.	Year of publication.	Page.
3	Luc Macé.....	Not dated ; received 18 April, 1855.	Invention of a species of sun dial, entitled the "perpetual solar watch," which, with the aid of the sun, indicates the following particulars,—At mid-day, the latitude ; from 6 a.m. till 6 p.m. the longitude, the time of day, and also the true meridian, whereby both time-piece and compass may be regulated.	30 July, 1855	1866	9
35	Charles James Clowes Perry	10 Sept., 1860	Invention of a nautical instrument, entitled, "Perry's anti-collision dial and shipwreck preventer," designed for the purpose of marking approximately, either by day or night, the course of an approaching ship, and the angle of her course with reference to that of the observing vessel, in order to avoid collision ; and for marking approximately, whilst sailing or steaming along, either by day or night, the distance of the observing ship from a visible terrestrial object, in order to prevent shipwreck through making a false estimate of such distance, when the bearing of the object is taken by compass, consisting of—(1) A flat circular instrument made of brass, &c., upon three-fourths of the face of which are represented by lines of perforations, the points of the compass, half-points, quarter-points, and eighths ; (2) small pins for inserting in the perforations, parallel rulers with double slides, and two small flat models of ships, for marking and working out the positions observed.	3 Oct., 1860	1866	159
79	Cyrus Mason and William Robert Martin.	10 Aug., 1863	"Improvements in the method of producing spectral illusions," consisting in employing for the purpose a sheet of perfectly clear glass, fixed at such an angle as to produce a reflected image or illusion of an object which is kept out of sight of the observer, and upon which the concentrated rays of a lime or other powerful light have been thrown ; the operation may be varied by the introduction of a mirror placed behind the object and casting its reflection upon the sheet of glass ; by turning the mirror on its axis, the reflection may be made to glide away gradually or to vanish at once ; or by placing a transparency between the light and the glass, an illusion may also be produced.	5 Sept., 1863	1866	383
84	Angelo Tornaghi.....	7 Oct., 1863	Improved circumferentor, consisting of—(1) Large circle, graduated in the usual manner, and having a long needle in a trough affixed to serve as a guide in setting the instrument due north and south ; (2) movable sight-vanes, or telescope, together with an attached vernier, and clamping and tangent screws ; (2) circular level, with ball and socket joint, for levelling the instrument quickly.	26 Nov., 1863	1866	407
126	George Case (assignee of the author or designer.)	5 Mar., 1866	Invention of an apparatus for producing illusional effects, consisting in a box, chamber, or apartment, having an aperture at the top to admit light, and having affixed to the back wall or side two mirrors of glass reaching from the floor to the ceiling, placed in a vertical position at any angle, and hung one or other of them on movable hinges ; also, a lamp for illuminating the box ; the illusion is seen within the box, and the operator can secrete himself behind the hinged mirror, leaving the box apparently empty.	18 June, 1866	1870	7
667	John Bobardt and Thomas Victor Houghton.	8 Feb., 1878	Invention of an instrument called "Houghton's Sino-meter," for showing by inspection, without calculation, the sine and cosine (or latitude and departure) of any traverse of which the length and bearing are given, consisting of a square frame, a T-piece in guides giving parallel motion, and a travelling limb pivoted at one corner of the square, the several parts being graduated and provided with tangent screws.	6 May, 1878	1881 vol. 2	35

76. Optical, Mathematical, and other Philosophical Instruments ; including Nautical, Astronomical, and Meteorological Instruments.

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
76. Optical, Mathematical, and other Philosophical Instruments; including Nautical, Astronomical, and Meteorological Instruments—continued.						
668	Thomas Berry	22 Feb., 1878	Invention of an instrument called "The Co-ordinator," for ascertaining by inspection the difference of latitude and departure of any two given points, and the bearing and length of a right line connecting them, or <i>vice versa</i> , and of solving without arithmetical calculation or the use of tables many other problems in right-angled trigonometry, consisting of a graduated quadrant, with a movable radial arm, bearing a vernier on the extremity, and graduated to two different scales on either side of a slot; in this slot runs a slide carrying a double vernier with a projecting stud; one of the fixed arms of the quadrant, termed the "cosine bar," is similarly graduated; and sliding on this bar at right-angles, and graduated in like manner, is a T-arm, termed the "sine bar;" this bar has a vernier at its base for reading off cosines; it has also another vernier, sliding in a longitudinal slot, and having a projecting piece to act as a stop when it comes in contact with the stud on the sliding vernier of the radial arm; the instrument has likewise clamping screws, slow-motion screws, and adjusting screws for setting the T-arm at right-angles to the cosine bar.	6 May, 1878	1881 vol. 2	39
695	Wilhelm Handke (by his agent, Seigfried Franck.)	19 Aug., 1878	Invention of a registering machine called the "Totalisator," for registering in visible characters any number consisting of not more than (say) three figures; also a series not exceeding (say) fifteen of such numbers; also the total of the units in the whole series: consisting in a combination of toothed wheels, number discs, springs, ratchets, &c., by means of which when any number is increased a unit by turning a handle, the total is correspondingly increased by the mechanical connection of the parts.	17 Sept., 1878	1881 vol. 2	105
761	John Henry Pepper	7 Aug., 1879	Improvements in apparatus for producing illusional effects, by means of which it may be made to appear that persons or objects gradually come into being out of thin air, or that one person or object gradually dissolves into nothing and is substituted by another person or object evolved out of nothing, consisting in the use of a graduated mirror, that is, a mirror in which the quicksilver behind is gradually reduced from a solid covering to thick and then thin lines (perfectly horizontal), and finally to none at all; the mirror slides in a groove directed towards the observer; the apparatus is set diagonally, the near corner being cut away to expose the interior; the wings and the fore part of the mirror-slide are formed of drapery hangings.	12 Sept., 1879	1882 vol. 1	105
852	Orlo W. Richardson (by his agent or attorney, J. B. Carter.)	15 May, 1880	Improvements in apparatus for producing illusional effects, being a device termed the "Carpet Exhibitor," consisting in the combination of several reflecting surfaces so connected together as to allow of the size of the space between them being increased or diminished at pleasure, in order to multiply in reflections samples of carpets or other merchandise.	30 June, 1880	1882 vol. 2	195

77. Harbours, Docks, Canals, &c.

*254	James Scott	19 Sept., 1870	Invention of a new system of ship lifting, consisting in—(1) The atmospheric ejection of the water by the pressure of air equally distributed throughout any number of connected caissons, docks, vessels, or compartments under water at the same time, by means of which they are simultaneously raised, and lift any ship, &c., that may be resting on them; (2) a system of parallel motion for the better steadiment of caissons, docks, or floating bodies, ascending or descending in the water, consisting of one or more pairs of parallel girders, one above the other, hinged to the wharf and to the caisson dock, for the purpose of keeping the latter in a perpendicular position; (3) a tubular girder pontoon, which may be made without a bottom, and raised by the pressure of air forcing the water out of it.	4 Nov., 1870	1872	111
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* Should have been classed under "Ship-building, &c.," p. 70.

No.	Name of Applicant.	Date of Application.	Name of Invention.	When granted.	Year of publication.	Page.
77. Harbours, Docks, Canals, &c.—continued.						
505	Ernest Bazin	31 Dec., 1875	Improvements in dredging boats or apparatus, consisting in—(1) Establishing at the bottom of the hold of the dredge a water entry, through a tube or tubes long enough to reach the bottom of the stream, thus creating an hydraulic upward pressure through the tube equal to the difference of level between the line of flotation and the water entry; (2) rotatory pumps or other efficient means or engines operating below water-level in the tube, for assisting the upward current through the tube, and transmitting the mud and sand to the place of discharge; (3) arming the ends of the tubes with flexible pipes or nozzles, having openings, slots, or apertures of various forms, by means of which the water may be cleansed in passing into the tubes; (4) a pair of arms or booms hinged on each side of the dredge, and connected at the lower extremities by a revolving disintegrator armed with teeth, which is kept in revolution by means of chain bands, and prepares the ground for the action of the suckers; (5) the sucking tubes and the disintegrator are raised and lowered by means of derricks.	3 Feb. 1876	1879	23
576	John Mervin Courtenay ...	10 Feb., 1877	Invention of an automatic signal buoy, in which the power of the surface waves, in connection with the weight of the buoy, is jointly utilised for the compression of air, for giving automatic signals, and for other purposes, in foggy and stormy weather, consisting of—(1) A buoy; (2) a central downward tube, extending through the buoy to a depth not affected by surface waves, and having at or near the mean water level a head or diaphragm with an air-entrance pipe or pipes and bottom valves, and at the top an air-exit pipe with whistle or other sounding device, to be operated by the raising and lowering of the buoy by the action of the waves and the compression of the air in the central tube; (3) tube and valve, connecting air space below diaphragm of tube with interior of buoy, to establish in the latter a gradual pressure sufficient to prevent leakage; (4) side ladder and top railing; (5) slack anchoring cable or chain, connected to buoy near its base; (6) intermediate submerged float, for balancing lower section of chain in deep water; (7) rudder plate, extending from base of buoy along tube, for steadying buoy against rotating motion.	20 Mar., 1877	1881 vol. 1	47
78. Grinding Grain and Dressing Flour and Meal.						
158	Matthew Adam Munn	19 June, 1867	Improvements in machinery for the manufacture of maize or Indian corn into maizena or corn-flour, and of these substances, or of barley, wheat, sago, or rice, into maizena and into starch, the fibrous refuse being good food for cattle, consisting in the various milling processes and appliances described, including the following specialties,—the steeping vats, or tuns, or vessels, the circular dies of the mill-stones, the manner of passing the stream of water through the same, the sieves, the depositing run or plane, the manner of constructing the weirs, and the application of the alkaline process to the substances manufactured.	20 Aug., 1867	1870	91
177	Samuel Golay	20 Mar., 1868	Improvements in cutting or dressing mill-stones, consisting in—(1) The application to this purpose of hard stones, and especially of the diamond, acting so as to split off or chip the stone (exactly as the hammer does) by attacking it with blows succeeding each other with great rapidity; the said blows may be produced by either a rotatory or a rectilinear motion, preferably the former, as in giving to the rotation a certain rapidity, a true chipping motion or succession of shocks is produced, which attacks the stone, and by causing it to chip or fly off in minute fragments produces the desired effect; (2) apparatus for working and moving the tool, comprising a frame having a central socket on the end of the mill-stone axle, from which radiate three arms with levelling screws for adjusting the height, and with set screws for centering the machine to the socket; also radial and transverse slides and their attachments; the cutting tool is a disc, formed of two discs screwed together, the diamonds being placed in recesses between them and allowed to project a little around the circumference; the cutter is made to revolve rapidly by means of a travelling band; (3) the diamond, instead of acting by rotation, might be made to operate by means of a rectilinear or vibrating motion.	24 June, 1868	1870	135

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
192	Samuel Pretyman Mumford and John Wallis.	2 Nov., 1868	Improved mode of and apparatus for dressing mill-stones, consisting in substituting for the ordinary straight line pattern, a series of curved lines arranged as a convolute, starting from the eye or near the centre and terminating near the periphery of the mill-stone; the cutting tool is a diamond or other hard stone or stones; the machine for holding and guiding the cutting tool is arranged to travel over the surface of the mill-stone in a convolute form; the diamond is set in a nick or recess made in a soft metal consisting of a mixture of tin, zinc, and antimony, with which a hole drilled in the end of a bar holder is filled; the two parts of the holder are screwed together so as to nip the diamond between the two pieces of soft metal.	16 Dec., 1868	1870	183
267	Thomas Carr	14 Feb., 1871	Improved process and machinery for manufacture of flour and semolina, consisting in—(1) Reducing wheat to flour by subjecting the grain to the percussion of any suitable continuous-acting beaters, travelling at a sufficient speed, and striking the said wheat while the same is unsupported or falling freely or is being projected through the air, which process is applicable also to producing flour from maize, beans, pease, and other seeds; (2) applying "Carr's Patent Disintegrator" [Patent No. 778 of United Kingdom, 9 March, 1859; Registration of improvements therein No. 224 of New South Wales, 3 November, 1869] to the purpose of so reducing wheat and other seeds into fine or coarse flour, such machine having, however, the number of cages considerably increased beyond the four alone hitherto used, and two or more of the first inner cages all rotating in the same direction, and being provided with distributing cylinders and counterbalancing fly-wheels; (3) combining an exhausting draught with the casing or chamber in which the machine works, to draw away cerealine or other deleterious matter from the flour.	14 Mar., 1871	1873	13
659	Samuel Turner	10 Jan., 1878	Improved self-raising flour, and machinery for the manufacture of the same, consisting in—(1) Combination of the following ingredients,—salt, together with bi-carbonate of soda, tartaric acid, cream of tartar, and finely-ground rice, in certain proportions, mixed with each other and with the flour, and treated in sieves and otherwise; (2) machinery for making self-raising flour according to this recipe, consisting of a circular sieving or mixing machine, comprising—(a) zinc or metal cylinder, perforated as a fine sieve, and fixed in a box with an iron shaft running through the centre; (b) brushes affixed to the shaft to brush the inside of the cylinder; (c) the shaft revolves by steam power or is turned by hand; (d) an aperture is made at one end and towards the top of the box, through which the flour for mixing passes out.	4 Mar., 1878	1881 vol. 2	19
778	Edmund Schmeja	12 Sept., 1879	Improvements in apparatus for grinding grain, pulse, bones, cement, and other substances, relating to machines in which the substance to be ground is passed between two metal discs, with roughened or grooved surfaces, revolving in close contiguity to each other, and consisting in constructing the grinding surfaces of such discs with projections or teeth of various forms, adapted for reducing the grain, &c., to the desired pulverulent or granular condition, and also capable of being adjusted either to make good any wearing off of the grinding surfaces, or to re-sharpen the working edges by grinding the acting surfaces of the one disc against those of the other, with the intervention of emery or similar substances; furthermore, the grinding surfaces may be made reversible with duplicate sets of teeth or projections on each side, in order that when one set is worn or blunted the plate may be reversed to bring the other set into action.	13 Nov., 1879	1882 vol. 1	159

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78. Grinding Grain and Dressing Flour and Meal—*continued.*

827	Robert Charles Ransome...	25 Mar., 1830	Improvements in machines for dressing grain, designed for the treatment of large quantities of stuff and intended more especially for use as an adjunct to stripping machines, consisting of an under-carriage, supported on four wheels, bearing a machine comprising cup elevators, jog shoes, screens, caving riddles, sieves, and revolving fans—also, an adjusting chobber and barley awner, with knives and beaters and centrifugal elevator—all working in combination with each other, for separating cavings and chobs and dust and seeds from chaff and grain, and collecting the screenings and the screened corn in different receptacles; also, for dressing barley.	11 May, 1880	1882 vol. 2	123
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79. Purifying and Filtering Water.

424	Josiah Vincent Lavers	11 May, 1874	Invention of a filter, entitled "Lavers' Capillary Charcoal Filter," for purifying water, consisting of—(1) A vessel provided with a discharge tap, for holding water when purified; (2) a vessel occupying the upper half of the latter, for holding the water which is to be filtered; (3) the filter, being a smaller vessel, with perforated bottom, set in the centre of and passing down for some distance through the bottom of the vessel last described; (4) this third vessel is partly filled with animal or vegetable charcoal, and the water to be filtered is conveyed into it by means of skeins of woollen yarn, which are knotted together at one end and free at the other, the knotted end being placed in the vessel and the free ends hanging over the sides; (5) the filtering operation consists in the water passing up from the first vessel into the second, through the tubes of the woollen yarn, by capillary attraction, which partly purifies it; and then passing down into the third vessel, through the charcoal, which completes its purification.	8 June, 1874	1877	67
526	Richard Gervase Elwes.....	31 Mar., 1876	Improvements in filters, in which animal or other charcoal, or other filtering material, in powder or granules, is employed, and in which the filtering apparatus is constructed and arranged in such a manner as to combine the process of upward filtration with the means of admitting continuously, or from time to time, fresh charcoal or filtering material at or near the point of egress of the filtered liquid, and removing spent or exhausted charcoal or filtering material at or near the point of ingress—and which apparatus is specially applicable to the decolourization of sugar—consisting of a perpendicular vessel, formed of superimposed cylinders narrowing towards the bottom and having a hopper on top for introducing fresh charcoal, and valves below for removing the vitiated charcoal; also having receiving, discharging, charcoal-washing, and air pipes, and a flexible pipe at the lowest point communicating with other pipes leading respectively to a syrup or juice tank, a sweet water tank, and an outlet for waste water.	11 May, 1876	1879	79
*643	John Bowing	15 Nov., 1877	Improvements in filter presses, specially adapted for the treatment of large masses or volumes of matter having low comparative value, such as waters, sewage, cement, slurry, potter's clay, china clay, whiting, yeast, &c., consisting of a cylindrical vessel, supported in a horizontal position upon suspended rails, and constructed and used as follows:—(1) A series of hooped wooden or other rings, each furnished with a pair of rollers for running on the rails; (2) a disc or plate with slits in the middle, introduced between each pair of rings; (3) the discs are covered (circumferentially, not in the middle) on both sides with canvas, cloth, linen, sacking, calico, felt, matting, wire-cloth, or some analogous material; (4) the rings, discs, cloths, &c., are moved along the rails and fastened together by means of bolts or ties secured to solid end-plates; (5) the liquid to be filtered is introduced through a hole in one of the centre rings by means of pumping or forcing apparatus, passes through the slits in the discs or diaphragms till it fills the vessel, and then exudes on all sides through the porous material between the discs; (6) when the liquid has been thus expressed from the contents of the cylinder, the bolts are removed, the apparatus opened, and the residuum taken out in solid slabs or blocks. Apparatus on the same principle, for treating delicate or costly bodies, or bodies of small bulk, may be made of glass, &c., and suitably mounted.	12 Dec., 1877	1881 vol. 1	211

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
79. Purifying and Filtering Water—continued.						
854	Prosper August Maignen and Jules Retif, junr.	16 June, 1880	Improvements in filtering water and other liquids for the purpose of clarifying and purifying the same, consisting in—(1) Obtaining a large area of filtering surface, by covering a frame of small bulk in such a manner as to enclose a space therewith for the liquid to filter into, which liquid escapes through the exit opening, provided at the bottom with any suitable tissue, felt, &c., covered or coated with the filtering material—the said tissue or material alone being sufficient when the apparatus is employed for filtering wine lees or such liquids; (2) more than one of such frames may be employed, and the frames may be strengthened with cross-bars; (3) when more than one frame is employed, a system of connecting and discharging pipes is provided; (4) the filtering medium consists of powdered vegetable charcoal, carbonate of magnesia, or paper pulp; and it is deposited by mixing it with some of the liquid to be treated, and passing the mixture through the apparatus, which causes the floating particles to deposit themselves on the exterior of the coverings; (5) various modifications of the apparatus, to adapt it for heating, cooling, and other specified purposes.	26 July, 1880	1882 vol. 2	199
80. Artificial Leather, Floorcloth, Oilcloth, Oilskin, and other Waterproof Fabrics.						
28	William Acland Douglas Anderson (assignee of Alfred Fauvin Jaloureau), by his agent, Paul de Castella.	20 April, 1860	Improvements in the manufacture of pipes for the conveyance of water and gases, for enclosing electric telegraph wires, and for other purposes; also applicable to strengthening various descriptions of pipes and rendering them waterproof and staunch, consisting in the superposition, by rolling on a cylindrical mandril, of sheets of paper, cloth, or other fabrics, materials, or tissues, rendered adhesive between each layer by immersion in a waterproof mastic containing bitumen or caoutchouc, or other waterproof material, and finished exteriorly and interiorly in various ways.	21 May, 1860	1866	129
294	Alfred Edward Arnold	1 Nov., 1871	Invention for utilizing waste and old unperished leather, converting such leather by process of cleansing, cutting, grinding, and shredding into a substance which, when pressed by hydraulic or screw power, will produce heels and soles for boots and shoes, and a variety of fancy and useful articles—the cleansing being effected by using soda, with or without potash; and the substance to be pressed being prepared by mixing the shred and ground leather together by means of gums or resins, or glutinous substances—also, machines and appliances for carrying out the said invention.	22 Dec., 1871	1873	87
81. Agriculture—Field Implements, &c.; including Cultivating, Improving, and Irrigating Land.						
9	James Craig	Not dated; received, 29 May, 1858.	New and improved machine for reaping and dressing corn, consisting in parts for—(1) Reaping and for retaining the grain when the front of the machine is depressed, and for beating the grain; (2) adapting fanners to the machine, so as to winnow the grain as it leaves the beaters; (3) introducing to the beaters a second time heads found to be unthrashed; (4) a better arrangement of gear, whereby the draught is improved and the belt pulleys made more secure; (5) means for stopping the machine instantly, and for setting free the quicker parts in case of any sudden stoppage or obstruction; (6) the teeth of the comb are made separate, and can be changed as required; (7) the machine needs less cleaning, is better balanced, and more easily moved and worked than former machines.	20 July, 1858	1866	39
15	Francis Porter Mansfield and Cyrus Hewitt.	15 Sept., 1858	Improvements in appliances and methods for extracting the stumps of trees, and for pulling down trees, consisting of—(1) A crotch, to the fork of which one end of a chain is fastened; this chain is passed through a block, and thence over a pulley on top of the crotch back for some distance to a lever; (2) attached to the block is a chain which is secured to a root of the tree to be removed; (3) the lever is supported at the ends by wheels; it is secured to a stump by an anchor loop, which forms its fulcrum. Two chains are affixed to links or hooks in the front of the lever, one of them being the continuation of the chain passing over the crotch, and the other a short piece of chain which is fastened to one of the hooks and hitched further and further upon the main or taking-up chain as the work proceeds, by which means the stump is forced from its position; (4) animals attached to the long end of the lever supply the motive power; (5) a number of implements are included in the invention.	23 Dec., 1858	1866	69

No.	Nature of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
81. Agriculture—Field Implements, &c.; including Cultivating, Improving, and Irrigating Land— <i>continued.</i>						
90	William Roberts (assignee of Robert Bodington).	9 Sept., 1863	Improvements in reaping and mowing machines consisting in—(1) Driving the knife-bar from the diametrical centre of the wheel; (2) the mechanical arrangements by which the back and side delivery is attained; (3) various improvements for promoting economy of construction and lightness of draught, either as a mower or reaper, or combined.	8 Mar., 1864	1866	427
96	Joseph Nicholson (assignee of the author).	13 May, 1864	Improvements in mowing and reaping machines or grass harvesters, consisting in—(1) Affixing the finger-bar so as to run direct from the axle, of which it forms a part, the bar being made in two pieces, and framing dispensed with, which is accomplished by means of screws for adjusting the knife-bar to the requisite height; (2) so arranging the knives or cutters that it is impossible for them to clog or foul, <i>i.e.</i> , placing them alternately, the one above, the next beneath the knife-bar, throughout the length of the bar; (3) form of bracket and mode of attaching same; (4) various improvements in the mechanism—all which, singly and combined, possess numerous advantages.	13 July, 1864	1866	447
221	David Edwards	3 Aug., 1869	Improvements in the construction of land cultivators, adapted for either ploughing or scarifying, being a triangular frame with the apex in front, running on three wheels, and carrying either teeth or ploughshares, consisting of—(1) Zigzag bars forming the sides of the frame, to which the teeth or ploughshares may be attached in the proper position relatively to each other; (2) means for attaching the teeth or ploughshares to the frame; (3) method of lifting the whole frame by a hand lever behind, thereby obviating the necessity of letting the teeth or ploughshares up and down one by one when setting the machine; (4) the use of sledges when required as a substitute for the back bearing wheels; (5) the combination of mechanical parts around the front wheel.	12 Oct., 1869	1872	11
282	Joseph Nicholson	21 July, 1871	Improvements in reaping and mowing machines, designed to lessen cost without impairing efficiency of same, consisting in—(1) Supporting the finger-bar by suspending it from one end of the axle, and preserving it there by means of a screw-thread thereon and nut and flanges; (2) constructing the bracket with the upper portion in the form of a hollow oblong box, with a plane surface for the pole to rest upon, either with or without flanges, with perforations for passage of axle (one being smaller than the other, so as to form a resistance to the shoulder on axle), with shield for excluding the dust, and with sockets (one for raker's seat-iron, the other for driver's seat-iron), &c.	25 Aug., 1871	1873	57
338	Joseph Nicholson	30 Sept., 1872	Improvements in reaping and mowing machines, referring to the method of altering the speed of the knife-bar, and consisting chiefly in the use of an eccentric bush on the axle of the draught wheel or wheels, and also in a peculiar construction of draught wheel; the bush enables pinions of different sizes to be used, so as to vary the speed of the knife-bar, and also enables the pinion to be thrown in or out of gear with either of the toothed gearings; the construction of the draught wheel with two sets of toothed gearing of different diameters enables the knife-bar to be driven, through a pinion, at different speeds.	4 Nov., 1872	1874	129
464	William Rigg	8 Feb., 1875	Improvements in wire fencing, consisting in—(1) The use of oval wire of superior quality; (2) the use of iron standards with oval holes; (3) guide-plates on wooden standards having oval holes; (4) corrugated iron stretchers for either round or oval wire fencing.	30 Mar., 1875	1878	25
470	Joshua Alexander Kay	17 Mar., 1875	Invention of tools, implements, or devices for tying knots, and of contrivances for imparting the necessary motion to the same, consisting primarily of a looper, a horizontally sliding hook, and a hooked finger and thumb, and secondarily of a needle, a knot slipper, a fixed hook, a top, bottom, and middle cord catcher or holder, and a knife (the knot being tied inside an oblong casing called the knotting box), which invention is applicable to tying knots in string around sheaves of grain, or knots in single or double string for any purpose whatever.	10 May, 1875	1878	41

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
577	William Humble and Ward Nicholson (assignees of the authors).	19 Feb., 1877	Improvements in machines for reaping and binding, and which perform the several operations of reaping the standing crop, feeding the cut stuff to the binder, binding it into sheaves, tying the two ends of the band into a knot, and delivering the bound sheaves at the back of the machine, consisting in the following features:—(1) The knife-bar is constantly cutting, while all the other devices work intermittently; (2) the feeding machinery works until a sheaf has been collected and then stops; (3) the binding arm then commences to close up the sheaf; (4) just as it has completed this work, the knot-tying devices come into play and tie the knot almost instantaneously, suddenly falling out of gear again; (5) during the process of knot-tying, the binding arm never ceases to move, but keeps retiring to its original position, when it also stops; (6) the delivery machinery then falls into gear and delivers its sheaf, when it also ceases to move, and the feeding again commences as at first—the whole of the operations being performed automatically.	28 Mar., 1877	1881 vol. 1	51
590	Alexander Williamson Dobbie (assignee of David Buist and Charles E. Alden).	20 April, 1877	Improvements in broad-cast seed-sowing machines, consisting in—(1) A horizontal distributing wheel or disc, with curved and sloping radial ribs or partitions; this disc is cut or slit and struck up to form inclines or lifts which meet the backs of the ribs and brace them; these inclines also give a lifting motion to the seed and project it further when it is being cast away by the centrifugal force of the wheel; (2) a hopper supported by brackets, and formed with a removable or rotary neck which serves as a nozzle or delivery end; the nozzle is in the shape of a short cylinder, with sloping bottom and curved opening therein, and the shaft of the distributing wheel is carried up through it to a bearer in the bottom of the hopper; by turning the nozzle partly round, it will scatter, wholly or partly, on one side, and the feed is graduated by a slide; (3) the sower is mounted on a waggon; the driving power is derived from one of the wheels by means of stud clamps fastened adjustably on the spokes, and a chain passing over said stud clamps and over a pulley, from which passes a belt to a pulley on the shaft of the distributing wheel.	8 June, 1877	1881 vol. 1	99
635	Melville Thomson Neale ..	16 Oct., 1877	Improvements in harvesting machines, consisting of devices whereby the uncut stalks, having been beaten down towards the knives by means of revolving beaters (which may be feathering) and cut, are moved backwards on to an appropriately formed part of the platform into a suitable position, and are then gathered together for tying, by means of a reciprocating fork or rake operating in conjunction with guides so arranged as to collect and hold the stalks in a compact form ready for tying, in which position the twine is carried round them to bind the sheaf, and by a pair of loopers having rotatory motion two loops are formed simultaneously in a part of the twine intermediate between the reel and the twine-carrier pincers; when the latter have arrived at their position of rest, a pair of reciprocating pincers dart through the said loopers and loops, to seize that end of the twine which has been carried round the stalk as aforesaid; then a tube (called the sheath) closes the pincers so as to hold the twine fast, and the twine-carrier pincers release their hold; the loopers are now immediately withdrawn from the twine, leaving the loops on the reciprocating pincers' sheath, the reciprocating pincers retire to a certain distance within the sheath, carrying the end of the twine with them, a pusher then forces the loops off the sheath over that part of the twine whose end is still held by the reciprocating pincers, and a tension device draws the knot tight; when the twine carrier takes hold of the twine near the knot and commences its rotatory movement for binding another set of stalks, the twine is severed by a suitable knife or cutter; the reciprocating fork having retired, and the guides having moved into a suitable position, the reciprocating pincers now retire a little further within the sheath, open automatically, and release the end of the twine, allowing the completed sheaf to fall to the ground; the tying apparatus is arranged on an adjustable frame or carriage, to provide for the efficient binding of stalks of various lengths.	19 Nov., 1877	1881 vol. 1	185

81. Agriculture—Field Implements, &c.; including Cultivating, Improving, and Irrigating Land—
continued.

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
636	Cyrus Hall McCormick ...	16 Oct., 1877	Improvements in harvesting machines, relating to—(1) Grain-binding mechanism for harvesting machines, and having for one of its objects the provision of a new mechanical arrangement, by which the binder-arm of such mechanism has imparted to it a steady and easy motion, and by which the twisting or tying apparatus is moved in a proper manner with reference to the motion of the said binder-arm; another object of the invention being the adaptation to harvesting machines of a new manner of operating the compressor, which holds the grain while being bound; and the said invention is intended more particularly as an attachment to that class of harvesting machines in which the cut grain is carried over the driving wheel and delivered to the binding apparatus; (2) a removable secondary frame or binder's carriage in connection with the mowing machine truck; (3) the manner of combining with the same the grain platform, elevator, binders, grain receptacle, stand, tables, and lifting apparatus, whereby the grain-harvesting attachment, made complete in itself, is adapted to be readily applied to and used in connection with such mowing machine truck, or to be removed therefrom when the machine is required for mowing.	29 Nov., 1877	1881 vol. 1	193
638	Cyrus Hall McCormick.....	16 Oct., 1877	Improvements in harvesting machines, relating chiefly to automatic binding apparatus, and comprising—(1) A twisting and cutting device, consisting of two symmetrical pinions revolving around a common axis working together to twist the wire, but having a differential movement to cut the same; to secure steadiness of working, two pinions are employed revolving close together around a common axis with an annular groove at the point of contact with each other, in which groove fits a fixed plate forming part of the binding-head, and constituting a bearing for the points of the teeth of the pinions, a space being left between the inner edge of the plate and the centre of the pinions through which the binding wire travels during the operation of twisting; (2) combination with the aforesaid twisting device of a vibrating rack, whereby the twisting wheel is intermittently actuated, by throwing the rack automatically into and out of gear, with the object of keeping the twister wheel positively locked when out of gear, which is effected by combining with a vibrating slide that carries the twister wheel a fixed stop, against which the wheel abuts when thrown out of gear; (3) further improvements in the improved binding mechanism, by means of which the grain is delivered continuously by the endless apron upon the binding platform; the binding-arm having discharged its load, moves forward, and (pausing while the stirrup link is turning with the chain around the sprocket) turns the shaft, causing its crank to act through its pitman upon the binding-arms, thus making them descend upon and compress the bundle, and it carries the wire into the binding-head; the arm then moves backward, twisting and severing the wire as it goes, and the binding-arm and compressor withdraw, leaving the bound bundle upon the platform to be pushed off by the succeeding bundle; the positive feed of the lower wire takes place during the withdrawing or retracting movement of the binding-arm and while the binding carriage is stationary; (4) a modification of the said invention, and the combination with the same of a device for preventing the unrolling or uncoiling of the wire except at the proper time; (5) the combination of parts comprising the main frame, the binder's frame, pivoted thereon, the cross bar interlocking with and overlapping the fixed shield, the grain receptacle, and the slotted rocking cranks and lever.	3 Dec., 1877	1881 vol. 1	201
656	William B. Rice.....	18 Jan., 1878	Improvements in harvesting machines, being an improved arrangement for combining a header and thresher in one machine, and consisting in mounting a threshing machine directly upon the ordinary header frame in the rear of the draper, and driving it by suitable gearing from one of the bearing wheels of the header frame; also consisting in the arrangement of a series of drapers and carriers which take the grain from the ordinary header draper, and convey and feed it to the threshing machine, so that the entire work of harvesting, from the cutting of the grain to the sacking of the threshed and cleaned grain, is accomplished within the compass of and upon the header frame.	4 Mar., 1878	1881 vol. 2	11

81. Agriculture—Field Implements, &c.; including Cultivating, Improving, and Irrigating Land—continued.

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
81. Agriculture—Field Implements, &c.; including Cultivating, Improving, and Irrigating Land— <i>continued.</i>						
696	William Donison Hunt and Henry William Putnam.	20 Aug., 1878	Improvements in wire fences and barbs and machines for making the same, consisting in—Fence-wire having projecting barbs or spurs, whether composed of one or more longitudinal wires upon which the barbs are applied, and in a machine for making such barb fence-wire or fencing by a continuous operation, embracing the following combinations of parts:—Arrangement for automatically feeding forward the main wire at stated intervals; and mechanism constructed and arranged to automatically feed forward the cross or barb wire across the main wire at stated intervals; and mechanism for coiling the barb about the main wire; and mechanism for cutting off the barb wire and for fastening the coil barb wire to the main wire; and various combinations of parts, including the combination with the mechanism for barbing the wire and feeding the barbed wire and the wire, of mechanism for at once both twisting or cabling the wires to form the finished barbed cable wire or fencing, and winding the same upon its spool or reel in a uniform and even manner.	19 Sept., 1878	1881 vol. 2	107
732	George Phillipson, junr.....	11 Mar., 1879	Improvements in harvesting machines, being the combination with an ordinary grain-stripping machine of mechanism for the purpose of winnowing and bagging the crop as well as stripping it, consisting of—(1) A fan so placed as to act upon the stripped grain almost immediately after it enters the machine, such draught to be approximating in direction to the front of the machine, and to have an outlet for the chaff at its extremity; (2) a second fan so placed as to act upon the grain after the first, and while it is in the act of falling from the elevator to the shakers or riddles; (3) a straw elevator and discharger, constructed like a riddle, so as to allow the grain to fall through it and be conducted to the shakers or riddles; (4) supporting the shakers from a platform suspended from a universal joint carried by the frame of the machine; (5) an elevator for returning the straws and white heads to the front of the machine for rethrasing and rewinnowing.	21 April, 1879	1882 vol. 1	37
749	Thomas Ellis	18 June, 1879	Improvements in the manufacture of wire fencing and in the wire used therefor, consisting in forming the said wire with its sectional area bounded by right or straight lines (by preference in the form of a triangle, or a rhomboid or rhombus), the lines being so disposed in relation to each other as to give a maximum breadth or depth of wire and make the fence conspicuous.	22 July, 1879	1882 vol. 1	79
753	James Hornsby and William Hornsby (assignees of George Agars Walker).	10 Dec., 1878	Improvements in machinery for cutting thorn and other hedges, consisting of—(1) Self-acting cutting or clipping machinery, arranged with an adjustable knife or knives, and capable of being mounted on a farmer's cart drawn by a horse; (2) a cutter-bar carried in such a manner that it can not only be set and held at any required angle, but can also be raised or lowered; (3) arm jointed to a standard by a horizontal joint, or carried by a slide which moves up or down on a standard; (4) combining with the cutter for cutting the side of a hedge, another reciprocating or revolving cutter for cutting along the top of the hedge; (5) the extensible arm from which the cutter is swung is made tubular, in order that the spindle by which motion is conveyed to the cutter may pass through the said arm and be protected by it; (6) means for bringing the cutter-bar to any desired angle and retaining it at that angle; (7) a divider carried at the end of the arm, to press the top shoots of a hedge into the path of the cutter by which the side of a hedge is being cut.	4 Aug., 1879	1882 vol. 1	89
781	William Humble and Ward Nicholson (assignees of James Ferrier, junr.)	9 Oct., 1879	Improvements in wire-straining machinery, designed principally for taking in and retaining the sag or slack of the wires in wire-fencing or between any two points, consisting of—(1) A contrivance which fits on the wire, and always remains there, and is called the "strainer"; (2) the machine which operates such contrivance, and is called the "straining machine"; (3) the machine is portable, and is carried from one strainer to the other.	17 Nov., 1879	1882 vol. 1	171

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
808	William McIntyre Cranstoun (by his attorneys, Want, Johnson & Want).	3 Feb., 1880	Improvements in apparatus for automatically binding cut crops into sheaves, adapted to be attached to or constructed as a part of any harvester or reaper which is constructed to receive the grain as it is cut on an apron or other device capable of effecting continuous, or practically continuous, delivery on to a binding platform or table; the apparatus is also applicable to binding straws leaving a threshing machine; it employs twine or string as a binder and knots itself; the invention embraces the following groups of devices, each performing its own office, and all combined working automatically, viz., (1) Special appliances for gathering the cut straw as it is received upon the binding table, and packing the same so as to get a firm solid sheaf; (2) special mechanism for arresting the last-mentioned devices and bringing into action the devices for passing the binding twine around the sheaf, which may be of an adjusted size; (3) mechanism for operating the needle-arm, the office of which is to carry one end of the binding cord around the unbound straw into position for it to be seized by the twine grasping and severing device, and to hold the binding-cord during the operation of tying the knot; (4) special devices for simultaneously seizing and severing the binding twine or cord, and mechanism for operating the same; (5) apparatus for grasping the two ends of the binding cord between their several points of attachment to the grasping device and the eye of the needle-arm respectively and the straw which said binding cord encircles, and for tying said two ends into a knot; (6) devices for elevating the lever or arm by means of which in part the sheaf has been compressed or held during the binding process, so as to clear the path of delivery of the bound sheaf from the machine; (7) special appliances, together with the means for operating the same, whereby the bound sheaf is expelled from the machine; (8) the group of co-operative devices for tying the knot in the binding cord, and special provisions for operating the same; (9) special provisions for regulating the supply of the binding cord to the binding apparatus, and for governing the tension of the same in the process of paying out.	12 Mar., 1880	1882 vol. 2	56
815	William Humble and Ward Nicholson (assignees of James Ferrier, junr.)	14 Feb., 1880	Improvements in binding apparatus for attachment to reaping machines, consisting in—(1) Contrivances for binding the crop cut or reaped into bundles or sheaves with string bands, and for tying the ends of such bands into knots, applicable to any machine that will supply the cut crop in regular order to the table; (2) the apparatus can be attached to any part of the machine, and consists essentially of a standard, the upper part of which carries the gathering, compressing, and string-carrying contrivances, whilst the lower part carries the knot-tying and the string-cutting and holding contrivances; (3) this standard has a to and fro motion imparted to it, during a considerable part of which the operating contrivances are motionless; (4) the gathering, compressing, and string-carrying contrivances, consist essentially of three curved arms, one of which assists in gathering the sheaf, and also carries the string around it; a second one, which is carried by the first, guides the string into its proper position relatively to the knot-tying machinery; whilst the third is the compressing arm; (5) the knot-tying contrivances consist essentially of a twisting hook, a looper, and a puller, and the cutting and holding contrivance of a cutter and holder; all these contrivances have an intermittent motion imparted to them by a rack and certain cam edges on the under side of a metal plate which does not move with them but simply rises out of and falls into position at the proper time.	15 April, 1880	1882 vol. 2	79
817	Hugo Graepel	15 Jan., 1880	Invention of a machine for stripping wheat or other grain, entitled, "Graepel's Patent Steam-power Stripping Machine," consisting chiefly in the application of a steam-engine as motive power for the stripping machine, and embracing the following claims—(1) The application of a foundation plate or foundation frame carrying the steam-engine and boiler and stripping machine; (2) or the application of a plate or angle-iron or girder frame fixed to the side of the steam-engine and boiler, and carrying the stripping machine; (3) the outside fuel-box with closing door, and the shifting plates; (4) the arrangement of the ash-pan, having the opening door towards the top, and being enclosed by a fence, and being closed towards the outside of the enclosing fence.	15 April, 1880	1882 vol. 2	87

81. Agriculture—Field Implements, &c.; including Cultivating, Improving, and Irrigating Land—continued.

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
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81. Agriculture—Field Implements, &c. ; including Cultivating, Improving, and Irrigating Land—
continued.

838	Harry Mohun and James Cock (assignee of one half share).	29 April, 1880	Improvements in stump extractors, consisting in the application of a right and left handed screw ; upon this screw traverse two nuts ; upon each nut is cast two trunnions, and upon each pair of trunnions is hinged a lever, the terminating point of the two levers being attached to the chain which is applied to the stump ; the screw is worked by a hand lever fitted upon each end of the same, such levers being provided with clutches working into ratchets at either end of the screw—which levers being pulled down by manual power turn the screw.	15 June, 1880	1882 vol. 2	151
884	Ole O. Storle (by his agent, Edward Waters).	2 Sept., 1880	Improvements in knot-tiers for grain-binders, consisting in a combination of mechanism for clamping the cord at two points ; a looping mechanism to form a loop from that portion of the cord held between the two clamps (such loop being formed around the inner clamp or next to the gavel) ; and a device to draw the cord through the loop and form the knot before the clamp next the gavel releases the cord.	19 Oct., 1880	1882 vol. 2	289

82. Agriculture—Barn, Farm-yard, and Station Implements ; including the Cleansing, Drying, and Storing of Grain.

24	Thomas Sutherland	7 Nov., 1859	Improvement in hulling and dressing rice, consisting of a hulling and a polishing machine, &c.—(1) The huller consists of a cylinder, with a wire covering, inside of which is suspended a circular stone which revolves about 450 times a minute within a quarter of an inch of its internal circumference ; the grain is fed to the cylinder through a hopper, fills the space between the stone and the cylinder, comes in contact with the stone, and is carried round at a great speed till it reaches the lower or depressed end of the cylinder and is discharged hulled and cleaned through a hopper ; it then encounters an air blast from a powerful fan, cleansing it of hulls and dirt ; (2) polishing machine, consisting of two flat surfaces of wood, &c., the lower one having two sides, being fixed at an angle of 45 degrees, and padded and covered with buff leather ; the top part works up and down about 500 times a minute, it is also covered and padded with buff leather ; the rice passing between the two leather surfaces becomes finely polished ; (3) it then falls into wire screens, and, being cleansed of small rice or dust, is fit for market.	14 Dec., 1859	1866	109
102	Henry Francis.....	1 Nov., 1864	Improvements in treating grain for human food, consisting in—(1) Separating the different constituent particles of grain by means of water ; the grain is crushed or ground, mixed with water, and the liquid passed through fine sieves, which have a vibratory or rotatory motion given to them, in combination with revolving brushes or beaters acting in them (inclined cylindrical sieves being preferred) ; after repeated washings the sediment is removed, formed into cakes, or prepared as bran ; the starch or fecula when used as starch for stiffening fabrics is combined with small quantities of borax, phosphate of soda, or sulphate of ammonia, for the purpose of rendering mosquito curtains, &c., unflammable ; (2) the grain is damped by passing it between rollers covered with absorbent cloths or endless bands, or cloths may be used which are kept sufficiently wet for the purpose ; (3) in silk-dressing machines the silk is kept tight on the frame by means of strips of india-rubber or springs of steel or other material, by which means the silk is kept uniformly tight, and its vibration and sifting qualities improved ; (4) insect life in grain is to be destroyed by passing currents of hot air up vertical or inclined tubes through which the grain is falling, or by passing it over inclined wire or perforated sheet metal screens, through which currents of hot air are ascending.	14 Dec., 1864	1868	7

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
82.	Agriculture—Barn, Farm-yard, and Station Implements; including the Cleansing, Drying, and Storing of Grain—<i>continued.</i>					
110	James Jennings McComb ...	Not dated; received, 18 May, 1865.	Improvements in fastenings for securing the bands of cotton and other bales, and in apparatus for applying the same, and in presses for forming compressed bales, consisting in—(1) The use of a metal buckle for coupling together the ends of the metal bands; the buckle consists of an oblong piece of metal, pierced either with a rectangular hole, which is sometimes wedge-shaped at one end and sometimes has a slit leading into it, or with two slots; one loop of the band is first connected with the buckle, and then the other loop is passed through the hole or slot and secured by being bent over or nipped; (2) the press consists of four standards, with a hollow frame top and a plunger bottom; the cotton is put in at the top and tramped down till the press is full; the sides are then closed and the plunger or follower is raised and finishes the pressing; the plunger is carried by two inclined rods, which are jointed thereto, and have for their fulcra coupling pins, which connect them to radius rods working on fulcra supported by lugs on the bed of the press; the coupling pins each carry a pair of grooved pulleys, which are intended to receive a chain or rope from a capstan or windlass, which chain or rope, having been passed round the pulleys, is led down to a staple of the bed-plate and fixed there; tension on the chain or rope draws the pulleys gradually together, and causes the rods to approach a vertical position; (3) the follower block is restored to its normal position, when it is released from the strain of the capstan block, by the descent of a counter weight; (4) improved grapple for drawing together and securing hay, corn, &c.	20 June, 1865	1868	41
150	Henry Lampson	3 April 1867	Improvements in connecting the ends of iron or other metal bands for baling cotton, wool, and other goods packed under pressure, consisting in a metal band provided with two flat metal loops, similar in form to the "sliding loops" of leather used with leather straps: one end of the band is passed through one of these loops and turned back against itself on the inside thereof, or towards that surface to be next the bale; this part may also be riveted, when the end turned back may be shorter; the other loop is passed over the other end of the band, and when the band is applied to a bale this other end is passed and drawn through the first loop, and turned short back again over it, when the second loop is slipped over this end, and thus acts as capping and keeps this end in place.	23 May, 1867	1870	65
241	Henry Francis	12 May, 1870	Improved means of joining the ends of hoop-iron used for binding wool bales and other materials, consisting in—(1) Causing the hoop iron to be compressed by presses, rollers, and dies, so that part of the metal is forced above the surface and part below the surface, thus forming loops which fit into each other, the metal being divided in the direction of its length into such proportions as to give the greatest strength; (2) the loops so formed are to be placed one within the other when used, the double metal forming a loop or space to receive the piece of iron, wood, or other material which is to be placed therein so as to cross the band and interlock the loops together.	31 May, 1870	1872	67
308	John Jukes and Thomas Benjamin Schwabe.	15 Mar., 1872	Improvements in husking and shelling Indian corn or maize, either together or separately, consisting in a frame supporting a cone or cones of any desired pitch, having teeth or cogs, raised pins, or pegs, upon its surface, each cone being placed upon a spindle or shaft, supported by bearings, and having a pinion with a handle at one end and a fly-wheel or counterpoise at the other; above the cones is a slanting trough or gutter, within which is a small roller for the cobs to revolve against and one to assist the feed and a pressure-board on top; there is also a division board to separate the cobs from the corn or husks, and underneath the cones is a coarse wire grating or gauge to separate the husks from the corn; fans may be likewise fitted to and propelled by the machine, for the purpose of separating the husk from the grain.	8 May, 1872	1874	35

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
417	Robert Harper	24 Mar., 1874	Improvements in machinery for cleansing and dressing rice, consisting in—(1) Making cylindrical rice-dressing machines adjustable, so that they may be set in a horizontal position or inclined either way, and thus made suitable for treating any kind of grain; (2) regulating the inclination of the cylinder by letting it hang from an immovable support at one end, and employing the mechanical arrangements described for raising and lowering it at the other end.	12 May, 1874	1877	51
468	Hanbury Clements.....	24 Feb., 1875	Improvements in wool and hay presses, entitled "Clements' Patent Combined Wool and Hay Press," consisting of—(1) A sill-piece, to each end of which is morticed a column; the columns are strengthened half way up by guide-pieces; (2) a wool box, the door of which is lifted up and latched when the box is full; the lid of the box has attached to it a perpendicular piece, and on the top of it a cross-piece; to each end of this cross-piece, passing over pulleys in the heads of the columns, is a weighted chain, by the action of which the lid may be run up out of the road when required; to each end of the cross-piece also is attached a chain passing down round a pulley in the foot of the column, and up to a rod which is acted upon by a system of levers and cams set in motion by a hand-pump lever connection; by drawing up the chain the cross-head and its attachments are pulled down and press the wool; the lateral pressure of the bale may be reduced or the bale taken out altogether by opening the hinged sides of the box; (3) by removing the sides of the box, the press may be converted into a hay press.	5 May, 1875	1878	37
479	William Speedy	14 June, 1875	Improvements in presses for pressing wool, hay, and such like material, consisting in—(1) The use of a windlass barrel placed at or near the bottom of the press, instead of the usual rack or screws; one or more ropes are attached to the barrel and passed over or connected to a monkey or presser-plate, or its attachments, so that by revolving the barrel the ropes are wound round it, and the monkey or presser-plate pulled down, thus pressing the wool into the box; (2) the barrel is kept from backward revolution by a pawl gearing into a ratchet; (3) increased power is obtained by the use of windlass barrels, tapering towards the centre or towards either end; there may be one or two barrels, and the barrels may be placed underneath or by the side of the bottom boxes, and may be attached to the press or its foundations, or separately supported on a movable under-carriage; (4) power is applied preferentially by shifting levers fitting into sockets like hand-spikes; (5) chains, bands, &c., may be used instead of ropes; (6) slits are made in the two sides of the upper box to allow the rope to pass through as the presser-plate descends.	13 July, 1875	1878	75
*493	Edward William Pitts	14 Sept., 1875	Improvements in machinery for removing burrs and other impurities from the fleeces and skins of sheep, consisting substantially in the use and application of a revolving drum or cylinder, fitted with projecting spikes or claws; for operating on a sheep, the drum is set vertically in the midst of a table made with ledged sides and battened bottom, to facilitate handling the animals; for operating on sheepskins, the drum is set horizontally, and there is a spring-bar kept free of it by helical springs at each end, which bar is worked by the pressure of the operator's thigh.	3 Nov., 1875	1878	111

* Should have been classed under "Spinning," p. 74.

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
517	Thomas Denny	15 Nov., 1875	Improvements in the gearing of wool-presses, consisting of—(1) A sill-piece, columns, horizontal piece, and top or cap piece, strongly framed; on one of the columns are a winch, spindle, and bevel-wheel for giving motion to a vertical spindle; bevel-wheels at the top of this spindle give motion to a horizontal spindle, which has a pinion keyed on to it for giving motion to a large crown-wheel, which latter is prevented from travelling up the screw by friction rollers; the said crown-wheel is fitted into a box which is turned by a wheel, thereby giving motion to the nut for pressing the screw down; the nut is made of brass, and is in two sections; it is fitted into the box, leaving room for each section to glide back and disengage the screw; (2) the sections of the nut are controlled by wheel-work and eccentrics set in motion by a crank handle; the screw and attached monkey are connected to a balance weight, so that when the nut is withdrawn from the screw, the screw and monkey are caused by the weight to fly up into position for pressing the next bale; (3) the box is made in two parts, the upper one of which travels on horizontal trams, and has a false bottom, so that the filling of the top and bottom boxes and the pressing may conveniently proceed.	28 Mar., 1876	1879	53
519	James Mentiplay	4 Mar., 1876	Improvements in the construction of wool-presses, consisting in—(1) Improved method of opening and closing the two halves of the nut through which the screw works in screw presses; (2) improved contrivances for raising and lowering the screw; (3) construction of the upper box so as to swivel on hinged legs or levers and deposit itself on the floor of the wool-shed to be filled, and so as to be swung into its place again when filled by means of hand gear for winding ropes over reels upon a spindle attached to the framework.	24 April, 1876	1879	57
568	William Humble and Ward Nicholson (assignees of David Ferrier).	27 Nov., 1876	Improvements in presses for pressing wool, hay, &c. consisting in—(1) Application of power to the monkey or presser plate by means of a rope winding on a fusee attached to the back of the press, the revolution being effected first by means of a handle attached to the shaft of the said fusee, and afterwards when greater power is required, by means of a lever acting successively upon shoulders provided in the butt of such fusee; (2) catches to hold the front and sides of the lower box in position; (3) catches to hold the edges of the bale while the pressing is going on.	6 Feb., 1877	1881 vol. 1	11
575	William Andrews and Henry Moffat.	19 Feb., 1877	Improvements in chaff-cutters, consisting in—(1) Attaching a screw press to a portable chaff-cutter, or to one that can be taken to the stack to be worked by a portable engine or horse-power similar to a threshing machine; (2) applying a self-acting brake to either a fixed or portable chaff-cutter, to hold up the bags whilst the chaff is being pressed into them.	20 Mar., 1877	1881 vol. 1	45
613	James Henry Brodie	30 July, 1877	Improvements in kilns for drying roots and grain, consisting in—(1) Making kilns for drying roots and grain circular and rotatory; (2) introducing into such kilns mechanically-worked levellers and mechanically-worked scoops or shovels, for the purpose of turning the material under treatment, the principal object being to dispense with manual labour inside the kiln, and to carry on the drying process more evenly; (3) the invention is equally applicable to "floors" for drying roots and grain.	29 Aug., 1877	1881 vol. 1	145
714	Thomas Quinlivan	24 Oct., 1878	Improvements in and connected with thrashing machines, consisting in—(1) The addition thereto of a contrivance for carrying the sheaves from the stack to the machine, instead of supplying them by hand as at present; (2) improved mechanical arrangement for regulating the supply to the beaters of the thrasher.	27 Dec., 1878	1881 vol. 2	161

82. Agriculture—Barn, Farm-yard, and Station Implements, &c., including the Cleansing, Drying, and Storing of Grain—continued.

No.	Nature of Applicant.	Date of Application.	Name of Invention.	When granted.	Year of publication.	Page
765	James Henry Channing Martin.	23 Aug., 1879	Improvements in means or apparatus employed in husking and otherwise decorticating and polishing rice and other kinds of grain and seeds, consisting in—(1) The employment for this purpose of one or more segments of a hollow drum or cylinder in combination with revolving cylindrical surfaces; the grain or seeds are fed into the space between the concave side of the segment or segments and the cylinder by means of a hopper along the entire length of the cylinder and segment or segments; (2) the segment or segments is or are adjusted at such a distance from the revolving cylinder as will suit the particular grain or seeds under treatment, and the feed thereto is regulated according to the action of the cylinder, as no more grain or seed can be taken by the cylinder than the space between the cylinder and segment or segments will permit.	29 Sept., 1879	1882 vol. 1	109
772	George John Hoskins and Patrick Ryan Larkin.	12 Sept., 1879	Improvements in wool or chaff press, entitled, "Hoskins and Larkin's Self-acting Hydraulic Wool or Chaff Press," consisting in—(1) Press driven by double-acting pumps with fast and loose pulleys; casing of ram sunk into ground, for economy of room; the top box is supported by balance weight for convenience of packing wool in box; the bottom box, which opens at opposite corners, is on wheels, and runs on rails on to bottom platen; (2) the pumps are set in motion by raising weighted lever; when the wool is pressed into bales, and goes up to the catch, the upper lever is lifted, which throws off the belt and opens the escape valve at the foot of the lower lever; when the bottom platen in its return is within a few inches of the bottom and touches the lever in its course, the governor acts upon the valve and cases down the ram; the valve is a special equilibrium valve; (3) press of same construction as foregoing, with exception of having chaff bin and elevator; the platen also works on a knuckle joint, and is thrown into position by raising a starting lever.	17 Oct., 1879	1882 vol. 1	139
867	John Fisher.....	13 July, 1880	Improvements in apparatus for husking and cleaning rice, coffee, or other grain, and for pulverizing and mixing mortar, cement, or other materials, consisting in—(1) A vessel revolving on an inclined axis, in combination with a vertical bar rising and falling above the lower part of the vessel, and having its lower end provided with a device for husking and cleaning rice or other grain by friction; (2) the application of a piston actuated in a cylinder by means of steam or compressed air, for the purpose of operating such vertical bar or cleaning device; (3) means for causing the vertical bar and cleaning device to rotate in the rice or grain at each stroke; (4) the combination of the vessel revolving upon an inclined axis, with a beating and cleaning device attached to the end of a vibrating lever actuated by manual labour, for the purpose of husking and cleaning rice and grain or pulverizing hard substances; (5) the method of causing the vessel to revolve upon the inclined axis whilst the rice or grain is being operated on; (6) the combination of a vessel revolving upon an inclined axis, with one or more hammers or stamp-heads actuated directly by steam or compressed air, for the purpose of pulverizing quartz or other mineral substances, or of breaking and mixing cement, mortar, or other materials; (7) the method of applying circular screws of gauze or perforated plates to the revolving inclined vessels; (8) the combination with the inclined vessel of a hollow adjustable spindle, upon which it revolves, and through which quartz or other material is discharged when sufficiently pulverized.	25 Aug., 1880	1882 vol. 2	239
899	Alexander Morrison Fell...	7 Sept., 1880	Improved corn husker and sheller, consisting of—(1) A vertical concave disc or discs, studded with conical teeth, only the outer circles being wedge and beak shaped, revolving on an axle or axles driven by hand or other power, also feed box or boxes with tension or pressure blocks passing across face of disc or discs; (2) a fan and sieve or sieves may be added for the purpose of cleaning and separating the corn from the husk and chaff.	17 Dec., 1880	1882 vol. 2	335

82. Agriculture—Barn, Farm-yard, and Station Implements, &c.; including the Cleansing, Drying, and Storing of Grain—continued.

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
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83. Agriculture—Traction Engines.

711	George Rogers..	2 Nov., 1878	Improvements in traction engines, consisting in the combination with the driving shaft and rear axle (which axle may be either loosely or rigidly secured to its wheels) of an intermediate shaft, by means of bevelled gear wheels and a supplemental shaft, provided also with bevel and gear wheels, which invention is specially adapted for application to portable engines, used for agricultural or sawing purposes, in order to render them capable of self-locomotion.	9 Dec., 1878	1881 vol. 2	157
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84. Trunks, Portmanteaus, Boxes, and Bags.

[No Inventions under this Class yet registered.]

85. Ice-making Machines, Ice Safes, Ice Houses, and Travelling Freezing Appliances; including the use of Freezing Agents for preserving purposes.

14	Bevan George Sloper	1 Nov., 1858	Improvements in refrigeration and the making of ice, and in machinery for effecting the same, consisting of an air-pump, which may be worked by the direct action of a steam cylinder fixed on the same bed-plate as such air-pump, or by gearing from a detached steam-engine, and which operates by means of a system of exhaust-valves, valve-chests, air chambers, and slide valves, moved by valve-rods worked by short arms fixed on a rocking shaft which receives its alternate motion from a rod actuated by an eccentric connected with the steam-engine gearing, whereby at each alternate stroke of the piston, a measured or regulated quantity of air enters one of the air chambers, which expands into the ice-chest at the next stroke of the piston, producing intense cold by its expansion, circulates in a continuous stream around the ice-bags converting the water they contain into ice, and passes off by the valve-chests into the air-pump cylinder and thence by the exhaust valves into the atmosphere.	23 Dec., 1858	1866	65
36	James Harrison	14 Sept., 1860	Invention of cold-producing apparatus, for refrigerating by the co-operation of volatile liquids <i>in vacuo</i> and the continuous condensation and re-co-operation of the same materials, consisting in producing cold by the evaporation of a liquid in one vessel, the withdrawal of the vapour formed, and the getting rid of the heat thus withdrawn by the condensation of the vapour in another vessel, such condensation being effected by pressure, and the heat given out during such condensation removed by the vessel being surrounded by water, the condensed liquid being again available for evaporation, the whole process being conducted <i>in vacuo</i> , that is to say, the liquid and vapour being isolated from the pressure of the atmosphere; the evaporating vessel and the condensing vessel may be of any suitable size, shape, or material; the apparatus for withdrawing the vapour from one vessel and forcing it into the other may consist of a double-acting air pump—a double-acting air pump with a piston of a half-drum or gasometer shape, working freely in an annular space filled with mercury—a blowing fan enclosed in an air-tight vessel, or a series of blowing fans—or, the vapour may be forced under a head of mercury and delivered on the other side of a partition, where the mercury is kept at a lower level by the increased tension of the compressed vapour by means of a diving-bell—or a reversed archimedean screw, or a reversed overshot wheel may be used—or, generally, the vapour may be depressed by reversing any of the ordinary means whereby liquids are raised; the invention thus consists in the combination of a refrigerating process by the continued and self-regulated circulation of a stream of ether or other volatile liquid with the continued circulation of a stream of uncongealable liquid conveying and diffusing the frigorific effect over large surfaces, and in rendering the process subservient to the manufacture of ice in an economical manner, to cooling worts, &c., to regulating the temperature of rooms, and generally to any process in which a temperature below that of the season or climate is required.	22 Nov., 1860	1866	163

No	Name of Applicant	Date of Application	Nature of Invention	When granted	Year of publication	Page
85. Ice-making Machine, Ice Safes, Ice Houses, and Travelling Freezing Appliances; including the use of Freezing Agents for preserving purposes—continued.						
47	Eugene Dominique Nicolle and Richard Dawson.	13 Sept, 1861	Improved method of manufacturing ice, consisting in the employment of such gases as are susceptible of liquefaction by pressure, and of resuming the gaseous state by the removal of such pressure, for obtaining a temperature sufficiently low to freeze water in large quantities, to reduce the temperature of wort during the preparation of beer, to preserve articles of food, and to effect other useful purposes —(1) The gases preferred are sulphurous acid, deutoxide of azote, ammonia, and hydrochloric acid; (2) a fluid capable of dissolving one of these gases, such as water, is employed; (3) the liquid, saturated with the gas, is placed in one or more boilers; the boilers are united at the bottom by a pipe which is perforated with small holes inside the boilers; at the middle of the pipe, and between the boilers, an ascending pipe is placed, which connects this pipe with a bent pipe passing from the domed top of each boiler, above the stop cocks, and then passes upwards to the refrigerator; the boilers are built in, and have not the fire directly under them, (4) the refrigerator is composed of four or more pipes, firmly fixed at each end to an iron semi-spherical box, which is fixed at the bottom to the ascending pipe, and forms connection with each spherical box, (5) a water tight vessel is fixed outside the refrigerator, and is provided with a water supply and let off pipe; (6) the freezing cistern is connected with the refrigerating apparatus, (7) the gas receiver is of annular shape, (8) a number of tinned iron moulds, filled with water, either boiled or plain, are hooked on top of the gas receiver, and resting against the outer and inner circles; the whole is enclosed in a wooden vat, filled with water strongly saturated with salt, or with alcohol diluted in water, or with other fluids not subject to congeal but at very low temperature	7 Nov, 1861	1866	257
64	Eugene Dominique Nicolle, William Henry Wilkin son, and James Hartwell Williams.	13 Feb, 1863	Improvements in the manufacture of artificial ice, having for their object the introduction of certain mechanical arrangements, in combination with the employment of certain gases and vapours susceptible of liquefaction by pressure, and of resuming their gaseous state by the removal of such pressure, by means of which a temperature may be obtained sufficiently low to freeze water in large quantities; the apparatus is constantly in operation, and freezes by liquefying and gasifying alternately; it consists chiefly of the following improvements on Letter of Registration No 47 —(1) The application of steam in the liquefying boilers, combined with the internal application of cold water simultaneously; (2) the mode of rectifying the boilers before liquefaction, by applying the remaining gas of the weak solution after liquefaction; (3) the arrangement of the liquefying apparatus; (4) the mode of freezing on horizontal surfaces, combined with the travelling motion given to the tin moulds during the process of freezing; (5) the mode of charging the gas receivers; (6) the mode of purging the gas receivers	19 Feb., 1863	1866	
77	Henry Francis	30 April, 1863	Improvements in ice making and refrigerating apparatus, consisting in—(1) Cylindrical vessel, capable of withstanding the pressure of the atmosphere, and of being opened at one end to withdraw the ice formed within it, the cylinder is horizontal, and along the inside of the top of it extends a perforated pipe leading from the tank; (2) a series of tubes are fixed near or above the supply pipe, in which tubes intense cold is produced by partly filling them with ether and evaporating it in vacuum, or by the liquefaction and expansion of ammoniacal gas, or by any other materials for condensing gases and refrigerating; (3) the cylinder may be made double, and the space between the cylinders may be used for employing the refrigerating materials, instead of or in addition to the freezing tubes, (4) a vacuum is formed in the cylinder by means of air pumps, and this causes a vapour to arise from the evaporation of the spray and films of water, which vapour carries off the latent heat and is condensed, by which process and apparatus ice may be made or fluids cooled artificially by the flowing of water, in sprays or films, gradually, into refrigerating vessels or chambers, with or without the assistance of a vacuum	1 Sept., 1863	1866	373

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
156	Thomas Sutcliffe Mort	12 July, 1867	Invention of a self-acting method of and apparatus for preserving fish, flesh, and fowl, and all other articles of food, by a process of refrigeration, being an application of Faraday's discovery of the liquefaction of certain gases by pressure, and the capacity of such gases for the absorption of heat on their release from liquefaction, and having for its object the introduction of improved mechanical arrangements whereby such gases may be employed to produce a temperature sufficiently low to secure the preservation of all articles of food, preference being given to the use of ammoniacal gas for the purpose; the various mechanical arrangements separately and combined accomplish the following purposes: (1) The continuous operation of the apparatus without the use of any external force beyond the occasional application of heat from a steam boiler; (2) the mode of applying heat to the "separator"; (3) the mode of rectifying the gases after liquefaction; (4) the mode of removing the weak liquor from the "separator," into the re-absorber, by its own pressure; (5) the mode of sending up into the feeder the strong liquor from the re-absorber; (6) the mode of returning the strong liquor into the "separator"; (7) the arrangement of the "meat-receiver"; (8) the arrangement of the portable meat-preserver.	26 July, 1867	1870	89
166	Eugene Dominique Nicolle and Thomas Sutcliffe Mort.	4 Oct., 1867	Invention of apparatus for separating the aqueous portions of fluids and juices from the more solid portions of the same, applicable to the manufacture of sugar, the preservation of milk, the concentration of extracts of flesh, and the making of wine when the must contains an excess of water the reduction of which will proportion the balance of saccharine and aqueous elements proper to a perfect fermentation—the combined operation of which apparatus attains two principal objects, both involving artificial refrigeration: (1) The conversion of the greater part of the aqueous portions of fluids and juices into flakes of ice, to be removed by skimming whilst in suspension, leaving the other portions more or less concentrated; (2) the absorption, when necessary, of the remaining aqueous portions by a current of desiccated air; the invention embraces chiefly the following features: (1) The combination and arrangement of the temperature exchangers; (2) the freezing and skimming arrangements in connection with the freezing and parting tank; (3) the arrangement of the hemispherical cylinders, whereby the concentrated fluids and juices are desiccated; (4) the arrangement of the apparatus for freezing the new wine, in order to destroy the yeast or germs of fermentation, and to insure the wine from again fermenting, in combination with the recovery of the cold employed for the purpose.	8 Nov., 1867	1870	111
173	Dugald Little	27 Dec., 1867	Invention of a method of and apparatus for the reduction of the temperature of air, and for the production of ice, and for the preservation of animal, vegetable, and other perishable substances, by freezing, consisting in—(1) Condensing air (preferentially with a surface condenser, similar to those generally used in steamers) at a high pressure, such air being treated in a bath of sulphuric acid if it requires to be dried; (2) reducing the temperature of the compressed air by any known and suitable method, preferentially the vacuum process, which consists in passing the water through a close vessel, in which is placed a quantity of concentrated sulphuric acid, and from which the air is exhausted; (3) to produce and maintain as low an atmospheric temperature as may be required, under freezing point, in any room, ship's hold, or other close vessel or receiver, by the discharge into it of a volume of the compressed, cooled, and condensed air, at a lower pressure than is contained and maintained in the condenser, which air will expand into said room, &c., at a temperature below what it stands at in said condenser in proportion to extent of said expansion, said room, &c., being provided with ventilators, &c.; (4) to produce ice, and to preserve perishable substances by placing them in said room, &c., subject to the influence and operation of air so treated.	5 Mar., 1868	1870	121

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
180	Jehoshaphat Davy Postle and Andrew James Livingstone Learmonth (assignees of a full half-share).	8 July, 1868	Improved apparatus for producing artificial cold by the reduced temperature resulting from the expansion of atmospheric air or gas, consisting of a pump for compressing the air, a cooler through which the compressed air is passed in order to be cooled, a reservoir for storing the compressed air, and an expansion cylinder in which the compressed air expands and gives back a portion of the force used in effecting its compression, which portion of force is employed to assist in the compression of fresh air.	24 Aug., 1868	1870	141
181	Thomas Sutcliffe Mort and Eugene Dominique Nicoll.	7 July, 1868	Improved method of and apparatus for obtaining reduction of temperature by the expansion of air or other permanent gases, in special connection with the preservation of articles of food, the manufacture of ice, and the cooling of rooms and liquids, and consisting in the use of strong and simple machinery, working at a low temperature, of which the following are the principal features :—(1) The new combination can be worked by an ordinary engine driver ; (2) there is no air-pump, but the compression is effected by means of the hydraulic ram in large hydraulic cylinders ; (3) the regularity of speed in the machine is obtained by the variable expansion of steam in the steam cylinder meeting the actual demand of power required for the progressive compression of the gas in the upper part of the cylinders during each successive compression,—the removal of the heat during the compression of the gas being effected by the spirals in the hydraulic cylinders themselves ; (4) the same gas and the same water are used continuously, and the gas is desiccated after compression ; (5) the compressed air is passed through the temperature exchanger to the expanding vessel receiving the surplus cold in its passage ; (6) articles of food are refrigerated by the expansion of permanent gases in an apparatus consisting of a thin metallic cylinder, encircled by a cylinder of wood, the two cylinders being separated by a spiral or spirals made of wood, of sufficient thickness to form the ribs of the cylinders, which are bolted together through the spirals ; the gases are expanded in the space between the spirals, and the temperature thereby reduced, and after circulation they are led back to the apparatus for compression ; (7) for the cooling of rooms, liquids, &c., a similar arrangement to that employed for preserving articles of food may be used, or they may be cooled by the expansion of the air by direct application or in pipes or tubes passing around or through the vessels containing liquids or the apartments requiring to be cooled ; the circulation of gas employed is perfect, and the transmission of the reduced temperature very rapid ; the articles of food, &c., to be acted upon, not being exposed to the action of the gas by contact, are not desiccated but only refrigerated by metallic transmission, which does not injure them in the slightest degree ; (8) the power employed is that of steam, but a horse-mill, water-fall, column of water, hydraulic pressure transmitted by turbine or water-wheel, screw propelled by the motion of a sailing-vessel, wind-mill, or hand-power, could be substituted ; (9) any sort of steam-engine would answer, but preference is given to a double cylinder engine working the hydraulic ram direct, water being the fluid used by preference ; the expansion gear and the transmission of motion to the time-shaft are the only peculiar parts.	24 Aug., 1868	1870	145
216	Eugene Dominique Nicolle and Thomas Sutcliffe Mort	24 May, 1869	Improved cold-producing machine, entitled, "The Australian Refrigerating and Freezing Apparatus," consisting in means for taking advantage of the well-known affinity that ammonia has for water, without further mechanical aid than is afforded by a peculiarly but simply constructed pump in combination with an equally simple apparatus, whereby the whole process of producing cold is carried on, and substances are refrigerated or frozen without necessity for any medium of transmission other	5 July, 1869	1870	249

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
85. Ice-making Machines, Ice Safes, Ice Houses, and Travelling Freezing Appliances; including the use of Freezing Agents for preserving purposes—<i>continued.</i>						
216	Eugene Dominique Nicolle and Thomas Sutcliffe Mort— <i>continued.</i>	24 May, 1869	than the ammoniacal liquor itself—the process being therefore one of liquefaction by affinity, with the aid of slight pressure, in contra-distinction to the several known processes of liquefaction under pressure; under this invention the solution follows the law of liquids under evaporation (not requiring any intermediate agent); first cooling itself, it is permitted to run under released pressure from the evaporator as weak liquor, at its lowest point of temperature, through pipes passing around the substances required to be refrigerated, the solution returning by gravitation (cooling the liquor in the strong liquor vessel on its way) to the entrance of the pump; at this point the solution meets the gas from the evaporator, with which, under the law of affinity and the pressure exerted by the pump, it is thoroughly reunited, and parting with its heat in passing through a coil connected with the pump (both being immersed in a current of water) is forced as strong liquor into the strong liquor vessel; upon entering this vessel it is further cooled by exchanging temperature with the liquor that is on the way from the refrigerating cylinder to the pump, as above alluded to, and so rendered capable of absorbing a further amount of gas, after which it is sent up by the pressure of the gas (which always exerts a force equal to the pressure exerted by the pump) to the evaporating chamber to be again evaporated, a course which is continued so long as the pump is kept working.			
250	John Andrew Edwards.....	19 Aug., 1870	Improved method of and apparatus for obtaining a reduction of temperature by the expansion of air and permanent gas, with a view to the preservation of articles of food, the manufacture of ice, and the cooling of liquids and rooms, consisting in—(1) The compression of air or gas by the hydraulic ram in a large hydraulic cylinder, sphere, or ellipse; the ram has two outlets, one at the bottom and one at the top, each fitted with a flange, junction pipe, and stop-cock; a force pump and a hydraulic pump are connected with the lower outlet; a hollow sphere of much less cubical contents than the ram is attached to the upper outlet by the upper junction; the upper stop-cock being opened to allow a free passage of air from the ram to the sphere, water is pumped into the ram by the force-pump driving the air upwards into the sphere and compressing it there; when the resistance of the compressed air becomes too great for the power of the force-pump, the hydraulic pump is used to complete the compression; when the ram is filled with water all the air it contained at first is compressed into the sphere, where it is confined by a stop-cock; the sphere is then detached from the ram and submerged in a frigorific mixture; it is next connected with a close vessel of cubical content equal to that of the ram, or nearly so, from which the atmosphere has been exhausted; the compressed air is then allowed to enter the vacuum, and it then becomes a cooling medium; (2) rooms or liquids may be cooled by the expansion of the air by direct application, or by the expanded air being conveyed in tubes or pipes passing round or through the vessel containing fluids, or round or through rooms; (3) the apparatus may be worked by any kind of power; (4) the following is an alternative arrangement: the water being pumped into the ram as before, the air is conveyed by a pipe to the small sphere not affixed to the top of the ram, but placed on the same basement as the ram, or in any convenient position, and submerged in a cooling mixture; as the compression of the air and the heat is gradual, the cooling also of the compressed air is gradual by the cooling mixture, and the cooling is effected almost as rapidly as the heating; when sufficiently cooled, it is passed to the congelator or vessel in which the freezing takes place; the freezing of water or of articles of food may be effected without the use of an air-pump, but in that case a loss of cooling medium takes place; (5) articles of food having been congelated by the above-mentioned process for preservation, are packed in ice in cases of wood rendered non-conductive of heat except of very high temperature, as described.	26 Sept., 1870	1872	95

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
256	Eugene Dominique Nicolle and Thomas Sutcliffe Mort	27 Sept., 1870	Invention for obtaining the reduction of temperature by an apparatus styled, "Nicolle and Mort's Patent Low-pressure Freezing Machine," which machine is based upon the principle of liquefaction of ammonia by affinity under low pressure, and of its gasifications by the removal of such pressure, whereby the full effect of the refrigeration capable of being produced by a given quantity of gasified ammonia is obtained, consisting chiefly in—(1) Mode of employing ammoniacal gas, under pressure and released pressure, as a motive power; (2) mode of reducing the temperature of the water intended for the supply of ice-moulds; (3) the direct application of the refrigerated weakened liquor, as a medium for transmitting cold without the aid or intervention of any agent; (4) the arrangement and construction of the freezing cistern; (5) the arrangement of the strong liquor vessel, by which the cold weakened solution, on its return from the evaporating or freezing cistern or vessel, exchanges temperature with the strong liquor next to be evaporated, whereby power is given to the strong liquor to absorb more gas, thus converting the vessel into a re-absorber, whilst the pressure exerted in the vessel by the superincumbent gas constitutes a self-acting pump for forcing the strong liquor to any place where it may be required; (6) the mode of fitting-up vessels or rooms for the carrying or reception of meat or other food or of articles requiring to be secured against moisture and atmospheric influence, or for cooling rooms or spaces.	7 Dec., 1870	1872	115
360	Eugene Dominique Nicolle and Thomas Sutcliffe Mort.	16 May, 1873	Invention for utilizing the waste cold from frigorific mixtures, and for applying the same, in combination with a plan for the continuous recovery of the salts employed for producing the cold, by an apparatus styled, "Nicolle and Mort's Frigorific Machine," consisting in utilizing the waste cold resulting from frigorific mixtures, in such a way as to follow up the lowering of temperature to the extreme point at which the salts used will dissolve; the refrigeration is effected with a simple apparatus designed for domestic use, and with the aid of such familiar ingredients as common salt, sugar, washing soda, or any other crystallized salts which produce cold during liquefaction, those fixed salts being preferred which are soluble in water, and only require to be evaporated to be again fit for use, such as nitrate of ammonia, chloride of calcium, &c.; the apparatus embraces chiefly the following features: (1) it is instantaneous in its results, works easily, and the continuity of its action may be perpetuated without any manual interference beyond keeping the motive power going, the water and the salts for each successive manipulation being (where the evaporating apparatus is used in combination with the freezing power) mechanically and continuously supplied as the evaporation of the spent liquor goes on; (2) utilizing in a temperature exchanger the principle that, the lower the temperature of the liquid used in cooling mixtures for the dissolving of the salts, the more intense the cold produced, and thus imparting to the water and salts next to be used the surplus cold of the liquid; (3) a central tube for preventing the overflow of the mixing water until saturated with the salt, and also by its union with the salt, as the two find their way into the refrigerating well, also prevent its being frozen; (4) the mode of utilizing the cold left in the spent liquor or other agent after having done its work in or over or around the frozen chamber, and on its return therefrom, by passing it through or over or around a second or outer chamber, by which means—(a) a valuable barrier is presented against the infiltration of heat into the frozen chamber, (b) the surplus cold which is possessed by the agent is utilized in cooling the articles next requiring to be frozen, or in the temporary preservation of articles of food, or in the cooling of rooms or spaces.	23 June, 1873	1875	45

85. Ice-making Machines, Ice Safes, Ice Houses, and Travelling Freezing Appliances; including the use of Freezing Agents for preserving purposes—*continued.*

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
85. Ice-making Machines, Ice Safes, Ice Houses, and Travelling Freezing Appliances; including the use of Freezing Agents for preserving purposes—continued.						
384	Samuel Barclay Martin and John M'Gough Beath.	9 Oct., 1873	Improvements in machinery for making ice, cooling liquids, refrigerating rooms, and for other like purposes, relating to that part of the machine called the congealer or refrigerator, and to that class of machines in which cold is continuously produced by the vaporisation and condensation of volatile fluid, and consisting in—(1) Using as a surface for the formation of ice metallic plates traversed by parallel channels in which the volatile liquid flows as it expands into vapour, thereby forming ice on either surface from the water in which it is submerged; (2) applying means for regulating the intensity and uniformity of the cold throughout the whole extent of the congealer composed of these channel plates however large they may be; (3) a single channel plate in the form of a scroll might be employed to embody the principle; (4) providing for the expansion of the liquid while travelling through the pipe, by forking or branching the pipe, and then uniting it again, as many times as may be required, till a uniform density and consequent uniform degree of cold is attained throughout the series of pipes, and so that the vaporisation is not entirely completed till the liquid reaches the outlet; (5) plates of transparent and compact ice are thus slowly formed between metal plates of this construction when set parallel to and at the proper distance from each other, with water between them; (6) the ice may be loosened from the plate when necessary by forcing gas from the condenser into the plate; (7) as the ice is detached from the plate it is split vertically into square blocks, which are floated into the open water space, where they turn on their sides and may be easily drawn out; (8) the same principle may be applied to plates in the ceilings of rooms for cooling such rooms.	21 Nov., 1873	1875	117
385	James Harrison	16 Sept., 1873	Improvements in cooling, by the evaporation of volatile liquids and condensed gases, and by the solution of salts—in the apparatus and processes for the manufacture of ice thereby—and in the application of ice and cold solutions to the regulation of temperature, for the cooling of enclosed spaces, the cooling of worts and other liquids, and the preservation of perishable animal and vegetable substances, consisting in improvements chiefly in the following particulars: (1) The forms of boiler and condenser; (2) the valves; (3) the stuffing boxes; (4) the trap valve; (5) the arrangement for getting rid of any air that may leak into the apparatus; (6) the employment of a subsidiary boiler, wherein the evaporating fluid is purified without any stoppage of the works; (7) the cooling of the liquefied vapour or gas in a separate vessel, and employing it in a jet for the condensation of vapour within the condensing chamber; (8) the use of mixtures of evaporating liquids in such proportions as to evaporate without leaving a residue; (9) the use of crystallized chloride of calcium or other deliquescent salt and of a stream of water, passing in opposite directions, for the production of a brine of intense coldness; (10) utilizing the cold remaining in the brine for the purpose of cooling fresh supplies of the salt and water; (11) the use of pipes with central solid core, so as to diminish the quantity of contained liquid and increase relatively the extent of cooling surface; (12) arrangement for evaporating the brine and recovering the solid salt; (13) the making of ice by the accretion of thin films of water flowing over surfaces exposed to the radiating surface of a boiler or other surface over which a stream of cold brine is kept flowing; (14) the use over again of brine which has not been deprived of the whole of its refrigerating power, by raising it on endless webs passing over rollers; (15) the perforated pipes or troughs with cloth coverings and serrated defending edging; (16) the application of the previously described processes to the cooling of worts or other liquids; (17) the arrangement for the maintenance of an equably cold temperature in enclosed chambers, by streams of cold brine flowing over the interior surface without tubes; (18) the arrangement of two sheets of metal or other waterproof material with blanketing or other porous substance (sandwich fashion) between, to insure a regular and diffused flow of brine downwards; (19) the application of a mixture of ice and salt, and of ice over which a stream of brine is kept flowing, to the maintenance of a low temperature, duly regulated, for any required space of time; (20) the mode of perpetually renewing the purity and dryness of the air in any enclosed space by a process of self-acting respiration which is also applicable to other purposes.	21 Nov., 1873	1875	121

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
394	Thomas Sutcliffe Mort and Eugene Dominique Nicolle.	24 Dec., 1873	Invention for utilizing the waste cold from frigorific mixtures, and for supplying the same, in combination with a plan for the continuous recovery of the salts employed for producing the cold, to be called "Nicolle and Mort's Improved Frigorific Machine," consisting in apparatus in two forms—one for intermittent, the other for continuous working; the former being designed for household purposes and to be worked by hand, and the latter for larger requirements; the size, shape, and motive power may be varied; simple fixed salts are used, which are soluble in water, and only require to be evaporated to be again fit for use; the salient points of the invention are—(1) Its intermittent and continuous forms, and its employment either with or without the evaporating apparatus; (2) the process described of utilizing the waste cold in salts which have been dissolved for the purpose of producing refrigeration, by giving the cold left in the cold saturated solution last used to the water and salt next to be used (either or both), the imparting of the cold to the salt being by preference effected by direct contact by immersion in the cold spent liquor, and the cooling of the water by preference by passing through a temperature exchanger of the particular kind described, and by which process an increased degree of cold is attained, the depth of which is only limited by the temperature at which the salt employed will dissolve; (3) the mode described of building spaces or chambers for the reception of substances to be frozen or cooled, or where cold is to be maintained, in combination with the mode described of transmitting the cold into, over, or around such chambers; (4) the mode described of constructing the freezing trough.	9 Feb., 1874	1877	3
411	Eugene Dominique Nicolle and Thomas Sutcliffe Mort.	10 Mar., 1874	Improved process for the preservation of food and other perishable substances, solid and liquid, by means of artificial refrigeration, consisting in placing such substances in hermetically closed vessels, and subjecting them to a temperature sufficiently low to destroy the spores or germs of ferment.	15 April, 1874	1877	35
429	Eugene Dominique Nicolle and Thomas Sutcliffe Mort.	30 May, 1874	Invention for the manufacture of ice by fractional congelation and subsequent regelation under pressure, also for icing creams or other confections, for refrigerating liquids, and for cooling rooms or spaces, and for cooling purposes generally in connection with all cold-producing machines or agents, entitled "The Revolving Freezer," consisting in—(1) A metal drum, revolving in a trough containing the liquid to be operated on, the freezing mixture being passed into and out of such drum through the journals, and the ice forming in a thin flake on the exterior periphery of the drum; (2) a spiral cutter for removing the ice from the drum; (3) hydraulic press working automatically, for receiving the fragments of ice from the cutter and converting them into a block by regelation under pressure, the small amount of heat evolved by the pressure enabling this latter effect to take place; (4) the drum is turned by hand or any other kind of power; (5) for cooling rooms, air is passed through the trough instead of water; (6) for general cooling purposes, brine is substituted for water and pumped through pipes laid in positions to cool the surrounding atmosphere.	30 June, 1874	1877	79

85. Ice-making Machines, Ice Safes, Ice Houses, and Travelling Freezing Appliances; including the use of Freezing Agents for preserving purposes—*continued.*

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
434	Samuel Barclay Martin.....	20 June, 1874	Improvements in machinery for making ice, cooling liquids, refrigerating rooms, and for other like purposes, consisting in—(1) A hollow plate, to the ends of which a system of pipes and cocks are attached; an uncongealable liquid is caused to enter the said plate and draw the heat from the water in which it is submerged, the ice being formed on the outer sides of the plate, after which water is admitted into the hollow plate to detach the ice; (2) a double condensing pipe or coil, whereby the hot gas is made to flow in one direction while the cold gas is caused to flow in an opposite direction, by which means a more rapid condensation of the freezing agent is obtained; (3) means for spraying the condensing coils with refrigerated water, and means for moving and controlling the uncongealable liquid and the water for effecting the object desired, and other details of construction, whereby the operation of freezing is made continuous, and the cold is produced by the escape of vapour from a volatile liquid, or the liberation of a gas from a liquid state, in the presence of a liquid uncongealable at the temperature employed, which circulates continuously through the apparatus, for conveying and diffusing the frigorific effect equally and uniformly over large surfaces, a condition indispensable to the proper formation of ice and its economical production.	24 Aug., 1874	1877	87
473	John M'Gouch Beath	21 April, 1875	Improvements in the process of making artificial ice and in apparatus therefor, consisting in—(1) Congealing apparatus for producing solid ice in great bulk, practically free from air and impurities, so simplified in construction that it may be extensively employed with comparatively little expense, and, by filling large rooms or storehouses, practically admit of the ice remaining upon the congelers as in a magazine, until demand exists therefor, and embracing the following features: (a) novel process consisting mainly in forming the ice on freezing surfaces in the rear of which the refrigerating agent is applied, and through which it operates by the congelation of water which is applied to and over said surfaces in flowing streams or currents, whereby ice of any desired thickness may be formed, and the surface of the ice as it is formed is constantly washed and kept free from air bubbles; (b) novel process of manufacturing ice by forming it around or upon hollow cores containing the refrigerant, by showering the water upon them; (c) arranging the congealing pipes in a vertical position, whereby they and the ice formed thereon are rendered self-sustaining; (d) combining with said vertical congelers a water-delivering apparatus whereby the water may be discharged upon said congelers and produce clean ice; (e) combination with each vertical congealer of a trap for containing a portion of the liquidized refrigerant through which the gases will pass in their course from one congealer to another; (f) mode of connecting and arranging the vertical congelers with a refrigerant supply-pipe common to them all, so that the refrigerating agent can be diverted successively into and through each congealer back to the supply-pipe; (2) improvement in condensers wherein the gaseous ammonia is liquefied, consisting in so arranging the water supply which is directed upon the pipes containing the gas that said pipes may be intermittently charged with water, and freed therefrom, instead of being constantly wet as heretofore, whereby the full and valuable effect of surface evaporation is attained; (3) improvement in the method of absorbing ammonia in aqueous or other solutions, consisting in merging the gas and water in due proportions by mingling them while in transit, and then passing the mixture in streams through conduits which are exposed externally to cooling action; (4) method of treating ammonia solutions in retorts or boilers, and apparatus therefor, whereby the gas is continuously assorted into two classes, <i>pure</i> and <i>impure</i> , and which allows the pure gas to be passed direct to the condensers, and the impure gas (by a separate and distinct route) through a dryer, and thence to the condenser.	7 June, 1875	1878	53

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
85. Ice-making Machines, Ice Safes, Ice Houses, and Travelling Freezing Appliances ; including the use of Freezing Agents for preserving purposes—continued.						
487	Charles Arthur Goby and Leon Jaubert.	14 Aug., 1875	Invention of a revolving double-action freezing machine, specially adapted for domestic purposes, consisting of a cylinder, which may be round, oval, or square, balanced on pivots in its sides, supported by standards resting on a movable base ; a crank-handle, cog-wheel, or pulley is fixed on an extension of one of the pivots, for giving revolution to the machine ; fitting into each end of the cylinders, and held there by a screw with cross-head handle, is a flange having in it a number of round holes of different sizes into which are set tubes shaped like the frustrum of a cone and placed with the small ends inwards, the two sets of tubes nearly meeting in the cylinder ; the water to be frozen is contained in the tubes ; a solution of nitrate of ammonia and water is placed in the cylinder ; ice is formed in the tubes by a few revolutions of the machine.	3 Sept., 1875	1878	99
488	Jehosaphat Davy Postle ...	19 Aug., 1875	Improvements in apparatus for cooling and freezing water and other bodies, consisting of a simple contrivance for domestic purposes, in which the cold is produced by the liquefaction of certain salts and compounds, such as nitrate of ammonia, &c. ; the apparatus is formed with two concentric cylinders, affording an annular space for the reception of the water to be cooled, such annular space at the same time affording, when empty, an additional barrier to the ingress of heat when the greatest cold is required ; the outside cylinder is cased with wood or other non-conducting material ; there is a compartment at the bottom of the apparatus communicated with by a pipe from the top and having a discharge pipe ; over the bottom compartment is the dissolving chamber, and in the latter are suspended the moulds containing the water to be converted into ice ; the whole rests on rockers, so than an oscillating motion can be given to it : when water is to be cooled, the compartment at the bottom is filled with it, the dissolving chamber is charged with the freezing solution, and the machine set in motion ; when ice is to be formed the annular compartment is left empty, the dissolving chamber is charged as before, water is placed in the moulds and a motion being given to the apparatus this water is changed into ice ; in another form of the apparatus the bottom compartment is omitted.	11 Sept., 1875	1878	101
501	Jehosaphat Davy Postle ...	30 Oct., 1875	Improvements in apparatus for cooling and freezing water and other bodies, being improvements on Registration No. 488, and comprising a freezing apparatus and a cooling apparatus : The freezing apparatus consists of a cylindrical vessel such as a keg, in which is suspended four moulds ; a coil of pipe lies in the bottom of the cylinder ; a circular piece of wood a little less in diameter than the cylinder rests on the coil of pipe ; there is a water-tight cover for the moulds ; the vessel is supported by rockers ; the moulds are not placed in the same plane as the rockers, consequently the liquid in the cylinder strikes the moulds obliquely rendering the cooling action more effective ; the operation is simple—(1) The moulds are filled and the cover screwed down ; (2) the chamber is nearly filled with nitrate of ammonia, or any suitable salt or compound, and sufficient water is poured in to dissolve half of the salt ; (3) water to be used for the dissolution of the rest of the salt is passed through the coil ; (4) the water in the chamber passes down round the bottom board, and circulates in the space between the coil till it reaches the centre and flows out through a pipe having a plug ; (5) at the same time the water passing through the coil is cooled ; (6) the water thus cooled is thrown into the chamber upon the remaining salt, and the rocking is proceeded with till the water in the moulds is found to be converted into ice : the cooling apparatus may be used either in conjunction with the said rocking apparatus, or in conjunction with any ordinary machine for making ice in one operation, or independently : it consists of either—(1) One cylindrical vessel within another, the cooling mixture being poured into the inner vessel, and the water to be cooled into the outer vessel ; or (2) the same kind of cylinders, but with the inner vessel extended downwards, and nearly filled with a third vessel ; the space between the two latter vessels is occupied with a helix, so that water passes down the spiral from the centre chamber and is discharged from a pipe below ; a corresponding spiral winds round the outside of the vessel ; water is conducted to this spiral from the outer cylinder by a pipe entering at the bottom, and it is discharged cooled through a cock at the top of the coil.	3 Jan., 1876	1879	1

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
504	Eugene Dominique Nicolle and Thomas Sutcliffe Mort (by W. Edye Mort).	21 Dec., 1875	Invention for refrigerating and purifying air in rooms or spaces, for refrigerating liquids and other substances, and for restoring to their solid state the frigorific salts employed in such refrigeration, and which invention is styled "Nicolle and Mort's Concentrator, Refrigerator, and Temperator," and embraces machines for—(1) Domestic use and minor purposes; (2) refrigerating on a large scale, by acting upon a liquid vehicle by conduction, in a manner especially applicable to treating cargoes of meat; (3) using air as the refrigerating medium, and cooling it by direct contact with the freezing agent; the invention is universal in its application to refrigerating purposes, and possesses the following desirable features:—(1) The concentration of salt, such as nitrate of ammonia, under vacuum, whereby the following advantages are attained,—(a) the production of another liquor is avoided; (b) evaporation is carried on with rapidity and without risk of loss of component parts, this latter being due to the low temperature at which the work is done as compared with that at which the same point of concentration could be reached in open pan in same time without loss; (c) reduction of bulk to its minimum upon cooling; (d) absorption of moisture after consolidation is mainly prevented, owing to the comparatively small surface exposed; (e) the full refrigerating power of the salt is secured; (f) the whole of the salt is recovered in solution in condition for immediate use, <i>i.e.</i> , in those solid blocks or forms suited to requirements; (2) the use of concrete or consolidated salt in connection with the reduction of cold, in shapes or blocks or other consolidated form, resulting from the concentrated liquor being run into shapes or moulds after concentration whilst in a state of fusion; (3) the use of dilute liquor of ammonia as a medium for conveying the cold to the rooms or spaces to be acted upon when nitrate of ammonia is employed, as in case of leakage, the introduction is prevented of any foreign agent which might decompose the salt and so interfere with the refrigerating power, and by neutralization with nitric acid the fluid which has got in by leakage is converted into nitrate of ammonia itself; (4) the arrangement for refrigerating liquids, as also air and other gases, by fractional cooling, by passing the same through a series of (by preference horizontal) sealed perforated plates or discs or coils, the liquids in the discs or coils, and the air or other gases, meeting the cooling agent at the bottom at its warmest, and gradually ascending and as they ascend being as gradually cooled, till they pass out at the top where the refrigerating agent is the coolest; (5) a temperature exchanger which enables the temperature of two liquids to be exchanged with the minimum of loss arising from radiation and conduction.	28 Jan., 1876	1879	11
558	James Shaw.....	25 Oct., 1876	Invention for keeping meat, fish, butter, milk, vegetables, and all other kinds of perishable articles, consisting in preserving or retaining perfect all such articles, by placing them in a chest, box, cupboard, ship's hold, or any part of a ship, for domestic use or for use on voyages, such receptacle being lined or padded with a coating at least three inches thick of sheep's wool, cotton, or some other non-conducting material and the necessary degree of cold being obtained by introducing into such receptacle blocks of ice or other cold-producing agents.	27 Dec., 1876	1879	167
634	James Dorrrough.....	9 Oct., 1877	Invention for resisting the influence of heat and cold in the package and carriage of all kinds of perishable goods, by lining the receptacle or vehicle with furs, skins, or hides, dressed or undressed.	19 Nov., 1877	1881 vol. 1	183

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
85. Ice-making Machines, Ice Safes, Ice Houses, and Travelling Freezing Appliances; including the use of Freezing Agents for preserving purposes—continued.						
710	Joshua Siddeley, John Siddeley, and Frederick Noel Mackay.	11 Nov., 1878	Improvements in the manufacture of ice and in apparatus or appliances employed therein, having for its object—(a) to produce clear transparent ice at a low cost, (b) to circulate cooling and refrigerating fluids economically, and (c) to provide simple and efficient apparatus and appliances for carrying into effect the said manufacture and process; the following are the essential features of the invention: Under Part I.—(a) Condensing ether or volatile liquid by means of a stream or streams of atmospheric air; (b) controlling the amount of ether or volatile liquid passing from the condenser to the vapourizer, by the combination of the chamber, valve, and float; (c) causing the vapour of ether or volatile liquid to pass in its course from the vapourizer to the exhaust pump, on one side of tubes, leaves, or spaces, the water to be afterwards frozen into ice being made to pass on the other side of such tubes, leaves, or spaces, by the combination of the economizer, tubes, and supply and escape pipes; (d) leading the ether or volatile liquid from the condenser to the refrigerator, through the ether or volatile liquid vapour, or through the economizer, by the combination of the economizer and pipe; (e) in ether or volatile liquid exhaust pumps, the combination of the valves and springs: Under Part II.—Dividing the body, mass, or matter to be frozen or refrigerated into sections, and causing the brine or refrigerating liquid to circulate from one section to another, by means of the apparatus or appliances described: Under Part III.—(a) Employing vibrating, rocking, or reciprocating arms or brushes to agitate the water to be frozen, constructed, arranged, and combined with suitable apparatus and appliances for the purpose; (b) causing the water to be frozen to circulate from one tank to another of a series, by means of the apparatus or appliances described; (c) employing movable cells, by means of the combination of cells, rollers, and pipes; (d) hollow cells of the peculiar construction described.	9 Dec., 1878	1881 vol. 2	153
723	Kennard Knott	6 Jan., 1879	Improvements in dry air refrigerating and in apparatus therefor, applicable to railway carriages and ships, store-rooms, and other stationary refrigerators, for the transportation and preservation of meat and other perishable articles, consisting in constructing such machines on the following principles:—(1) So as to produce the required low temperature from any suitable agents or any known process for producing cold, enclosed within and air-tight tank or receiver, built within the car or store-room, which is made air-tight and non-conducting, whereby the air in said car or store-room is cooled without coming into contact with the refrigerating agents; (2) gutters and waste-pipe are employed for collecting and discharging the moisture from the rime which forms on the surface of the tank and pipes passing through the same, so that the air in the car or store-room is kept constantly dry; (3) coil of pipes in connection with the tank for utilizing to the full extent the refrigerating agents employed; (4) vertically placed gutters for collecting and discharging the moisture arising from the rime which forms on the said coil.	20 Feb., 1879	1882 vol. 1	21
771	Henry Bell, James Bell, and Joseph James Coleman.	15 Sept., 1879	Improvements in processes and apparatus or arrangements for cooling and regulating the temperature and dryness of air in holds, saloons, and cabins of ships, and in railways, vehicles, hotels, theatres, halls, factories, hospitals, slaughter-houses, and other interiors, consisting in—(1) The combination of refrigerative processes in which compressed air is first cooled by injecting water during compression, and by intermingling opposite currents of water with the air immediately after compression; by passing the air in contact with extended metallic surfaces for the deposition of moisture; re-expanding the air against resistance, and passing the air in contact with moisture-depositing apparatus; (2) arrangement and combination of steam-engine, air-compressing, compressed-air cooling, and air-expansion apparatus; (3) arrangement of the moisture-depositing and re-expanded air distributing apparatus; (4) placing the moisture-depositing apparatus in casings or in hollow partitions provided with inlets, outlets, or connections and valves for controlling the passage, in contact with the said apparatus, of whatever current or currents of air are found suitable; (5)	17 Oct., 1879	1882 vol. 1	133

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85. Ice-making Machines, Ice Safes, Ice Houses, and Travelling Freezing Appliances; including the use of Freezing Agents for preserving purposes—<i>continued.</i>						
771	Henry Bell, James Bell, and Joseph James Coleman— <i>continued.</i>	15 Sept., 1879	construction of a chamber in which a temperature below or not much above freezing point is to be maintained; (6) combination of supplementary circulation apparatus with the refrigerating machinery, such apparatus comprising a fan or blower drawing air from the interior, and re-distributing it therein by pipes, ducts, or passages; (7) construction of the pipes, ducts, or passages for the supplementary circulation currents contiguously to or so as to cover the main pipes, ducts, or passages through which the cool or ex-expanded air is passed.			
812	Norman Selfe	24 Feb., 1880	Improvements in the production of artificial cold by a combination of mechanical devices and the alternate compression and expansion of air or gases, consisting in—(1) The arrangement of compressing pumps for refrigerating machinery with two or more barrels, in which the operation of compression is carried on and the heat taken up step by step; (2) the use of a series of cylinders in which the compressed air is expanded and cold produced by steps; (3) the arrangement for utilizing the sensible heat of compression by imparting it to a volatile substance, and converting it into a vapour to do work in an engine, and thus reduce the quantity of condensing water required, and the power necessary to drive the machine; (4) the construction of jet condensers or exchangers, with perforations admitting air or gas below the level of the liquid; (5) the construction of freezing rooms or chambers, with an air jacket or surrounding chamber, in which cold air is circulated to prevent the infiltration of heat and render further operations unnecessary in the freezing room itself after it is once cooled to the required temperature; (6) the construction of a pump or pumps for changing the condensing water under pressure, in such a way that the pressure of the water being removed balances the pressure against which the supply of water has to be pumped in; (7) the provision of shallow trays for freezing the ice in thin strata.	2 April, 1880	1882 vol. 2	69
850	Cassius Clay Palmer	15 May, 1880	Improved method of producing refrigeration in ice-making and refrigerating machines; also an improved method of and apparatus for freezing water on the plates of ice-making machines and for detaching it therefrom, including also improved method of and apparatus for cooling air, and a pipe-coupling for connecting pipes in such machines, consisting in—(1) Process or method of producing refrigeration by introducing a volatile liquid (by preference, chlorate of ethyl) into the cells or chambers of ice-making and refrigerating machines, in the form of a shower or spray, so as to intensify the refrigerant effect; (2) process of pouring a thin film or sheet of water against the freezing surfaces; (3) maintaining a small body or quantity of water in the bottom of the tank, and causing the same to be continually taken up and spread in a thin film over the freezing surface, without being removed from the tank; (4) vertically moving endless belt, with perforated buckets, each provided with a flexible brush or apron, which belt passes around rollers at each end; (5) improved method of heating the freezing plates in order to detach the ice therefrom, consisting in cutting off the vapour from the condenser, passing it through a heater, and leading it thence into the cells in a continuous circulation; (6) freezing-cells, pump, condenser, and heater connected by a pipe with the top of the condenser, and also connected by a pipe with the cells, so that the gas can be turned into the cells without stopping the pump; (7) process of cooling air by passing it through tubes arranged within a refrigerating chamber; (8) refrigerating cylinder or vessel having the tube-sheets connected by tubes, and provided at one end with a chamber connected with a fan-blower or other air-moving apparatus, and at the other end with a chamber provided with an outlet-pipe, in combination with a pipe and pump, a pipe and condenser, and another pipe; (9) refrigerating vessel or chamber, having air tubes passing through it, and provided with chambers at its ends, in combination with an air-forcing apparatus at one end and a discharge pipe at the other end; (10) discharging the air through a pipe of smaller area than that of the tubes and air chambers, in an air-cooling machine or apparatus; (11) pipe-coupling.	30 June, 1880	1882 vol. 2	189

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85. Ice-making Machines, Ice Safes, Ice Houses, and Travelling Freezing Appliances; including the use of Freezing Agents for preserving purposes—continued.						
887	Norman Selfe	21 Aug., 1880	Invention of apparatus for producing artificial cold, entitled the "Colonial Freezing Machine," consisting chiefly in—(1) Exhausting and condensing pump, either single or compound, in which the piston-rod and its packing are not subjected to the pressure of the vapour or liquid which is being condensed; (2) ice-box and cooling chamber, with ammonia evaporator, and the moulds for holding the water to be converted into ice, all immersed direct in one freezing solution, which solution is circulated in the cooling chamber when desired; (3) pipes having wings or fins attached for the purpose of increasing their conducting or radiating surface; (4) combination of a compound engine and a compound vapour and liquid pump; (5) cooling air by passing it through water in which an ammonia evaporator is immersed, and subsequent drying and distributing such cold air; (6) mechanical refrigeration machine in a railway carriage, deriving its motive power from the revolution of one or more of the axles; (7) air condenser or cooler with large surfaces for imparting heat to the atmosphere, thereby lessening the quantity of condensing water required; (8) cylinders and portion of engine so constructed that the pressure of ammonia gas or other vapour may be employed either in a simple or compound form, without having such pressure to act on the piston-rod and its packing; (9) compound engine for freezing or other purposes, having a valve or valves, cock or cocks, so constructed as to admit the initial pressure of the steam, air, or vapour employed direct to the valve-chest of any cylinder of the series, and thus enable a comparatively constant power to be obtained from a variable pressure, or a variable power from a constant pressure of steam, air, or other vapour.	19 Oct., 1880	1882 vol. 2	301
888	Kennard Knott	27 Feb., 1880	Improvements in refrigerating cars for the transportation of meat and other perishable articles, consisting in improved means for obtaining low temperature of any desired intensity for the preservation during transportation of meat, fish, poultry, game, and other perishable articles; and for circulating cooler air in an air-tight or nearly air-tight car; and also for condensing and absorbing any dampness in such air, and for purifying the said air,—which effects are produced by employing an air-tight or nearly air-tight and non-conducting refrigerating car, and by providing an arrangement whereby a constant circulation of cooler, dried, and purified air is kept up in the car as described.	19 Oct., 1880	1882 vol. 2	307
86. Unfermented Beverages; Aerated Liquids; Mineral Waters; Perfumes; Extracts, &c.						
242A)	Edward Hogben and Henry Barrett.	2 June, 1870	Improvements in apparatus for supplying the syrup in the manufacture of aerated beverages and other liquids (also applicable to other purposes), and in stoppering bottles containing such liquids, consisting in—(1) Pump or apparatus for supplying the required quantity of syrup in making beverages (also applicable to such other purposes as measuring or forcing to another place any required quantity of liquid); (2) Stopper in the form of a cylinder or plug of wood of greater specific gravity than water, having a groove for receiving an india-rubber washer; this stopper is applied by forcing it into the bottle, which is then filled while in an inverted position, and the air-pipe being withdrawn the stopper falls into the neck of the bottle where it is held by the force of the gas till the bottle is opened by pushing it in.	13 July, 1870	1872	73
266	Henry Dundas Glogag.....	16 Jan., 1871	Improved process of manufacturing, clarifying, and decolourizing syrups and sugars at low temperatures, by the application of improved filters of steam, and of an economical use of alcohol, consisting in—(1) Means for clarifying cane-juice and other liquids by passing them through a novel tubular reversible filter; (2) the use of a closed vessel to which steam is applied in order to produce concentration of the liquid in partial vacuum without the use of air pump or condenser; (3) arrangement for taking samples of the pan without admitting air, constructed like a syringe; (4) method of using spirit obtained from the refuse in sugar-making for the purpose of decolourizing syrups and sugars without using animal charcoal.	9 Mar., 1871	1873	9

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86. Unfermented Beverages; Aerated Liquids; Mineral Waters; Perfumes; Extracts, &c.—continued.						
465	William James Grant	15 Dec., 1874	Invention of a "generator" for the manufacture of aerated waters, consisting of a box with orifices, slide valve, screw inlet cap, cylinder, acid bottle, &c., operated as follows—(1) The orifices in the box are first closed by means of a slide valve, then the screw inlet cap is removed and the cylinder nearly filled with a prepared solution, the cap closed, and the air vent opened; (2) the screw-cap of the acid bottle is then removed, the bottle filled with a second prepared solution, and the cap refixed; (3) then the bottle is inverted, allowing the two solutions to mix in the cylinder, and while the admixture is taking place, the fans or agitator are kept in rapid revolution by the treadle or hand crank; (4) during or after this, the box regulator is opened by removing the slide-valve, and filled, and the water is ready to be drawn off by the tap as required; (5) the liquid can be made of uniform quality by closing the orifices in the box as may be necessary; (6) when the apparatus is exhausted and cleaned out and drained if necessary, it is ready to be refilled for use again.	30 Mar., 1875	1878	27
836	David Johnson	14 April, 1880	Improvements in the manufacture of aerated and other beverages for restorative and medicinal purposes, termed "zoedone," such beverages being valuable as nerve tonics and to supply the waste of nervous power consequent upon labour and sickness, consisting in—(1) The employment in such manufacture of certain chemical substances in combination with medicine or medicinal substances, or with wine, spirit, syrup, or other liquids; (2) the said chemical substances are as follows: viz., a soluble phosphate of lime, of iron, of potass, or of soda; or a lactophosphate, a pyrophosphate, or a hypophosphite of lime or of iron, or unoxidized phosphorus; or a compound of any or all of these substances; or a compound of strychnia or nux vomica dissolved in hydrochloric acid, and mixed with any or all of these substances; (3) the production of aerated beverages, consisting in the combination of said chemical with strychnia, and a suitable liquid, such as quinine, sarsaparilla, taraxicum, podophylin, pepsine, lacto-pepsine, gentian, hops, cardamums, or the like, or any of the various forms of salicine.	28 May, 1880	1882 vol. 2	143
87. Tea, Coffee, Chicory, Chocolate, Cocoa, &c.						
58	James Farquharson M'Kenzie (by his attorney, William Adamson)	19 Feb., 1862	Improvements in roasting coffee and other seeds and roots, also in drying grain, consisting in—(1) The employment for the purpose of open and close vessels, set at an incline, and caused to revolve during the operation of roasting; (2) so adjusting such open vessels that as the coffee, &c., becomes roasted, its decreased weight acts upon the cylinder in such manner as to facilitate the delivery of the roasted or dried substance.	18 Nov., 1862	1866	303
828	David Strang (assignee of James Mentiplay.)	9 April, 1880	Improvements in the process of and apparatus for roasting coffee, chicory, cocoa, and other like substances, chiefly applicable to treating coffee berries, consisting in—(1) The roasting of coffee, &c., by hot air, instead of the hot fumes and gases arising from the combustion of charcoal or other fuel; (2) the combination and arrangement of parts forming the complete apparatus for carrying out such process.	11 May, 1880	1882 vol. 2	127
88. Fire-engines, Extinguishers, Escapes, Alarms, &c.; including Fire-proof Dresses and Fabrics.						
50	John Korff	28 Nov., 1861	Invention for extinguishing fires on board ships and in warehouses, &c., entitled, "Korff's Patent Fire Main and Revolving Branch," consisting of a main pipe and revolving branch, stanchion, pointer or index, and an endless chain (passing over two pinions or rollers) connected by rods for fixing the elevation and direction of the branch; also a flange for resting the apparatus on a deck or floor; the apparatus works through a hole in the deck or floor; when there are two or more decks or floors, the apparatus is to be made the requisite length by screwing on additional lengths to the parts.	14 Jan., 1862	1866	271

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88.	Fire-engines, Extinguishers, Escapes, Alarms &c.; including Fire-pooof Dresses and Fabrics—					
<i>continued.</i>						
60	James Partridge	7 Oct., 1862	Invention of apparatus for the preservation of life and property from destruction by fire in buildings, houses, and ships, consisting in—(1) For buildings and houses, wrought iron gun-barrel tubing, fixed on outside of wall, bent through, and carried along the tie-beam to the king-post, and thence to the other end of the roof, such tubing to be plain and stopped at the end with a screw-stop; from this pipe, branches of plain pipe to proceed from the king-posts up the struts, and from thence to branch off and be fixed to the purlins; perforated pipes with three or four rows of holes in a zigzag extend from one end of the roof to the other at each side; each end has perforated bends and cross connecting pipes also perforated; (2) for a small house, one perforated pipe is sufficient; (3) for public buildings or places of worship, a perforated pipe should descend through the ceiling, and turn round the cornice on the outside of the flowers as a member of the cornice, and also accompany projections, hand-rails, &c., and form rings on the ceiling; (4) small force-pumps, elevated water tanks, &c., supply the water with the necessary force when it is not obtainable by gravity from the public mains. For ships, perforated supply-pipes, to be fixed in the cabins, saloons, and between decks, on the same principle, in connection with portable lift and force-pumps on the main deck.	3 Dec., 1862	1866	311
148	William Bland	14 Jan., 1867	Invention for the suppression, prevention, and extinction of fires in holds of ships and other confined spaces, consisting in—(1) Placing two or more casks, pipes, or hogsheads on the keelson near the masts before the vessel has received its loading; the upper half of each such cask, &c., is perforated all round; out of the head of each such cask, &c., reaching to the upper deck is a straight metal tube; through this tube a stirring handle is carried, having a cross head on the top and a circular wooden or cast-iron plate with a ring of holes through it on the bottom; there is also a cast-metal elbow pipe, communicating with the interior of the cask, through which is introduced carbonate of lime (<i>e. g.</i> , marble or limestone broken into small fragments, or coarse powder, or whiting, or chalk), with proportionate quantities of sulphuric acid, nitric acid, or muriatic acid; the contents of the cask are to be worked up with the stirrer as soon as it is known that the ship is on fire.	26 Feb., 1867	1870	61
333	James Alexander Read	6 June, 1872	Invention for indicating heat at a distance, entitled, "Read's Distant Heat Indicator," consisting of—(1) An inverted syphon or indicator (with vernier), containing sulphuric acid or other suitable liquid coloured, which instrument is to be placed at the point where the heat is to be indicated; (2) bulb, vessel, or chamber, to be put in the place the temperature of which is to be indicated; (3) vulcanized india-rubber or gutta-percha tubes (one within the other, with a slight air-space between them for non-conducting purposes) connecting the syphon and the bulb, so as to register upon the syphon the expansion of the air in the bulb; (4) air-cocks attached to the syphon or indicator, for releasing the liquid therein from internal and external pressure, and for restoring the equilibrium of the liquid; (5) a second tube attached to the second arm of the syphon, and having a bulb or globe at the top of it, for balancing (with the aid of the air-cock) the expanding and resisting properties of the air in all parts and sections of the apparatus, leaving the expansion of the air in the heat bulb, which is placed in the hold, room, or compartment to be protected, to be alone indicated.	30 Sept., 1872	1874	117

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89. Washing and Wringing Machines.						
292	Matilda Lang	23 Oct., 1871	Improvements in washing, scouring, or cleansing clothes, wool, or fibrous manufactured goods, and in apparatus for such purpose, consisting in—(1) Table with roughened or corrugated surface, and with raised edges giving it the appearance of a tray or trough; (2) manipulator with corrugated face and convenient handles for moving it backwards and forwards, or with mechanical connections for imparting motion to it otherwise than by the hand; (3) the articles to be washed &c., are wetted with a solution of soap or alkali, folded up in convenient cylindrical or spherical parcels (preferably the former) and placed on the table; the manipulator is then applied in such a way, and with such an amount of pressure, that it causes the parcel to move backwards and forwards along with it, thus loosening or separating the dirt, or grease, or other matter required to be washed or scoured away, in such a manner that it can be afterwards removed by rinsing the articles treated in water.	6 Dec., 1871	1873	79
497	Joseph Gerrish Barron	12 Oct., 1875	Invention for washing linen, cotton, or woollen goods of every kind, entitled, "The Laundress's Friend," consisting of a vessel made of tin, in a cylindrical shape, nine inches in diameter, with top closed, divided into compartments or sections, and having a conical top to carry a wooden handle; the machine is worked up and down like a churn, and operates by alternately forcing and sucking air through the suds and clothes under treatment.	30 Nov., 1875	1878	121
512	Hans Echberg.....	27 Jan., 1876	Improvements in clothes-washing machines, consisting in the use of boxes or troughs lined throughout with half-columns corrugated crosswise, so placed as to present the corrugated semi-circular faces to the inside of the box or trough; the box is made longer at the top than at the bottom, and is suspended on gudgeons resting in bearings supported by a suitable framing on each side; the box has a cover and handle; the washing is effected by putting water and soap, &c., into the box, fastening the cover, and rocking the box to and fro on its gudgeons till the work is done.	7 Mar., 1876	1879	35
658	Hans Echberg and Friedrich Wolter.	31 Jan., 1878	Improved clothes-washing machine, consisting of a swinging clothes-washer made of metal, the body being cylindrical and the two ends conical; the body is formed in two parts, the larger acting as the vessel, the smaller as the lid; these parts are joined together by a screw, link, or wedge, the joint having india-rubber packing; the machine is balanced on gudgeons, resting in bearing on a suitable frame, and is rocked or swung when in a horizontal position by a handle fixed on the cylinder near the junction of one of the conical ends.	4 Mar., 1878	1881 vol. 2	17
703	Louis James (by his agent, Henry Halloran)	23 Sept., 1878	Invention of a boiler and furnace, portable or fixed, called "The Flue Circulating Tubular Boiler," for boiling clothes, heating conservatories, &c., consisting of a furnace, boiler, and pipes, so combined that the heat may circulate through flues passing through the main body of water before reaching the stack pipe, instead of passing through straight tubes or outside flues immediately into the stack pipe, whereby the heat is interrupted and constrained by the heat traps till the products of combustion are utilized and the remaining heat is allowed to pass into the stack pipe at a low temperature.	30 Oct., 1878	1881 vol. 2	139
780	John Walls	30 Sept., 1879	Improvements in clothes-washing machines, consisting of a tank or trough, of wood or metal, with curved or rounded bottom, which is also corrugated; hinged into the top part of the machine are three levers, which have their upper arms connected by rods with a three-throw crank having a handle and fly-wheel; attached to the lower ends of the levers are three floats or beaters of wood with a number of holes through them; the machine rests on legs; the washing, &c., is effected by putting the soap and water, &c., and the soiled clothes into the machine, and turning the crank handle.	17 Nov., 1879	1882 vol. 1	169

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89. Washing and Wringing Machines—*continued.*

783	William Humble and Ward Nicholson.	20 Oct., 1879	Improved contrivance for washing clothes automatically, consisting in an apparatus to be placed in domestic or other boilers, along with the clothes to be washed, for the purpose of causing the water or suds when boiling to circulate freely amongst the clothes, and thus to cleanse them; the apparatus in its simplest form comprises a hollow base, a perpendicular pipe communicating therewith, and a pipe with a bend for a discharge made to fit the latter, telescopically, so as to be capable of being adjusted to the height of the water in the boiler; the boiling water or suds is driven upwards through the apparatus by the action of the heat, and after circulating downwards, and re-entering the base through perforations in the sides, is thrown out again in the same way at the top; the following are the details of construction: base for resting on bottom of boiler, perforations in sides thereof, volute chamber therein leading to central exit pipe; telescopic pipe fitting on latter to regulate length thereof; the following are the modifications—(a) Two volute chambers (instead of one), having two series of perforations, each leading to its own half or vertical pipe; (b) volute chambers substituted by concentric semi-circular chambers each leading to its own half of vertical pipe; (c) same, terminating in separate spouts at opposite sides of apparatus; (d) single central pipe, terminating in a cap giving an all-round discharge.	25 Nov., 1879	1882 vol. 1	179
806	John Wintle	20 Jan., 1880	Improvements in washing machines, entitled "Wintle's Washing Machine," consisting of a cylinder with corrugated periphery and closed ends, supported by gudgeons resting on a frame, and operated by a handle or crank, &c.; a suitable door is provided for enabling the clothes and washing materials to be put in and taken out of the machine; when desirable, transverse bars are fixed on the interior and armed with brushes for further scrubbing and penetrating and cleaning the articles to be washed.	2 Mar., 1880	1882 vol. 2	47

90. Chains, Chain Cables, &c.

260	John Evelyn Liardet.....	18 Nov., 1870	Invention of a spring link for chain cables and other moorings, consisting of an open cylindrical cradle, the ends of which are formed of two plates or discs of metal, and the sides of a number of metallic rods or bars; through the centre of each of the ends is inserted a metallic rod or piston fastened by nuts, forelocked or otherwise, so as to prevent the pistons from coming in violent contact with each other; on the rods are placed alternately discs of wood and india-rubber or other elastic substance; the inner extremities of the rods are terminated by a metal plate or disc and nuts as aforesaid; the outer extremities are formed into eyes, to which the cable, &c., is attached.	14 Dec., 1870	1872	129
*642	John Alves	6 Nov., 1877	Improvements in wire rope and chain ways, and in apparatus in connection therewith, to be used for conveying persons, animals, and material from one place to another, and for excavating; and to be employed chiefly for unloading ships, raising materials from mines, &c., and for excavating loose material only, such as silt, sand, sludge, &c., consisting in—(1) Making extensible and radial that end or terminal which receives the supply of material, &c., to be conveyed, so as to be able to accommodate itself to the point of supply, or to the rise and fall of a floating vessel; (2) two modifications of wheel upon which the wire rope or chain travels, and two different clips of peculiar construction for use with such modifications; (3) peculiarly constructed support for erection in water, consisting of cylinders sunk sufficiently far in the bottom, and sufficiently high above high-water mark, filled with concrete, and surrounded by a larger shallow cylinder, the space between the cylinders being also filled with concrete; (4) vehicles for conveying material, to open and close automatically; (5) vehicles to empty by tilting; (6) foot at lower end of each tumbler to prevent buckets from injuring the bottom of punt; (7) contrivance like ploughshare for widening the cut of the machine.	12 Dec., 1877	1881 vol. 1	207

* Should have been classed under "Aids to Locomotion," p. 43.

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90. Chains, Chain Cables, &c.—*continued.*

754	The Ewart Manufacturing Company (assignee of William Dana Ewart)	16 June, 1879	Improvements in drive-chains, relating to what are called rag-chains, which are used in combination with sprocket wheels in harvesting and other machinery, consisting in a chain which is made up of detachable links; the links are preferably of a rectangular form, longer than they are broad, their side bars being round or nearly so, and their end bars being constructed with a broad hook (about three-quarters of a circle) adapted one to receive the other; the links possess the following features:—(1) The combination of the coupling hooks and of side bars sufficiently small, close to the end bars, to pass through the opening of the hook; (2) combinations in the open link of the end bar provided with a coupling hook and the end bar adapted to be coupled to the hook of a corresponding link to form a chain; (3) the combination in a drive-chain of the separate open hook or coupler and the links.	4 Aug., 1879	1882 vol. 1	95
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91. Dressing and Finishing Woven Fabrics, and Manufacturing Felted Fabrics; including Folding, Winding, Measuring, and Packing.

11	John Herman Athens	Not dated received, 30 Sept., 1858	Improvement in flat irons, consisting in constructing flat irons in such a manner that the fuel necessary for heating them may be contained within them; these irons are constructed with a hinged top and a grate.	8 Nov., 1858	1866	49
876	George Weichmann	14 Aug., 1880	Improved self-heating and revolving smoothing iron, to be called the "Excelsior self-heating and revolving smoothing iron," consisting of—(1) Hollow smoothing iron with two parallel faces; (2) this iron revolves on two central pivots; to the front pivot is hinged a small lever handle secured in place by a small self-acting spring; the back pivot is hollow, and fitted with a small lamp of peculiar construction; (3) the burner of this lamp is between the two faces inside the iron, and when lighted heats the upper face; holes are provided at the side of the iron to admit air to ensure a regular burning of lamp; (4) the iron may be used cold; (5) in burning spirits of wine or other volatile substances, the burner may be within the iron and the receiver outside.	22 Sept., 1880	1882 vol. 2	257

92. Stone, Marble, Slate, and Cement.

49	Samuel Rentsch and John Riegg	Not dated; received 28 Oct., 1861	Invention for planing stone, consisting of a carriage or carriages travelling on rails for supporting the stone, which stone is operated upon by a combination of circular cutters revolving on their own axes, and having adjustable boxes hanging either vertically or at any angle from arms revolving around a common central axis.	9 Dec., 1861	1866	267
274	Arthur Hope and Hugh Junor Browne	3 May, 1871	Improvements in the construction of stone-breaking and cubing machines, consisting in the use of—(1) A fixed jaw, with orifices of any shape desired, set at any angle; (2) a sliding jaw with its face working or set at any angle; (3) means for imparting alternate differential motion to the movable jaws by employing toggles, &c.	7 June, 1871	1873	39
372	James Bishop Perrins	20 June, 1873	"Perrins' Patent Hydraulic Cement," composed of limestone and bluestone, or limestone and any basaltic rock, in the proportions stated, pulverized, mixed with water, moulded into bricks or slabs, subjected to pressure, baked, and then re-ground.	21 July, 1873	1875	89
444	Patrick Hayes.....	2 Sept., 1874	Improved concrete for building walls and roofs of houses, &c., consisting of an admixture of cinders or coke and lime ground together, wetted with liquid silicate of soda, mixed with cement and sand, sprinkled with oil, and then, with the aid of moulds set in the position it is to occupy.	10 Nov., 1874	1877	113

No.	Name of Applicant.	Date of Application.	Name of Invention.	When granted.	Year of publication.	Page.
92. Stone, Marble, Slate, and Cement—continued.						
609	John Dickinson Brunton ...	28 June, 1877	Improvements in machinery or apparatus for cutting, dressing, planing, turning, and shaping stone, consisting in—(1) Imparting to circular cutters a positive rotation by means of toothed or frictional gearing; (2) controlling and adjusting the speed of this rotation, relatively to the chuck, by pulleys of various sizes, or by interchangeable toothed gear, or by varying the rate of travel of the rack; (3) application and use to and in the turning and shaping of stone, of slide-rests carrying rotatory circular cutters, and capable of receiving a rectilinear and circular motion for the purpose of turning the stone to any required figure.	1 Aug., 1877	1881 vol. 1	141
809	Russell Barton and George Hardie	28 Jan., 1880	Improved process for manufacturing hydraulic cement, consisting in the use of Wianamatta or other sedimentary shales, mixed with lime in the solid or liquid state, pulverized, dried in pieces, burnt on a kiln, and ground.	11 Mar., 1880	1882 vol. 2	59
883	Arthur Hope	27 Aug. 1880	Improvements in stone-breaking machines, designed for the purpose of multiplying the crushing motion of the moving jaw or jaws of such machines, giving them a double or treble motion at each revolution of the crank-shaft, and consisting principally in the peculiar construction of the toggles and toggle-faces.	19 Oct., 1880	1882 vol. 2	287

93. Glass and Glassware.

345	Henry Perry (by his attorney Nicholas La Feuillade.)	3 Jan., 1873	Improvements in bottles, designed for the purpose of preventing them from being used a second time, as a safeguard against fraud, consisting in making the bottle with a conical neck for the reception of a plug (preferably of the same material) to be cemented in, or with an inner neck of greater width to receive a compressed cork, so that the bottle cannot be opened without knocking off the head—to facilitate which operation the outside of the top is provided with a projecting flange—or the head may be made solid and the plug put in the bottom.	18 Feb., 1873	1875	7
386	Hiram Codd.....	9 Oct., 1873	Improvements in the manufacture of glass bottles and in apparatus employed therein, consisting in forming the bottle by blowing in a mould revolving on horizontal or vertical spindles, to which a second such revolving mould is added for forming the ring or head and attaching it to the body of the bottle.	21 Nov., 1873	1875	127
393	Frederick William Elliott	29 Nov., 1873	Improved method of making glass, consisting in the employment of gas ignited and burnt on the surface of the materials to be reduced, the combination being intensified by the admixture of atmospheric air, and the gas being manufactured from coal in a separate furnace.	5 Feb., 1874	1877	1

94. Carriages and other Vehicles for Common Roads.

39	William Randle, Thomas Loader, and William Elsdon.	Not dated; received 3 Jan., 1861.	Invention for transporting passengers through public thoroughfares, consisting in—(1) The use of horse trams and tramways for that purpose; (2) the construction of wheels, with adjustable flanges for use on either roadways or tramways; (3) a peculiar form of rail; (4) an arrangement of turn-out, with fixed switch points, by means of which vehicles may be run from any one line on to any other for which points are laid	28 Feb., 1861	1866	179
46	James M'Leery	12 July, 1861	An improvement in the manufacture of three-wheeled vehicles, giving greater power over the front wheel, and enabling it to be turned from side to side with more freedom than in wheels of the ordinary construction.	12 Aug., 1861	1866	255
72	Henry Hollinshed	4 Feb., 1863	Improvements in carriage wheels and labour-saving machines for making same: consisting, as regards wheels, in the nave or centre being of cast-iron made in two parts to counteract the shrinkage of spokes also in the use of angle iron for tires; and as regards machines, in appliances for cross-cutting, mortising or slotting, spoke-shaping and cutting the pins on ends of spokes, felloe-cutting, rounding, annular saw, and smoothing or glass-papering.	6 May, 1863	1866	349

No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
246	William Halley and Isaac Clyde.	11 June, 1870	Invention of a friction-brake for carriages of every description, to be attached to the nave or other portion of the hind wheels, consisting of an angle-iron or other flanged hoop secured to the nave or hub, which is gripped or seized by the friction-strap when the brake is applied, and prevents the latter from rubbing against the hub when loose.	17 Aug., 1870	1872	85
271	Andrew Newell	22 Mar., 1871	Improvements in carriage-brakes, being an improved combination of parts, consisting of bolster, sliding front, axle, and king-bolt of angle-plate and slotted plates, operating in connection with the brake-bar to regulate the backward and forward throw of the axle.	11 May, 1871	1873	29
296	Henry Hoyt.....	6 Oct., 1871	Improvements in omnibuses: Consisting of a double curved roof, and of a peculiarly constructed fore-carriage and circle-plate, hind-carriage and spring-bar, and brake, with springs, lever clogs, and attachments.	19 Jan., 1872	1873	1
491	Abiel Gifford Howland	19 Aug., 1875	An easy method of attaching and detaching shafts or poles to and from carriages and vehicles having four wheels, and to and from vehicles having four wheels known as buggies and American waggons.	12 Oct., 1875	1878	109
523	William Thomas Angus.....	28 Feb., 1876	"Angus's Shaft or Pole Detacher," being a contrivance for easily detaching the horse from the vehicle in case of probable accident, for quickly removing the shafts or pole or substituting one for the other, and for obtaining increased security by dispensing with the use of bolts.	3 May, 1876	1879	71
673	William Robert Rowan.....	13 April, 1878	Improvements in steam carriages for common roads, tramways, and railways, consisting in—(1) Resting one end of the vehicle on a bogie, and the other end either on common wheels or on a bogie; (2) placing the engine within the bogie pin; (3) when the bogie pin is cylindrical, connecting and supporting the main framing of the car or vehicle by a band or hook and anti-friction rollers surrounding the bogie pin, in combination with flanged or conical wheels and springs, carried by the framing and resting upon and travelling over a circular rail fixed to the top of the bogie frame, either with or without a draw-bar; (4) when the bogie pin is segmental, employing a segmental rail with a draw-bar and king-bolt.	27 May, 1878	1881 vol. 2	43
769	William Thomas Angus	1 Sept., 1879	Improvements in the construction of a certain vehicle known as the "Tray" or "Abbott" buggy, and designated the "Angus Buggy," being a complete single and double-seated vehicle, with little additional weight over the springs, and easily adapted for use of four persons.	29 Sept., 1879	1882 vol. 1	129
856	Henry Samwells.....	14 April, 1880	Improvements in the method of supporting and staying the shafts of a certain description of vehicle, partaking of the character partly of a "Brougham" and partly of a "Hansom" cab, called a "Two-wheeled Brougham."	26 July, 1880	1882 vol. 2	207

95. Brewing, Wine-making, and Distilling Alcoholic Liquids.

134	John Ambrose Coffey	12 July, 1866	Improvements in distilling apparatus for effecting what is known as fractional distillation,—such invention being specially applicable and valuable in the distillation of petroleum, which consists of several volatile oils and unctuous substances differing in degrees of volatility, and which (for certain purposes to which they are applied) are required to be more or less separated from each other and from a substance of the nature of pitch; consisting in a boiler, provided with a heat generator, which may be placed at a safe distance and the heat conveyed to the boiler by pipes or ducts; the matter to be distilled is conveyed by gravity from a tank or reservoir into a coil in the boiler, or it may be conveyed to be circulating, operating, or be operated upon in the apparatus; a pyrometer for enabling the degree of heat in the boiler to be "read off" is connected with the coil; from or near the pyrometer the coil is produced and passes into a continuous fractional distilling chamber, or system of chambers, in direct communication with the boiler, such chamber or system of chambers being made up of an	22 Aug., 1866	1870	23
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No.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
95. Brewing, Wine-making, and Distilling Alcoholic Liquids—<i>continued.</i>						
134	John Ambrose Coffey— <i>continued.</i>	12 July, 1866	arrangement of trays or partitions, in which the coil laid flat thereon is supported; the coil is continued from one tray or partition to another, throughout the whole series or system, till it reaches the top-most, and there it discharges its contents, and as each tray or compartment is in communication with the one beneath by means of a duct in the centre or other part thereof, should there be any accumulation of residuary material not volatilized, and passing of by the still-head, it will pass on to the trays or partitions in succession, and either be evaporated or volatilized or finally pass into the boiler; the residuum is discharged from the boiler by a waste pipe or syphon; the material undergoing distillation is contained not only inside the coil but outside it; the volatilized material or spirit, not drawn off at intermediate points, passes off by the still-head to the refrigerator or condenser; and from each of the sections or chambers between the trays or partitions aforesaid, a pipe is carried into the lower part of the receptacle for condensing or refrigeration, and this pipe is coiled therein and surrounded with water or cooling liquid, by which means different products or qualities can be drawn off at each of the stages of said sections, thus effecting continuous fractional distillation.			
166	Eugene Dominique Nicoll and Thomas Sutcliffe Mort.	4 Oct., 1867	Invention of apparatus for separating the aqueous portions of fluids and juices from the more solid portions of the same, applicable to the manufacture of sugar, the preservation of milk, the concentration of extracts of flesh, and the making of wine when the must contains an excess of water the reduction of which will proportion the balance of saccharine and aqueous elements proper to a perfect fermentation; the combined operation of which apparatus attains two principal objects, both involving artificial refrigeration: (1) The conversion of the greater part of the aqueous portions of fluids and juices into flakes of ice, to be removed by skimming whilst in suspension, leaving the other portions more or less concentrated; (2) the absorption, when necessary, of the remaining aqueous portions by a current of desiccated air; the invention embraces chiefly the following features:— (1) The combination and arrangement of the temperature exchangers; (2) the freezing and skimming arrangements in connection with the freezing and parting tank; (3) the arrangement of the hemispherical cylinders, whereby the concentrated fluids and juices are desiccated; (4) the arrangement of the apparatus for freezing the new wine, in order to destroy the yeast or germs of fermentation, and to insure the wine from again fermenting, in combination with the recovery of the cold employed for the purpose.	8 Nov., 1867	1870	111
168	Nathaniel Levy	10 June, 1867	Invention for distilling spirit by steam from beet-root and mangel-wurzel, consisting in—(1) Cutting the material into pieces, placing it in tanks, and causing it to ferment there with the aid of hot and acidulated water; the fermented substance is placed in holders or upright boxes of any material, provided with perforated shelves about a foot apart and with a door; steam is introduced underneath and passes upwards through the fermented substances in each box forcing out of it the alcoholic liquor; pipes on top communicate with a worm in a refrigerator, and through the latter the spirit or feints passes into the receiver; the boxes are provided with cocks at the bottom to let off condensed steam and with valves top and bottom to regulate the pressure; from the receiver the spirit passes downwards by a pipe into an apparatus which is fitted at the bottom with a small worm attached to the steam pipe; it is passed thence by a pipe from the receiver into a column, which is fitted with a large number of boxes, one over the other, each covered with a sheet of perforated copper having a cup and discharge pipe in the middle; the steam pipe is also attached to the bottom of this column with worms, and generates the spirit to higher proof, thus forcing it upward in the column, whence it is conducted through a pipe at the top communicating with a worm in a refrigerator, and passes therefrom into the spirit room.	29 Nov., 1867	1870	117

No.	Name of Applicant	Date of Application.	Nature of Invention.	When granted.	Year of publication.	Page.
95. Brewing, Wine-making, and Distilling Alcoholic Liquids—continued.						
391	Robert Henry Prendergast	13 Nov., 1873	Invention for impregnating or aerating malt liquors by carbonic acid gas, consisting in—(1) The use of a machine similar to one employed by aerated water manufacturers, but having all the internal parts thickly plated with silver; (2) the use of the ordinary carbonic acid gas employed in the manufacture of soda water, or of the natural carbonic acid gas generated in brewery vats during the process of fermentation, for impregnating the beer with its natural gas; (3) the gas is collected by pumping it from the fermentation vats into a gasometer, where it is stored for use.	23 Dec., 1873	1875	145
475	Joseph Grafton Ross and William Adam Dixon	30 April, 1875	Improvement in the manufacture of alcohol from molasses and other fermentable substances, consisting in adding to the wash or to the molasses intended for fermentation tannic acid, alum, acetate of alumina, sulphate of alumina, chloride of calcium, acetate of lead, or other soluble lead salt, sulphate or any soluble salt of iron, sulphate or any soluble salt of zinc, sulphate or any soluble salt of copper, soluble salts of mercury, phosphoric acid or superphosphate of lime, either together or separately, so as to increase the yield of spirit by regulating the fermentation, and to cause the yield of spirit to agree with the attenuation of the wort.	7 June, 1875	1878	67
584	Philip Embury Lockwood	9 Mar., 1877	Improved method of preparing extracts of beer and other beverages of a like nature, in the shape of two new articles of manufacture, viz., condensed extracts of beer and similar fermented beverages, and condensed extract of unfermented beer (worts).	18 April, 1877	1881 vol. 1	71
794	Nicolaus Joseph Galland and Henry Simon	10 Dec., 1879	Improvements in malting and in the apparatus employed for that purpose, embracing—(1) Process of pneumatic malting, consisting in the combination of the consecutive operations whereby the grain is first treated in steeping and couching tanks, and is then subjected in tanks having perforated floors to regulated currents of cooled, moistened, and filtered air; or subjected inside revolving germinating drums to regulated currents of cooled, moist, and filtered air drawn through the drums from the germinating room, into which it is introduced through coke filters; (2) drums constructed with a perforated shell and central perforated tube or chamber, from which the air is exhausted, so as to cause currents of air entering through the shell of the drum to pass through the body of the grain whilst it is kept in motion by the rotation of the drum; central perforated tube of the drum having several separate compartments the communication of which with the exhaust is regulated by a valve or valves, so as to cause the air to penetrate the mass of grain before entering the tube; (3) arrangement in one and the same room of a series of couching tanks, each of which is situated directly above one of a series of revolving drums, communicating with a main exhaust channel; (4) the use of moistened coke chambers for controlling the character of the air currents; (5) the construction of multiple coke chambers, with air passages, &c., communicating with separate moistened coke columns; (6) the arrangement of air courses between the different parts.	19 Jan., 1880	1882 vol. 2	15
813	Samuel Burston (assignee of Charles W. Boynton).	6 Jan., 1880	Improvements in kilns for drying malt, grain, and other materials, but especially malt, consisting in—(1) A peculiar construction of the dumping trays of which the drying floor is composed; (2) a principal air-flue combined with two single air-flues with a cut-off between them, and leading to separate drying floors, these said flues being protected from grain coming from the floors into a hopper surrounding the flues by means of a deflector, by which means hot air and gases from the furnaces are discharged into both parts or either part of a two-part hopper beneath the drying floor, so that when grain or malt contained on one-half of the floor is to be dumped into its respective part of the hopper below, the hot air and gases from the furnaces may be excluded and cold air admitted, to permit labourers or attendants to enter the drying-room in which such floor is situated, to dump the grain; (3) the combination with the main air flue and its branches, and the two-part floor or hopper, of one or more furnaces having side openings communicating with the main air-flue, whereby the escape of heat is prevented until a proper amount of atmospheric air is supplied; (4) by this invention the drying process may be continued in one drying-room while the other is being emptied; (5) the construction of the trays is also a special feature.	2 April, 1880	1882 vol. 2	73

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95. Brewing, Wine-making, and Distilling Alcoholic Liquids—*continued.*

837	Louis Herrmann	14 April, 1880	Improvements in floors for malt kilns, consisting in constructing such floors with hurdles formed of a wire fabric affording abundant air-passage and great durability under the weight and manipulations of the attendants, the principal features being—(1) The combination of bent warp wire, recessed weft wire, and collars, to form hurdles; (2) the combination of the divided interlocking end eyes of two abutting hurdles with a weft wire; (3) the combination of the projecting ends of weft wires of one hurdle with the outer warp wires of the other hurdle, for giving a reciprocal support to the edges of contiguous hurdles.	28 May, 1880	1882 vol. 2	147
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96. Timber.

81	James Hartwell Williams, and William Henry Wilkinson	9 Oct., 1863	Improvements in saw-mill machinery, consisting of (1) A frame or sash carrying several saws, which are driven perpendicularly by the direct action of steam operating from an over-head cylinder, and also imparting the necessary feed motion to the wood to be sawn; (2) a lifting or shifting apparatus, used to supply the vertical frames with logs to cut and to remove them after cutting, pivoted and running on a circular tram overhead, which form of traveller is useful also for other purposes.	28 Oct., 1863	1866	393
220	Louis S. Robbins	14 July, 1869	A new and improved process for preserving wood from mould and decay, by removing therefrom the surface moisture, and afterwards charging and saturating the wood with oleagenous vapours and compounds.	7 Oct., 1869	1872	9
225	Edward Greville (assignee of James Merrett and George Dibbs)	5 Aug., 1869	Invention of machine for mortising and boring wood, consisting of a frame supporting a horizontal shaft, on which are keyed some bevel wheels; beneath this shaft there is another shaft with a spur-wheel and handle on one end and a fly-wheel on the other; this spur-wheel engages a pinion on the extension of the main shaft, and thus communicates motion to it; each bevel wheel on the main shaft mitres with a bevel wheel on top of a spindle, working through guides, and carrying an augur or other cutting tool; the rest for the timber is supported by ropes passing over a pair of rollers, and controlled by a foot-board; instead of the winch handle, a pulley may be substituted driven by steam or horse power; also, the driving power might be applied to the main shaft, dispensing with the second shaft.	17 Nov., 1869	1872	21
276	Michael James Cummins and James Swinbourn	26 April, 1871	New method of supporting and working steam saw-mills, consisting of a combined steam-boat and saw-mill; the boat, or floating foundation, is propelled by paddle-wheels; these wheels, being disconnected from the steam-engine, and acted on by the current when the boat is moored in a stream, supply motive-power to the sawing, lifting, and dragging machinery; there are stern rolling-ways, which are raised and lowered by a crane, for taking in the trees to be sawn; the boat can be used for towing purposes also, and the steam-engine utilized in various ways.	16 June, 1871	1873	45
377	William Malpas	24 April, 1873	Certain chemical compounds for preserving wood, consisting of sulphate of copper in combination with arsenious acid in a state of solution, applied to wood by immersion or otherwise, to protect it against white ants or other insects.	21 Aug., 1873	1875	101

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1882.

LEGISLATIVE ASSEMBLY.
NEW SOUTH WALES.

LETTERS OF REGISTRATION OF INVENTIONS

UNDER

16 VICTORIA, No. 24;

FOR

1881.

Printed in accordance with Resolution of Legislative Assembly.



SYDNEY: THOMAS RICHARDS, GOVERNMENT PRINTER.

1882.

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LEGISLATIVE ASSEMBLY.
NEW SOUTH WALES.

LETTERS OF REGISTRATION OF INVENTIONS.
(DESCRIPTIONS, SPECIFICATIONS, &c., ACCOMPANYING APPLICATIONS FOR.)

Printed in accordance with Resolution of Legislative Assembly.

RETURN (in part) to an *Address* of the Honorable the Legislative Assembly of New South Wales, dated 10 May, 1861, A.M., praying that His Excellency the Administrator of the Government would be pleased to cause to be laid upon the Table of this House (in addition to the Return already upon the Table),—

- “(1.) A copy of the Descriptions and Specifications accompanying any
“ applications for Letters of Registration of Inventions under the Act of
“ Council 16 Victoria, No. 24, together with the date of application for such
“ Letters of Registration, and when granted; also, copies of the Plans or
“ Sections annexed, and of the Report, in each case.
“(2.) That His Excellency will cause similar Returns to be laid before
“ Parliament annually.”

(*Mr. Hart.*)

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923	Adam Cyrus Engert	9 Feb., 1881	Improvements in fire-grates	7 April	85
924	The Tasmanite Manufacturing Co. (Limited).	14 Jan., 1881	Improvements in the treatment of tasmanite for the purpose of producing silicate colours in powder, polishing powder, and moulders' powder.	7 April	89
925	Henry Glover	23 Feb., 1881	Improvements in apparatus employed in the burning of sulphur or of materials containing sulphur, and in the application and use of the heat generated.	7 April	91

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926	William Dalziel	19 Feb., 1881	An improved combination of cock and valve for the positive prevention of waste of water for water-closets and other domestic purposes.	1881. 7 April	95
929	Thomas Bell Lightfoot ...	10 Mar., 1881	Improvements in refrigerating apparatus	16 May	99
930	Frederick Siemens.....	24 Mar., 1881	Improvements in lamps	16 May	103
931	William Weber	14 Mar., 1881	A new process for tanning leather with the aid of chemicals, &c.	16 May	109
932	Robert Bodington	2 Sept., 1880	Improvements in apparatus for arresting sparks from steam-engines.	16 May	111
933	Henry Francis Parsons...	16 Feb., 1881	An improved portable hand power machine for drilling holes in rocks and other substances.	16 May	115
934	Elphinstone Roe.....	7 April, 1881	Nyctagraph, or improved system of signalling ...	21 May	121
935	Paul Gustave Louis Gabriel Designolle.	5 April, 1881	Improvements in the treatment of ores or compounds containing copper, and the separation of copper from precious metals, and in apparatus connected therewith.	21 May	125
936	Christian Heinzerling ...	24 Mar., 1881	Improvements in converting skins or hides into leather.	21 May	129
937	Henry Cherry	29 Mar., 1881	Improvements in machinery or apparatus for raising and lowering heavy bodies.	21 May	133
938	Thomas Denny	15 Mar., 1881	An improved furnace for the combustion of fuel	21 May	137
939	Richard James Tonks ...	21 April, 1881	Improvements in machinery for crushing, pulverising, and amalgamating.	14 June	141
940	James Nicholas Douglass	21 April, 1881	Improvements in burners	14 June.....	145
941	Frederic Allen Gower ...	23 Feb., 1881	An improvement in telephonic apparatus	14 June	149
942	Edward Davies	24 Mar., 1881	Improvements in apparatus for feeding locomotive and other steam boilers or generators, applicable also for raising and forcing liquids for other purposes.	14 June.....	153
943	William Archer, William Atinar Fanning, George Fairbairne, Alexander Donald Macleay, Francis A. Gwynne, Alexander Caldcleugh Macleay, and Herbert Maguire White- head.	13 Jan., 1881	Improved machinery for the artificial production of cold for ice-making and other purposes.	17 June.....	157
944	John Auguste Arnold Buchholz.	10 May, 188	Improvements in machinery for grinding wheat and other grain, and in the process of converting wheat into flour and bran.	25 June.....	161
945	Leon Ribourt	4 May, 1881	Improvements in apparatus for preserving alimentary substances by means of cold.	25 June.....	167
946	Alfred Lee, Alston Wallace, and Robert Wright Knox.	10 Mar., 1881	Improvements in tins or cans for preserving meat.	25 June.....	171
947	Henry Ferdinand Ihlee and William Cullen Horne.	10 Mar., 1881	Improvements in painting, varnishing, and whitewashing.	25 June.....	173
948	Thomas Elva Edison	4 May, 1881	Improvements in the construction of machinery and appliances for electro-magnetic railroads, and in the generation, distribution, and translation of electricity for working the same.	25 June.....	177
949	John Louis Castner	25 May, 1881	A regulator for regulating the flow of gas or gases.	4 July	187
950	Thomas Alva Edison	12 May, 1881	Improvements in magneto or dynamo electric machines, applicable to both generators and engines.	4 July	189
951	Raoul Pierre Pictet	4 May, 1881	Improvements in producing cold, and in the manufacture of sulphurous acid, and in apparatus for these purposes.	8 July	199
952	John Addison Coleman..	4 May, 1881	Improvements in apparatus for the manufacture of nails for fastening horse-shoes and other purposes.	8 July	203
958	Gilbert Smith Dean	7 June, 1881	Improvements in the preparation of nitro-glycerine compounds.	2 August ...	207

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959	Thomas Denny	9 June, 1881	A machine for separating and concentrating auriferous pyrites, and for washing auriferous gravel, and for saving the gold resulting therefrom.	1881. 2 August ...	211
960	James Morrow and William Henry Nicholson.	3 Dec., 1880	An improvement in machines for stripping grain	2 August ...	215
961	Nicolaus August Otto ...	4 May, 1881	Improvements in gas motor engines	2 August.....	217
962	Carl Wagemann	30 May, 1881	Improvements in machinery for reducing and classifying ores, and for amalgamating the metals contained therein.	2 August ...	223
963	George Westinghouse, junior.	31 May, 1881	Improvements in apparatus for working brakes by fluid pressure.	2 August.....	227
964	Andrew Smith Hallidie...	5 July, 1880	Improvements in wire-rope tramways for transporting articles and substances from place to place, and in the machinery and apparatus connected therewith.	2 August.....	231
965	John F. Allen and Louis Ginter.	9 June, 1881	A cigarette of which the rice-paper at one end is prepared with an amber saliva-proof substance, preventing the rice-paper sticking to the lips or becoming moist in any way.	13 August.....	237
966	Thomas Alva Edison	15 June, 1881	Improvements in voltmeters or devices for measuring and registering the current flowing through conductors.	13 August.....	239
967	John Dixon	17 June, 1881	The manufacture of an improved gas and the apparatus and method therein employed.	13 August.....	243
968	Thomas Alva Edison	15 June, 1881	Improvements in systems of electric lighting, in electric lamps and in constituent parts thereof, and in means and methods of manufacture connected therewith.	13 August.....	249
970	Peter Tyrer	29 April, 1881	Improved contrivances for arresting and extinguishing sparks from steam-engines.	16 August.....	261
971	John Mitchell	22 April, 1881	Improvements in rock-drills	16 August.....	263
972	Alfred Lee, John Alston Wallace, and Robert Knight Knox.	29 June, 1881	Improvements in the process of preserving meat, and in tins for containing the same.	16 August.....	267
973	Louis Thénot	15 June, 1881	Improvements in the treatment of quartz, auriferous sand and soil, argentiferous and other ores which may undergo amalgamation, and improved apparatus in connection therewith.	16 August.....	271
975	George Blackeby	20 June, 1881	Improved lasts for making full and half sizes of boots and shoes.	24 August.....	275
976	Orazio Lugo.....	30 June, 1881	Improvements in telegraphy.....	24 August.....	277
977	George Ashcroft	28 June, 1881	Ashcroft's quartz-crushing and gold-saving machine.	24 August.....	283
978	John Griffith Corey and Nathan Weston Spaulding.	6 July, 1881	Improvements in sheep-shears	24 August.....	287
982	Marie Jean Léon Marie...	13 July, 1881	Improvements in furnaces for burning cane-trash and other fuel.	3 September .	291
983	Leopold Hesse.....	14 July, 1881	Improvements in closets and closet-pans, and in the process of and apparatus for deodorizing and converting offensive matters, such as excreta, offal, &c., into a fertilizing material.	3 September .	295
984	Friedrich Petri	13 July, 1881	Improved processes for the preparation and utilization of materials for the disinfection of fecal and other like matter, which, when, disinfected, may serve as manure or fuel.	3 September	299
985	Pierce Butler Wilson.....	13 July, 1881	Improvements in amalgamators	19 September	303
986	Juan Francisco Nepomuceno Macay.	8 Aug., 1881	Improved apparatus for dissolving and filtering, and for effecting chemical reaction in chemical and metallurgical processes.	24 September	305
987	Thomas Alva Edison	8 Aug., 1881	Improvements in devices for measuring the electric current passing through or used upon a certain circuit.	24 September	309
988	Francis Seaman	17 Aug., 1881	Improved method of washing sheep and preventing cruelty to animals.	24 September	313

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1881.					
989	James Martin, John Felix Martin, and Frederick May.	10 Aug., 1881	Improvements in machines for thrashing grain ..	24 September	315
990	Thomas Haxton	17 Aug., 1881	An improved harrow or grubber	4 October ...	317
991	Robert Dale Owen Smith	8 Aug., 1881	Improvements in closets, commodes, urinals, sinks, traps, and other depositories for offensive matters.	4 October ...	319
992	Francis Edward de Lacye Richards and John Kinloch.	9 Aug., 1881	A portable pantascope gas-light	4 October ...	323
993	John Dickinson Brunton	19 Aug., 1881	Brunton's heading-machine	4 October ...	325
994	Jules Gerard and Eugène Serullas.	10 Aug., 1881	The industrial treatment of bagauze, so as to extract therefrom sugar, and at the same time to obtain a ligneous paste, especially suitable for the manufacture of paper.	4 October ...	329
995	Samuel Henry Crocker ...	23 Aug., 1881	An improved process of engraving on glass or glassy surfaces, either direct or by transfer.	10 October ...	333
996	Count Antoine Apraxine	23 Aug., 1881	Improvements in aerial balloons	10 October ...	335
997	Henri Herrenschildt.....	27 Aug., 1881	A process of smelting antimony ore without the aid of any metals or chemicals.	10 October ...	339
999	William Stephens	2 Sept., 1881	Improvements in and relating to machines for boring in the earth.	15 October ...	341
1000	Charles Frederic Gardner	23 Aug., 1881	Improvements in sewing machinery, chiefly designed for the manufacture of boots and shoes.	15 October ...	345
1001	The Escape Door Lock Company (Limited).	31 Aug., 1881	An improved door-fastening	15 October ...	351
1002	Thomas Alva Edison	7 Sept., 1881	Improvements in electric lights and fittings, and fixtures therefor.	26 October ...	353
1003	Thomas Alva Edison	7 Sept., 1881	Improvements in electric arc lights.....	26 October ...	361
1004	Thomas Alva Edison	7 Sept., 1881	Improvements in magneto and dynamo electric machines or motors, and means and methods for controlling their generative force.	26 October ...	365
1005	Almerin Hubbell Light-hall.	2 Sept., 1881	Improvements in heading and harvesting machines, for heading and thrashing grain in the field.	26 October ...	371
1006	George Blackeby	12 Aug., 1881	An invention for pricking, channelling, nailing, and channel-setting soles of sewn boots and shoes.	26 October ...	377
1008	John Thomas Toohey and James Toohey.	7 Sept., 1881	Improvements in the manufacture of beer and yeast by means of a cooling system.	29 October ...	381
1009	George Harrison	23 July, 1881	A machine for polishing or burnishing the edges of the soles of boots and shoes.	29 October ...	383
1010	James Hornsby, John Innocent, and George Thomas Rutter.	20 Sept., 1881	Improvements in harvesting and sheaf-binding machinery or apparatus.	5 November .	387
1011	Thomas Alva Edison	20 Sept., 1881	Improvements in magneto or dynamo electric machines or electric engines.	5 November .	397
1012	Edward D. Barker.....	21 Sept., 1881	Improvements in the method of actuating railway brakes, part of which is applicable generally as a steam pump.	5 November .	401
1013	Thomas Alva Edison	7 Sept., 1881	Improvements in electric lamps and the manufacture thereof and in systems thereof.	5 November .	405
1014	Henry Upton Alcock	23 Sept., 1881	An improved table convertible into either a billiard or a dining table.	16 November .	411
1017	David Barnes	19 Sept., 1881	A machine for splitting wood	25 November .	415
1018	Thomas Alva Edison.....	3 Sept., 1881	Improvements in commutators for dynamo or magneto electric machines or electro motors.	29 November .	417
1019	John Naylor and Robert Thornton.	10 Oct., 1881	Improvements in rock-drills.....	29 November .	421
1020	William Henry Harrison	29 July, 1881	Harrison's Concentrator... ..	29 November .	423
1021	James Robson.....	22 Sept., 1881	Improvements in gas-engines	29 November .	427
1023	Peter Langwill	26 Oct., 1881	Langwill's Improved Naso-oral antiseptic Respirator.	13 December..	431
1026	William Robert Rowan...	7 Oct., 1881	An improved method of constructing tramways and light lines of railway.	22 December..	433



A.D. 1881, 19th January. No. 901.

IMPROVEMENTS IN DYNAMO OR MAGNETO ELECTRIC MACHINES AND
ELECTRIC MOTORS.

LETTERS OF REGISTRATION to Thomas Alva Edison, for Improvements in
Dynamo or Magneto Electric Machines and Electric Motors.

[Registered on the 21st day of January, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS
(commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of
the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-
Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS THOMAS ALVA EDISON, of Menlo Park, in the State of New Jersey, United States of America, electrician, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in Dynamo or Magneto Electric Machines and Electric Motors," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Thomas Alva Edison, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said Thomas Alva Edison, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said Thomas Alva Edison shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this nineteenth day of January, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Dynamo or Magneto Electric Machines and Electric Motors.

SPECIFICATION.

TO ALL WHOM IT MAY CONCERN :

BE it known that I, THOMAS ALVA EDISON, of Menlo Park, in the State of New Jersey, United States of America, electrician, have invented certain new and useful improvements in dynamo or magneto electric machines and electric motors, of which the following is a specification. A portion of my invention relates to the rotating armature, the arrangement of the commutator brushes or contacts, and the shaft of the rotating armature and commutator, which are applicable to both dynamo or magneto electric machines and to electric motors.

In rotating armatures made of a solid mass of metal, or of several large rings of metal, currents are induced in the armature itself, which circulate from points of greatest to those of lowest potential. To such currents is largely due the heating of the armature so often present as an injurious element in such armatures. To remedy this I construct an armature of a number of very thin discs or rings secured together upon a proper shaft or base and slightly insulated from each other. I have found that very good results are attained by using discs or rings one thirty-second to one sixty-fourth of an inch thick, separated from each other by sheets of tissue paper. As currents induced in the rotating armature have very small electro motive force, the insulation of the tissue paper and the thinness of the plates prevent almost if not quite entirely the circulation of induced currents and the heating attendant thereon. By this the effective capacity of the machine for conversion is very largely increased; for while the heating at one moment is not large, the covering of the armature prevents radiation, and the accumulation of heat proceeds faster than its dissipation, and the armature becomes an accumulating receiver of heat until the capacity of the machine for conversion is much impaired by limitation of exterior energy due to this heating, all of which is obviated by this use of exceedingly "thin" plates or discs. In this connection, as the word "thin" is a relative one, it is well to state that the plates should be at most not more than an eighth of an inch thick, and preferably very much thinner and insulated from each other in order to attain these effects.

Commutator springs or brushes have always been arranged at right angles to the axis of the commutator. With such there has usually been a large amount of "spark" on the face of the commutator, indicating a loss of electric energy by its conversion at a point where conversion was not only unneeded but injurious, causing a rapid destruction of the commutator apparatus.

I find that this can be largely and usually entirely avoided by arranging the commutator springs or brushes so that their axial line is at an angle other than a right angle with the axis of the commutator, or in other words that the brushes or springs bear obliquely upon the face of the commutator. In practice I have found that it is better that the brushes or springs stand at an angle of about 30° to the axis of the commutator.

As ordinarily arranged, the brushes or springs travel over the face of the commutator in a uniform track, speedily wearing a groove therein and rendering the face of the commutator uneven.

To remedy this, ensuring even wear over the whole surface of the commutator, and also to insure even wear and polishing of the surface of the revolving armature, I arrange the shaft of the commutator and its bearing so that the shaft may have a longitudinal movement in the bearings. Upon the outer end of the shaft a disc is fixed, forming a circular armature to an electro magnet suitably attached to the frame of the machine. When this magnet is charged, attracting the armature, the shaft is moved in one direction to its limit of motion, a spring serving to force it to the other limit when the magnet is inactive. If an iron pulley be used upon the shaft of the armature and commutator and placed near the polar extensions of the field magnet the spring may be dispensed with, the magnet for moving the shaft being placed to move the shaft in one direction, the attraction between the machine magnets and the pulley serving to move the shaft in the other direction.

Attached to any rotating part of the apparatus is a disc a portion of whose periphery is of insulating material, the remainder being a conductor, or the disc may have several alternating conducting and non-conducting portions. Upon the disc bears a contact spring, the disc and spring being interposed in a circuit leading from a battery or other source of electricity to the magnet last spoken of, or the current therefor through a shunt may be a portion of the machine itself. One rotating disc and spring may be arranged to control the circuit of the shaft-moving magnets of a large number of machines or motors.

In providing electro motors for any given work, it is desirable that any one motor should be constructed to give the maximum power required with a certain definite current.

As is the case with all motors, however, it may be desired to use the motor for less than its maximum capacity, that is, to run it with a variable load or amount of work to be performed, it is preferable that it should be provided with a governor, to correct any fluctuation in speed consequent upon such variation in load or work.

To accomplish this, I place on the main shaft, or I gear to it, either directly or by belting, a centrifugal governor, which lifts upon too great speed an adjustable circuit lever controlling, by either making or breaking, directly or indirectly, the circuit to the motor. This lever may control directly the circuit to the motor passing through it, or it may control indirectly by controlling a local battery circuit to a magnet whose armature lever operates a circuit-breaker placed in the motor circuit.

In order to prevent too sudden fluctuation upon the breakage of the circuit and to maintain regularity while the current is on, the main shaft is provided with a heavy fly-wheel whose momentum prevents irregularities and causes gradual slowing down when the circuit is broken.

As the circuit-controlling lever of the governor completes the circuit through an adjustable stop, the joint effects of the governor and fly-wheel are that the machine is capable of the finest adjustment, breaking and completing the circuit upon the least variation from a determined desired speed, acting exactly, so to speak, as an automatic cut-off in steam-engines, preventing unnecessary consumption of energy.

The breaking of the main circuit occasions a large spark at the breaking point, which is more destructive as a unit than it would be if divided into several sparks, hence I break the main circuit when breakage is necessary at several points simultaneously, in order to divide the spark and lessen its total injurious effect.

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I accomplish this by fixing upon an insulating bar several contact springs, the free ends of which rest each respectively upon proper contact posts and project slightly beyond the same. The circuit is led to one post, passes to its spring, whence it passes by a wire to the next post and its spring and by wire to the next post, and so on through the series of springs and posts. Either the circuit-controlling lever or the armature lever, as either is used for the purpose as before explained, is broadened at the end so as to take under the extreme free ends of all the circuit springs and upon desired movement lift them from their posts, breaking the main circuit at a number of points.

In using electric motors especially for actuating light machinery, it is very desirable that the rate of speed of the actuated machine be under control of the operator and that the means of control be simple, effectual, and easy of application.

Hitherto this has been attempted only through controlling the electric circuit to the motor, breaking or closing it in whole or in part. I prefer to control the speed by the application of a brake to the main driven wheel without reference to the current. A brake is so pivoted as to be capable of bearing upon the wheel but kept therefrom normally by a spring. Attached to the brake is a lever which in turn is attached to a treadle by means of which any desired pressure may be applied, though it is evident that the brake lever may be arranged to be operated by hand instead of through the medium of a treadle.

So far as I am aware electric motors have always been connected direct to the actuated machine, so that the rate of speed of the actuated machine and of the motor were the same. It is often desirable that the actuated machine be driven at a less or at a greater rate of speed than the motor. To effect this I interpose between the two differential gearing, that is, gearing which may be cogged wheels, pinion wheels, friction gearing, belts and pulleys, &c., of different diameters, arranging them to produce the desired differentiation of speed.

Referring now to the drawings for a more particular description :—

Fig. 1 is a detailed view of several parts detached from fig. 2; fig. 2 is an isometric view of a machine embodying a portion of the improvements forming the invention herein claimed; fig. 3 is a plan view; fig. 4, an end view; and fig. 5, a side view of a motor and actuated machine showing another portion of the invention herein claimed.

a is a rotating armature which revolves between polar extensions of magnets, not necessary to be shown. This armature is composed of a number of thin plates, rings, or discs, secured upon the shaft *b*, thin pieces of insulating material, preferably tissue paper, alternating with the plates, rings, or discs, and separating each of them from all the others. The black lines *a'* show the metallic plates, the intermediate white lines representing the insulating material. The plates, discs, or rings should not exceed one-eighth of an inch in thickness, while the best results are obtained when the thickness is from one sixty-fourth to one thirty-second of an inch. *dd* are the commutator brushes or springs resting against the commutator *d'*; these brushes are secured in stands, *d''*, capable of horizontal and vertical adjustment as shown. As more clearly shown in fig. 1, the springs or brushes are placed obliquely to the axis of the commutator, preferably at an angle of about 30°.

The shaft *b* of the revolving armature and of the commutator is supported in boxes, *e*, and is arranged to have a longitudinal movement therein.

Upon the end of the shaft *b* is fixed a disk, *f*, which forms the armature for a magnet, *m*, whose poles, *p p*, are extended as shown to exert their influence upon *f*. Through the magnet passes an electrical circuit, *y y*, in which is placed a circuit interrupter consisting of a spring, *u*, whose free end bears upon a hub or disc, *t*, whose surface is composed of alternate conducting and non-conducting material, one or a series of alternations being used. While the spring *u* bears on a conducting portion of *t* the circuit through *m* is complete and the poles *p p*, attract *f*, pulling the shaft *b* to its limit of movement in one direction. When the circuit is broken, a spring, *s*, forces the shaft to its limit of motion in the opposite direction.

The hub or disc *t* may be attached to any rotating part of a machine, or it may be driven by an independent motor. If it be so geared that its rate of speed is different from that of *b*, the movement of *b* will not occur at the same relative time in consecutive rotations and the wear of the commutator will be evenly distributed over its whole face, and the rotating armature will also be evenly worn and polished. I prefer that mica be used as the insulating material between the metal bars or strips of the commutator.

One circuit-breaker, *u t*, may control the circuit for a number or battery of generators or motors, or a series of them may be arranged upon one shaft, each controlling the circuit to a generator or to a motor and arranged to operate in succession.

As before stated, if an iron pulley be used upon the shaft *b*, it may be so arranged that the attraction between it and the not shown magnets of the machine will move the shaft in one direction, the attraction between *f* and *p p* moving it in the other, in which case the spring *s* is dispensed with. *g* is a centrifugal governor connected to the shaft *b* by a belt, *q*. It is evident, however, that this governor may be placed on the shaft or may be geared directly thereto. The sliding tube *g'* of the governor, raised or lowered by the action of the governor balls, carries a shoulder, *h*, taking under a pivoted lever, *h'*, whose free end normally rests upon an adjustable stop, *i*. The circuit *x x* of a small battery, LB, passes through the lever *h'* and stop *i*. This circuit, *x x* also passes through an electro-magnet, *l'*, whose armature lever, *n*, is pivoted in suitable standards, 1, 2. The free end of this lever *n* is widened out into a plate, which takes under the free ends of a series of circuit springs, in this case four in number, *o¹, o², o³, o⁴*, which number however may be greater or less as desired.

These springs are attached to an insulating support, *q'*, and are arranged when not lifted by *n* to rest upon contact posts *r¹, r², r³, r⁴*. The motor circuit *m c* passes to the spring *o¹* and post *r¹*, then by wire to spring *o²* and post *r²*, and so through the series.

The lever *h'* and part *i* are adjusted so that they shall remain in contact whenever a desired predetermined speed is not exceeded, but that *h'* shall be lifted from *i* when such speed is exceeded. In this latter event the circuit *x x* is broken between *h'* and *i*, the magnet *l'* is discharged, the armature lever *n* is raised by the force of its spring, lifting the springs *o¹, o², &c.*, from their posts and breaking at each the motor circuit *m c*. By this means a motor may be kept in action with a steady speed, and the destructive effects

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effects of one large main circuit spark lessened very materially by dividing into several minor sparks, or, by increasing the number of springs and contact posts for breaking the main circuit, any sensible spark effect may be entirely obviated.

If desired, the battery, L B, circuit xx , and magnet l^1 , may be dispensed with, and the springs o^1, o^2, o^3, o^4 , &c., be operated by the lever h^1 . Further, several magnets, l^1 , and armature might be used, one being assigned for each spring or for each division of two or more springs of the entire number used. In addition upon the shaft b is mounted a heavy fly or balance wheel, F W, whose momentum serves to avoid too sudden fluctuations in speed upon breaking the circuit.

In figs. 3, 4, and 5, a^4 is any suitable electro motor in which a^1 is the rotating armature, on whose shaft is a commutator, d^2 , upon which press the springs or brushes $d d$, for completing the circuit from the conductors 1 2 to the motor. Upon the shaft is the pulley b^1 , secured thereto by friction, the friction being so adjusted that the pulley and shaft shall be held and move together when only the resistance of the actuated machine is to be overcome, but that whenever a greater resistance is offered the friction shall be overcome and the shaft rotated within the pulley without rotating it.

From the pulley b^1 a belt, b^5 , leads to the large fly pulley b^6 , secured to the frame of the actuated machine. Upon the shaft b^6 is the pulley b^7 , from which a belt, b^8 , transmits the motion to the actuated machine.

Upon the under side of the table e^4 , or to any convenient part of the frame, is pivoted a brake, e^5 , adapted to be brought to bear upon the pulley b^6 , but held normally from so doing by a spring, x . To the brake e^5 is pivoted the rod e^6 , which passes down and is connected with a treadle, e^7 , underneath the table. Through this treadle, then, any desired pressure may be put upon the periphery of the wheel b^6 , regulating its speed, the current to the motor remaining unaffected and its rotation continued.

To the switch s^1 is attached a rod, s^2 , which passes to the front of the machine within easy reach of the operator. This switch is used to complete or break the circuit to the motor. The switch may, if desired, be placed upon the frame or table of the actuated machine. The form of the brake used may be varied; for instance, it may be a belt-tightener, the belt b^8 being normally loose and the brake arranged to tighten it so that it will take upon the pulleys and transmit motion from one to the other.

What I claim is—

First—A rotating armature composed of thin metal plates, discs, or rings, as described, with alternating interposed insulating material secured together upon a shaft or hub, substantially as set forth.

Second—The combination with a commutator of contact brushes or springs arranged at an angle to the axis of the commutator, substantially as set forth.

Third—The combination with the shaft of a commutator or rotating armature, or both, adapted to have a reciprocating movement in its supporting journals, of means for giving such motion, substantially as set forth.

Fourth—The combination with a rotating shaft of a commutator or armature, or both, of an armature, a magnet, a circuit-controlling device for giving a reciprocating motion to the shaft, substantially as set forth.

Fifth—The combination with a revolving armature of a governor receiving motion therefrom and adapted to control the main circuit, substantially as set forth.

Sixth—The combination with a revolving armature of a fly or balance wheel, substantially as set forth.

Seventh—The combination with the main circuit of a circuit-breaker adapted to break or close the main circuit at several points simultaneously, substantially as set forth.

Eighth—The combination with an electro-motor of a brake applied to the main driven wheel, substantially as set forth.

Ninth—The combination with an electro-motor of a friction pulley on the rotating shaft of the motor and a brake applied to the main driven wheel and adapted to control its speed, substantially as set forth.

Tenth—The combination with an electro-motor of a mechanical brake applied to the main driven wheel and adapted to control its speed, substantially as set forth.

Signed by me, this thirteenth day of September, A.D. 1880,—

THOMAS ALVA EDISON.

Witnesses,—

CHAS. H. SMITH.

GEO. T. PINCKNEY.

This is the specification referred to in the annexed Letters of Registration granted to Thomas Alva Edison, this nineteenth day of January, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

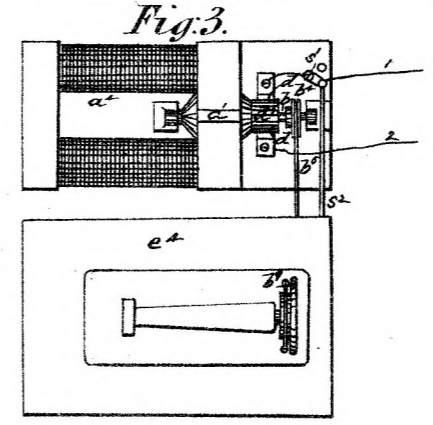
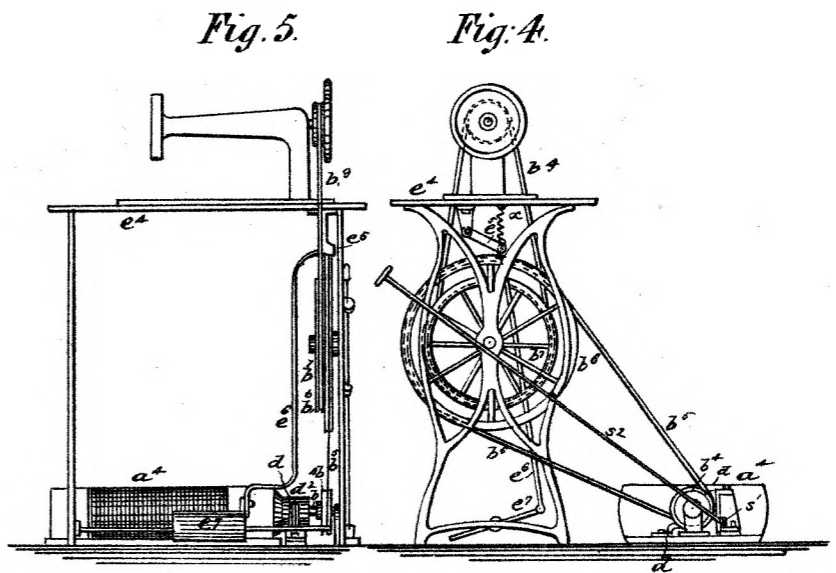
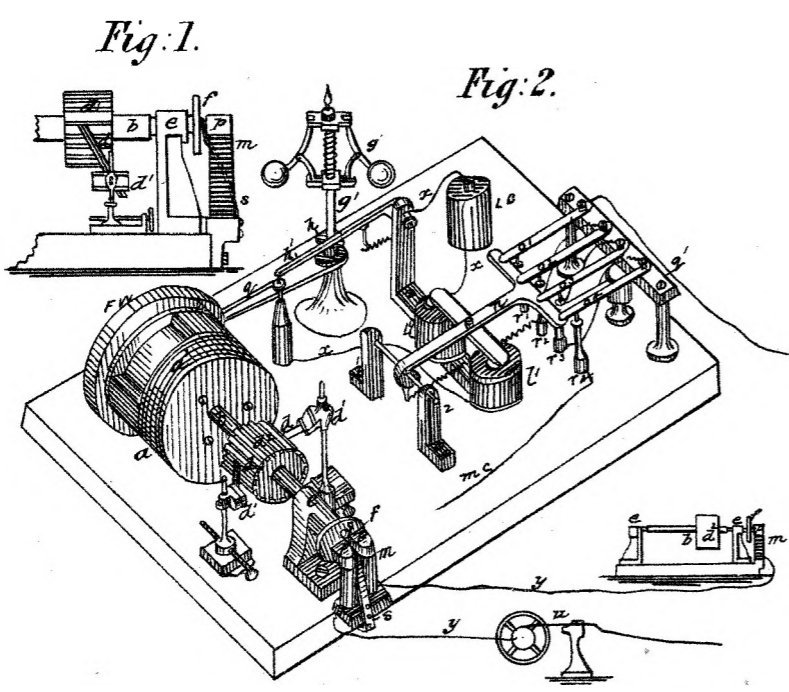
The application of Mr. Thomas Alva Edison for Letters of Registration having been referred to us, we have carefully examined the specification, and see no objection to the application being granted.

We have, &c.,

E. C. CRACKNELL.

E. O. MORIARTY.

The Under Secretary of Justice.



Witnessed,
 Chas. Smith
 Geo. T. Pinkney.

Inventor,
 Thomas Alva Edison.

*This is the Sheet of Drawings referred to in the annexed
 Letters of Registration granted to Thomas Alva Edison,
 this nineteenth day of January 1881.*

Augustus Loftus.



A.D. 1881, 27th January. No. 902.

AN IMPROVED CHAIR FOR CHILDREN.

LETTERS OF REGISTRATION to H. & L. Cambier Brothers, for an improved Chair for Children, convertible at will into a Perambulator or Cradle.

[Registered on the 28th day of January, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting:

WHEREAS H. CAMBIER and L. CAMBIER, trading under the name or style of "H. & L. Cambier Brothers," at Ath, in the Kingdom of Belgium, chair manufacturers, have by their Petition humbly represented to me that they are the authors or designers of a certain invention or improvement in manufactures, that is to say, of an invention entitled "An improved Chair for Children, convertible at will into a Perambulator or Cradle," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed; and that they, the said Petitioners, have deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and have humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to them for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said H. Cambier and L. Cambier, their executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said H. Cambier and L. Cambier, their executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said H. Cambier and L. Cambier shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this twenty-seventh day of January, in the year of our Lord one thousand eight hundred and eighty-one.

[L.s.]

AUGUSTUS LOFTUS.

An improved Chair for Children.

SPECIFICATION of H. CAMBIER and L. CAMBIER, trading under the name or style of "H. and L. Cambier Brothers," at Ath, in the Kingdom of Belgium, chair manufacturers, for an invention entitled "An improved Chair for Children, convertible at will into a Perambulator or Cradle."

THIS invention consists of an improved chair for children, which is convertible at will into a perambulator or cradle. When used as a chair, it is in the form shown in figure 1 of the accompanying drawings. The upper half is hinged at *a*, and connected by hook and eye at *b* to the lower half, so that by disconnecting said hook and eye and throwing back the play-table pivoted at *c*, the two halves of the chair can be swung on their hinges and made to assume the form of a perambulator, as shown in figure 2. By placing rockers, *d*, under the perambulator, so as to lift the wheels *e* off the ground, and by hooking them to the rails *f*; the perambulator is converted into a cradle, the hinged part of the seat marked *g* being swung over so as to form a continuous rest for the mattress.

We claim the construction of chairs for children, convertible at will into a perambulator or cradle, substantially as herein described and explained.

In witness whereof, we, the said H. Cambier and L. Cambier, have hereto set our hands and seals, this twenty-fifth day of November, one thousand eight hundred and eighty.

Witness—

EDWD. WATERS,
Melbourne, Patent Agent.

H. CAMBIER.
L. CAMBIER.
By their Agent,
FR. HUYLEBROECK.

This is the specification referred to in the annexed Letters of Registration granted to H. Cambier and L. Cambier, this twenty-seventh day of January, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

The application of Messrs. H. and L. Cambier Brothers, for Letters of Registration for an invention entitled "An improved Chair for Children, convertible at will into a Perambulator or Cradle," having been referred to us, we have examined the specification and drawing accompanying the same, and have now the honor to report that we see no objection to the issue of Letters of Registration as prayed for.

The Under Secretary of Justice.

Sydney, 3 December, 1880.
We have, &c.,
JAMES BARNET.
EDMUND FOSBERY.

[Drawings—one sheet.]

H.&L.CAMBIERS' PATENT.

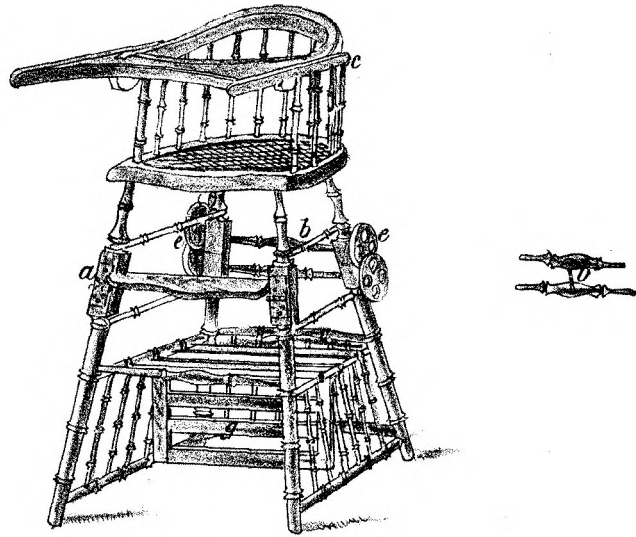


Fig. 1.



Fig. 2.



Fig. 3.

This is the Sheet of Drawings referred to in the annexed Letters of Registration granted to H. Cambier and L. Cambier this twenty-seventh day of January, A.D., 1887.

Augustus Loftus



A.D. 1881, 27th January. No. 903.

IMPROVEMENTS IN EXTRACTING GOLD, &c.

LETTERS OF REGISTRATION to Paul Gustave Louis Gabriel Designolle, for Improvements in extracting Gold and other precious metal from ores and other substances, and in the Apparatus employed therein.

[Registered on the 28th day of January, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting:

WHEREAS PAUL GUSTAVE LOUIS GABRIEL DESIGNOLLE, of Paris, in the Republic of France, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention of "Improvements in extracting Gold and other precious metal from ores and other substances, and in the Apparatus employed therein," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Paul Gustave Louis Gabriel Designolle, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said Paul Gustave Louis Gabriel Designolle, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said Paul Gustave Louis Gabriel Designolle shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this twenty-seventh day of January, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in extracting Gold, &c.

SPECIFICATION of PAUL GUSTAVE LOUIS GABRIEL DESIGNOLLE, of Paris, for "Improvements in extracting Gold and other precious metal from ores and other substances, and in the Apparatus employed therein."

THE said invention relates to a process for extracting the whole of the precious metal, and more particularly the gold contained in ores of all descriptions, goldsmith's ashes, and the like, the said process comprising a mode of effecting the electro-chemical and mechanical amalgamation of such metals, as well as a mechanical treatment for enabling the amalgam so obtained to be collected and completely separated from the gangues and other impurities in which it is distributed.

The invention is applicable to all ores containing amalgamable gold or silver, but it is more particularly adapted for the treatment of auriferous ores, such as auriferous schists or pyritous ores containing gold, known as sulphurets, in which the gold is found in a state of minute division, or in particular combinations, so that it eludes the ordinary process of extraction, whereas by means of this invention at least ninety-nine per cent. of the precious metal is collected.

The improved method of amalgamation, according to the present invention, by the employment of an electro-chemical process, combined with a powerful mechanical action, renders it possible to effect the amalgamation of the whole of the gold contained in the ores hereinbefore referred to, which ores could not heretofore be advantageously worked, except when they were of extreme richness, sufficient to compensate for the great waste involved by the treatment.

The improved system of treatment according to this invention is completed by the employment of a very simple rotary apparatus, which enables the whole of the amalgam obtained, in an extremely fine state of division, to be separated from the refuse.

The improved process of amalgamation is based upon the following principles, videlicet:—

With regard to the chemical action—

First—When an acid solution of any sort of mercury is exposed to the action of an electric current the salt will be decomposed and the mercury will be deposited in a metallic state at the negative pole. When the negative pole is formed by a blade or strip of gold amalgamation will take place.

Second—When strips of scoured or cleansed iron are in contact with a slightly acid solution of a salt of mercury, if these strips are touched with a gold wire or leaf, an electric chemical action takes place, in consequence of which the salt of mercury is instantly decomposed and metallic mercury passes to the gold wire or leaf and amalgamates with it. In certain cases the reaction is accelerated by slightly elevating the temperature.

Third—Taking into consideration the natural combinations of gold with antimony or tellurium, and the great affinity of chlorine for these two latter metals, then by employing A, bichloride of mercury in solution in water containing chloride of sodium, B, the electro-chemical reaction, causing the decomposition of the bichloride of mercury on contact with gold and iron, the antimonial gold and telluride of gold will be decomposed, the chlorine uniting with the tellurium or antimony to form chlorides, whilst the mercury unites with the gold and forms an amalgam.

With regard to the physical action—

First—The mercury or amalgamated metal plates powerfully attract the globules of mercury however finely divided.

Second—The attraction of the mercury or amalgamated metal plates is greater for gold amalgam than for native gold.

Third—The water containing particles of gold in suspension is a positive obstacle to the adherence of this metal to the amalgamated metal plates.

Fourth—This phenomenon does not take place when the particles of gold have been previously amalgamated, because, by reason of the attraction hereinbefore referred to, the particles of gold amalgam become instantaneously attached to the mercury of the plates, with which they unite.

Fifth—When gold is present in the finest imaginable condition of tenuity, preliminarily amalgamation has the effect of increasing the volume of each particle of gold, which increase of volume is highly favourable to the separation of these particles from their gangues.

Sixth—The preliminary amalgamation has the effect of modifying the condition of the auriferous slimes which are formed during the pulverization; in fact, these slimes, after amalgamation, lose their stiffness, and assume under certain conditions a spherical form, which is the form most favourable to their precipitation.

Bichloride in solution in water containing a certain quantity of chloride of sodium, is preferably employed as a salt of mercury, in order to avoid the formation of proto-chloride of mercury, which would be precipitated.

In order to effect the amalgamation of the whole of the gold present in the ore, the weight of the mercury contained in the salt employed should be at least five times the weight of the gold contained in the ore.

The difficulty in obtaining a practical result from the reaction which takes place consists in the necessity for bringing all the extremely fine particles of gold, which are contained in finely pulverized ore held in suspension in water containing a salt of mercury in solution, into intimate contact with iron within a relatively short time.

According to this invention this result is obtained with great simplicity, by effecting the amalgamation simultaneously with a perfect pulverization in a special apparatus constructed wholly of wrought and cast iron, in which the coarsely pulverized ore is placed, together with the salt of mercury in solution in water, the said apparatus being constructed in such a manner as to present a large amount of surface of contact with the iron.

This apparatus consists of an iron cylinder containing spheres of the same metal of different sizes and effects, the complete pulverization of the ore at the same time bringing all the particles of gold contained in the ore into forcible contact with iron, which ensures the electro-chemical action requisite for

Improvements in extracting Gold, &c.

for effecting the amalgamation. This cylinder performs a double function: it acts as a mechanical agent for effecting the pulverization, and as a chemical agent, owing to its being constructed of a metal which effects the electro-chemical reaction. Thus the particles of gold instead of being reduced by a simple grinding action to or into very fine laminae or flakes, which float in the liquid, and so escape from amalgamation, as in the apparatus heretofore employed, are immediately amalgamated, thereby increasing their weight and volume, and facilitating their deposition, at the same time that the influence of the movement causes the diminutive masses of semifluid amalgam to rapidly assume a spherical form more favourable to their precipitation.

It is of the greatest importance, in treating the various minerals hereinbefore referred to, that the amalgamation of the particles of gold should be absolutely complete in the apparatus appropriated for this process before the substances pass on to the plates provided for collecting the amalgam.

It is found that the very fine and light particles of gold are carried away without adhering to the plates, but that this is not the case with the globules of amalgam previously formed, which are precipitated on to the plate, and remain fixed thereto, the refuse alone being carried away by the current of water.

The special apparatus constructed according to this invention, which enables the whole of the amalgam produced to be collected, is composed essentially of a series of alternate revolving and stationary discs or plates of amalgamated metal, upon which the liquid is caused to fall on leaving the grinding apparatus in which the amalgamation is effected.

Moreover, as the apparatus is completely closed, there is no risk of loss of the precious metal from the dishonesty of the workpeople; and as the whole of the amalgam is retained, the water carrying the refuse containing no trace of mercury may be allowed to flow off into any stream or river without polluting the same or involving any waste of the precious metal.

In carrying the said invention into practice two apparatuses are employed, videlicet—(1) An apparatus for effecting the amalgamation; and (2) an apparatus for fixing or collecting the amalgam as hereinafter described.

Figure 1 of the accompanying drawings represents a side elevation, partly in section, of an apparatus for collecting the amalgam; and figure 2 is a plan, also partly in section, corresponding to figure 1; figure 3 is a side elevation, partly in section, of an apparatus for effecting the amalgamation; and figure 4 is a corresponding transverse section of the same.

The apparatus for effecting the amalgamation, which is illustrated in figures 3 and 4, consists of a horizontal cylinder, *a*, of sheet iron, capable of rotating in either direction on a horizontal axis, *f*, supported in suitable bearings, *g*; the said cylinder is terminated at its opposite extremities in the form of truncated cones, *b b'*, and contains a quantity of cast-iron balls, *h*, of different sizes. The coarsely pulverized ore is introduced at the end *b* of the cylinder, through a hopper, *c*, together with water containing a salt of mercury in solution, and the amalgamation of the gold is effected at the same time as the grinding, during the rotation of the apparatus, under the electro-chemical action which is produced. When the whole of the salt of mercury is decomposed, which is known to be the case when the liquid ceases to yield a reddish orange precipitate with iodide of potassium, the motion of the cylinder is arrested and immediately recommenced in the opposite direction, whereupon the materials treated are discharged automatically through an opening at the end *b'*, the said end being provided internally with blades, *d*, in the form of a conical helix.

The arrangement of apparatus hereinbefore described may however be somewhat modified, provided that the apparatus is constructed entirely of iron; as for example, the water containing the ore in suspension may be caused to circulate in vessels provided with perforated iron plates, or metallic gratings, or gauze, or grinding mills of wrought or cast iron may be employed, having horizontal or vertical axis, or balls rolling in a circular trough, and the like.

The apparatus for collecting the amalgam, which is illustrated in figures 1 and 2, is constructed and arranged in the following manner:—A is a series of copper or silver discs or plates, fast on a vertical rotating shaft, D, and enclosed in a cylindrical case, K, the latter being provided with a hopper, E, for the introduction of the materials to be treated, and a suitable outlet at the lower part for the escape of the refuse. The cylinder K is also provided internally with a series of concave plates, forming annular shelves, C, of copper or silver, sloping towards the centre, and arranged alternately with the discs A on the shaft D. These shelves are formed in segments, and are attached to the sides of the cylindrical case K, which are likewise formed in segments, being also mounted on hinges so as to be capable of opening outwards when required. In figure 1, one of these segments on the right is represented in the open position, and in figure 2 all the segments are represented as being open.

In operating with this apparatus, the discs A having been amalgamated, as also the stationary shelves C, and the segments of the case having been closed, the finely pulverized ore in suspension in water, after having been treated in the grinding and amalgamating apparatus hereinbefore described, is introduced through the hopper E, and the shaft D is set in motion.

The liquid falls on to the central part of the uppermost rotating disc, upon which it is distributed laterally, under the centrifugal action, and flows over the edge of the disc; the liquid thence falls on to the uppermost stationary shelf, which causes it to flow back towards the centre of the apparatus, where it falls on to the next rotating disc, which again causes it to flow to the sides of the apparatus, and so on in succession, the refuse from which the whole of the gold will have been abstracted being discharged at the lower part of the apparatus.

The number of discs and shelves, their dimensions, and the speed of rotation, will vary according to the nature of the gangue, the degree of tenuity of the particles of amalgam, and the richness of the ore under treatment.

The amalgam accumulated upon the discs and shelves may be readily collected and removed by opening the sides of the case and scraping it off with an india-rubber scraper.

The amalgamation of the discs and shelves of copper or silver for fixing the amalgam is effected, preferably, according to this invention, by means of bichloride of mercury, with the addition of chloride of sodium.

The

Improvements in extracting Gold, &c.

The reactions and apparatus, hereinbefore described, for the treatment of gold, are also applicable to native silver, chloride of silver, and to the extraction of silver contained in ores in any state of combination, provided that the said silver has been previously brought to the condition of native silver or chloride.

Having now described and particularly ascertained the nature of the said invention, and the manner in which the same is or may be used or carried into effect, I would observe in conclusion that what I consider to be novel and original, and therefore claim as the invention secured to me by the hereinbefore in part recited letters patent is—

First—The system or mode of electro-chemical amalgamation obtained and carried out by means of combined mechanical and chemical action, substantially as hereinbefore described.

Secondly—The application and use of bichloride of mercury in solution, in conjunction with chloride of sodium, substantially as and for the purpose hereinbefore described.

Thirdly—The peculiar construction and arrangement of grinding and amalgamating apparatus, constructed entirely of iron, and consisting of a cylinder and ball, with provision for the admission and discharge of the materials under treatment, substantially as hereinbefore described, and illustrated in figures 3 and 4 of the accompanying drawings.

Fourthly—The peculiar construction and arrangement of apparatus for fixing the amalgam, the said apparatus consisting essentially of a series of revolving discs of amalgamated metal alternating with stationary concave plates, also of amalgamated metal, arranged so as to act in succession upon the substances under treatment, and contained in a case capable of being entirely closed in on all sides, substantially as hereinbefore described, and illustrated in the accompanying drawings.

PAUL GUSTAVE LOUIS GABRIEL DESIGNOLLE.

Signed, sealed, and delivered by the said Paul Gustave Louis Gabriel Designolle, in the presence of—

EUGENE DUBAIL,
30, Rue de Rivoli, Paris.

E. COPPIN,
88, Boulevard Beaumarchais, Paris.

This is the specification referred to in the annexed Letters of Registration granted to Paul Gustave Louis Gabriel Designolle, this twenty-seventh day of January, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

We have carefully examined the plans and specifications for Letters of Registration applied for by Mr. Paul G. L. G. Designolle for "Improvements in extracting Gold and other precious metals, &c.," and see no objection to the same being granted.

Sydney, 16 December, 1880.
We have, &c.,
E. C. CRACKNELL.
A. LEIBIUS.

The Under Secretary of Justice.

[Drawings—one sheet.]

Fig. 1

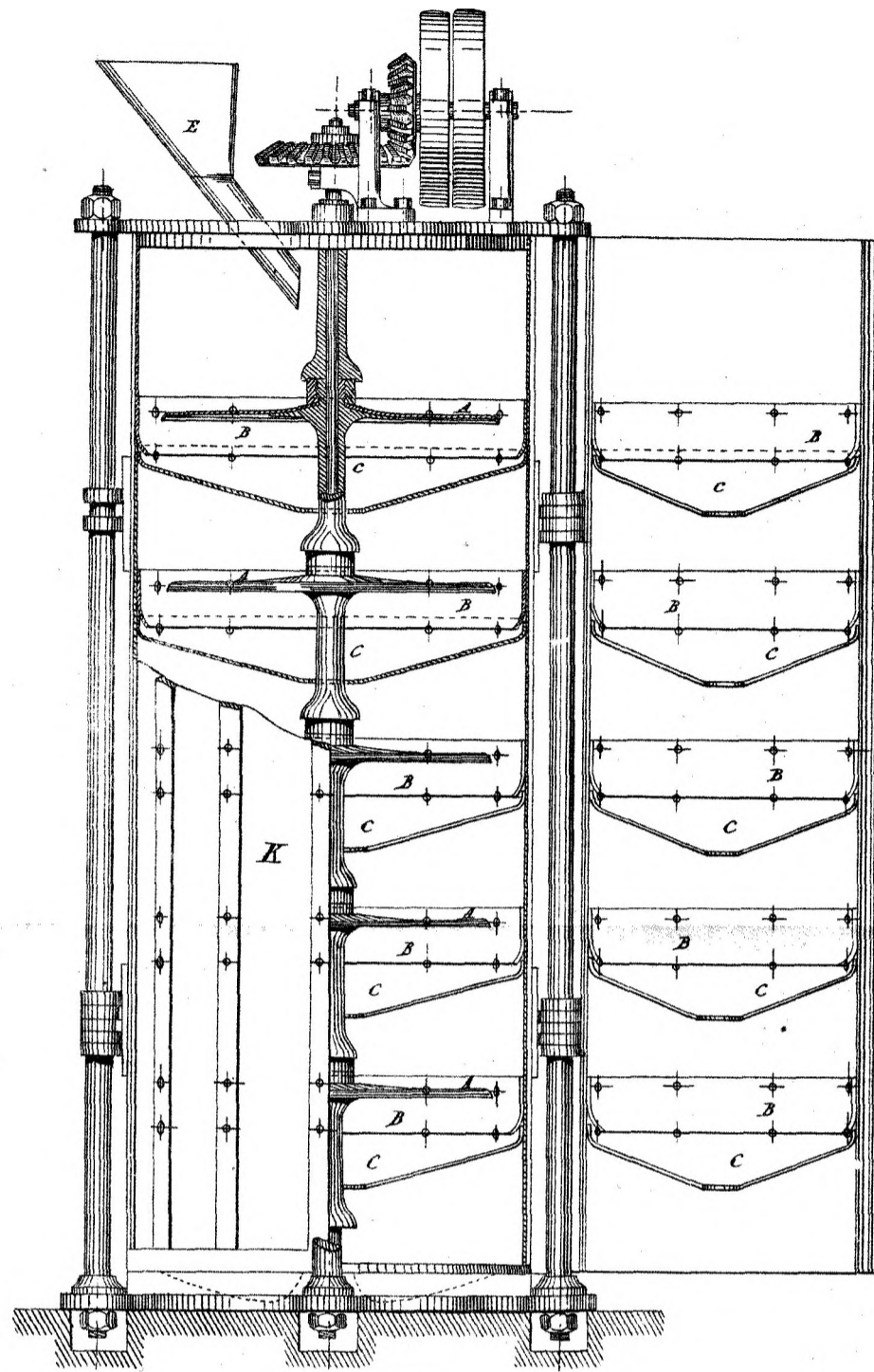


Fig. 2.

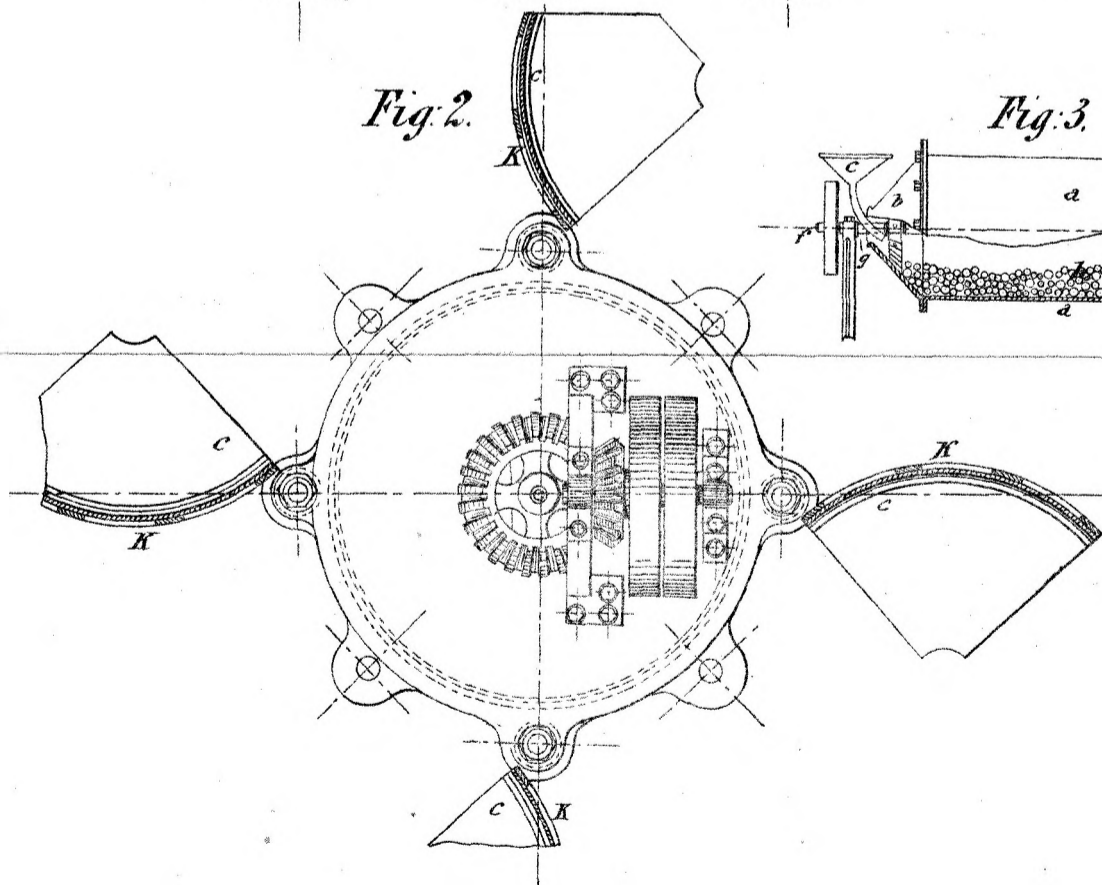


Fig. 3.

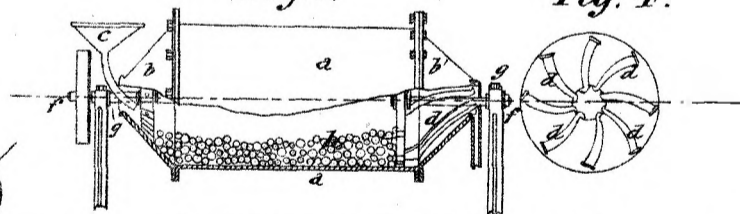


Fig. 4.

*This is the Sheet of Drawings referred to in the annexed
Letters of Registration granted to Paul Gustave Louis
Gabriel Designolle, this twenty seventh day of January,
A.D. 1881.*

Augustus Loftus.



A.D. 1881, 27th January. No. 904.

IMPROVEMENTS IN APPARATUS FOR THE MANUFACTURE OF GAS.

LETTERS OF REGISTRATION to William Rigg and William M'Lean, for
Improvements in Apparatus for the manufacture of Gas.

[Registered on the 28th day of January, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS WILLIAM RIGG and WILLIAM M'LEAN, both of No. 69, Elizabeth-street, Melbourne, in the Colony of Victoria, wholesale and retail ironmongers, have by their Petition humbly represented to me that they are the assignees of William Smith, of Pittsburg, in the State of Pennsylvania, one of the United States of America, who is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in Apparatus for the manufacture of Gas," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed ; and that they, the said Petitioners, have deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four ; and have humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to them for a period of fourteen years : And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said William Rigg and William M'Lean, their executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof : to have, hold, and exercise unto the said William Rigg and William M'Lean, their executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended : Provided always, that if the said William Rigg and William M'Lean shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this twenty-seventh day of January, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Apparatus for the manufacture of Gas.

SPECIFICATION of WILLIAM RIGG and WILLIAM M'LEAN, both of No. 69, Elizabeth-street, in the city of Melbourne and Colony of Victoria, wholesale and retail ironmongers, the assignees of William Smith, of Pittsburg, in the State of Pennsylvania, one of the United States of America, the author or designer of an invention entitled "Improvements in Apparatus for the manufacture of Gas."

THIS invention consists of new and useful improvements in apparatus for the manufacture of gas, and we do declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawing forming part of this specification, in which figure 1 is a perspective view, partly in section, of a furnace and retorts partly embodying this invention; figure 2 is a longitudinal vertical section, and figure 3 a transverse section of the same; figures 4, 5, 6, 7, 8, and 9 are detailed views of the furnace tile; figures 10, 11, and 12 are modified forms of retorts. Like letters refer to like parts wherever they occur. This part of the invention relates to the construction of furnaces and retorts for the manufacture of gas from oil, and consists first, in the arrangement of a series of vertical retorts, so set in a suitable furnace, and provided with deflectors, that the flame of the furnace is caused to reverberate upon and envelope the retorts, whereby the retorts are evenly and effectually heated; secondly, in the formation of grooved or channelled and perforated tile, which when arranged in position form a series of flues, surrounding the fire chamber and communicating with the stack; thirdly, in so constructing and shaping the retorts that only curved lines are presented to the flame, whereby the effect of the expansion and contraction of the metal is neutralized, and a strong and durable apparatus is obtained, and fourthly, in details of construction hereinafter specified.

We will now proceed to describe this part of the invention, so that others skilled in the art to which it appertains may apply the same.

A indicates the outer wall of the furnace or fire chamber, which may be built of brick if desired; but if preferred, either cast of metal, or formed in separate plates and bolted together. Within the same is arranged centrally a grate surrounded by a ledge or flange, a^1 , for the support of the lining B. The lining B is composed of a series of tiles, $b^1 b^2 b^3$, grooved longitudinally, as shown at c , so that when two tiles are placed face to face a continuous flue is formed within the fire chamber walls. Of these tiles those marked b^1 are usually bevelled or sloped upon one side, to accommodate the retort when dependent retorts are used. Said tiles are pierced as at c^1 at equal distances, so that the flue formed by c communicates directly with the fire chamber. The end tiles $b^2 b^3$ may or may not be bevelled as preferred, there being no special object other than uniformity in sloping them; but the tile b^3 next the outer wall should be perforated as at c^2 , to permit the products of combustion from c to enter the smoke stack; l represents a series of liners formed of fire-brick or other material, shaped on one face to correspond with the under surface of the retort which is to rest thereon. These liners span the fire chamber between the flue openings or ports c^1 , and support the several retorts, thus preventing any tendency of the retorts to sag, and preserving them from the direct action of the heat on the bottom.

D represents a series of vertical retorts arranged within the furnace as shown in figure 1, supported by the wall A, or if desired by the tiles B, and with spaces between the several retorts to permit the flame to play around them. These retorts are flat or flask-shaped, terminating above in a neck, d , having a cup or lead seal for the reception of the pipe which conducts off the gas, and either straight, rounded, or sloping below, as shown in figures 3, 10, 11, and 12, but preferably rounded or slightly bellied as shown in figure 3, such shape being found to be equally efficient and very durable; $d^1 d^2$ indicate tubes or openings on opposite sides of the retort, one being provided with a suitable pipe for admission of oil, to be transferred into gas, the opposite opening being employed for cleaning the retort, and when not so used is luted or otherwise closed.

In order to cause the flame and products of combustion to envelope and equally heat the retort, a series of deflecting partitions, e , are formed upon the sides of the retorts, which when the retorts are set form central flues, which receive the products from the grate and side flues, which conduct the products to the flues which surround the fire chamber.

Where necessary from the form given to the bottom of the retort, the partitions e are extended down to form wings or flanges, e^1 , whose lower edges rest upon the tiles B between the perforations c^1 . In some instances it will be found advantageous to form passages or flues, f (shown in figures 10 and 11), through the retorts, to effectually heat the upper part thereof.

D¹ is a hood or cap, which may be of any suitable material, but is preferably of cast metal or plate riveted to end pieces, provided with openings above for the passage of the necks of the retorts, and so connected to the case A as to be detachable therefrom. In the end of the outer wall or case A, opposite each set of tiles b^1 , is an opening a^2 , by means of which the tile flues can be cleaned at will.

The devices are employed in the usual manner of making oil gas, that is to say, the retorts having been brought to or nearly to a cherry red, the oil is admitted to the retort in graduated quantities by means of opening d^1 , is converted into gas, and escapes by the eduction-pipe connected to neck d .

When the retorts are to be cleaned the tube d^2 is unclosed, and the gas allowed to flow through or burn within the retort, and a rod or other instrument inserted to scrape the retort if necessary. The openings a^2 which are ordinarily closed by fireclay or plugs may be opened to clear the flues c .

The advantages of this part of the invention are that the essential parts are readily detached and packed for transportation; are easily removed, and replaced, or repaired; new parts can be substituted for old sections, without materially interrupting the working of the apparatus. The apparatus is very compact, and has great capacity in proportion to its size; and, owing to the arrangement of the flues and form of the retorts, is very durable and consumes little fuel.

The second part of this invention relates to a cheaper method of making the crown, cap, or dome of gas and other furnaces than is described in the former part of this specification, and consists in substituting for the fire tiles hereinbefore described a refractory material such as brick fire-clay daubed on to a metallic plate or plates provided with pins having an interlacing of wire. In the drawings, fig. 13 shows section of a furnace constructed in this manner, and fig. 14 perspective of one of the metallic plates partially covered with the fireclay; b^1 is the metallic plate, c the pins, d the interlacing wire, and e the fire-clay.

Having

Improvements in Apparatus for the manufacture of Gas.

Having thus described this invention, what we claim and desire to secure by Letters of Registration is—

First—In a gas apparatus of the class described, the combination of a series of vertical retorts having deflecting ribs, forming the central flue, and side flues with a series of channelled and perforated side walls and central fire chamber, substantially as and for the purpose specified.

Second—The longitudinally grooved and perforated tile lining for gas retort furnaces in combination with the ribbed retorts, substantially as specified.

Third—The oval flask-shaped gas retort provided with the deflecting ribs, the neck and oil inlet, substantially as and for the purpose specified.

Fourth—A crown, cap, or dome, for gas and other furnaces, the same consisting of a metallic plate or plates provided with pins having an interlacing of wire, and of a lining of refractory material, the pins and wire being embedded in the refractory material, and the whole combined substantially in the manner and for the purpose specified.

In witness whereof, we, the said William Rigg and William M'Lean, have hereto set our hands and seals, this third day of December, one thousand eight hundred and eighty.

Witness—

EDWD. WATERS,
Melbourne, Patent Agent.

WM. RIGG.
WILLIAM M'LEAN.

This is the specification referred to in the annexed Letters of Registration granted to William Rigg and William M'Lean, this twenty-seventh day of January, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

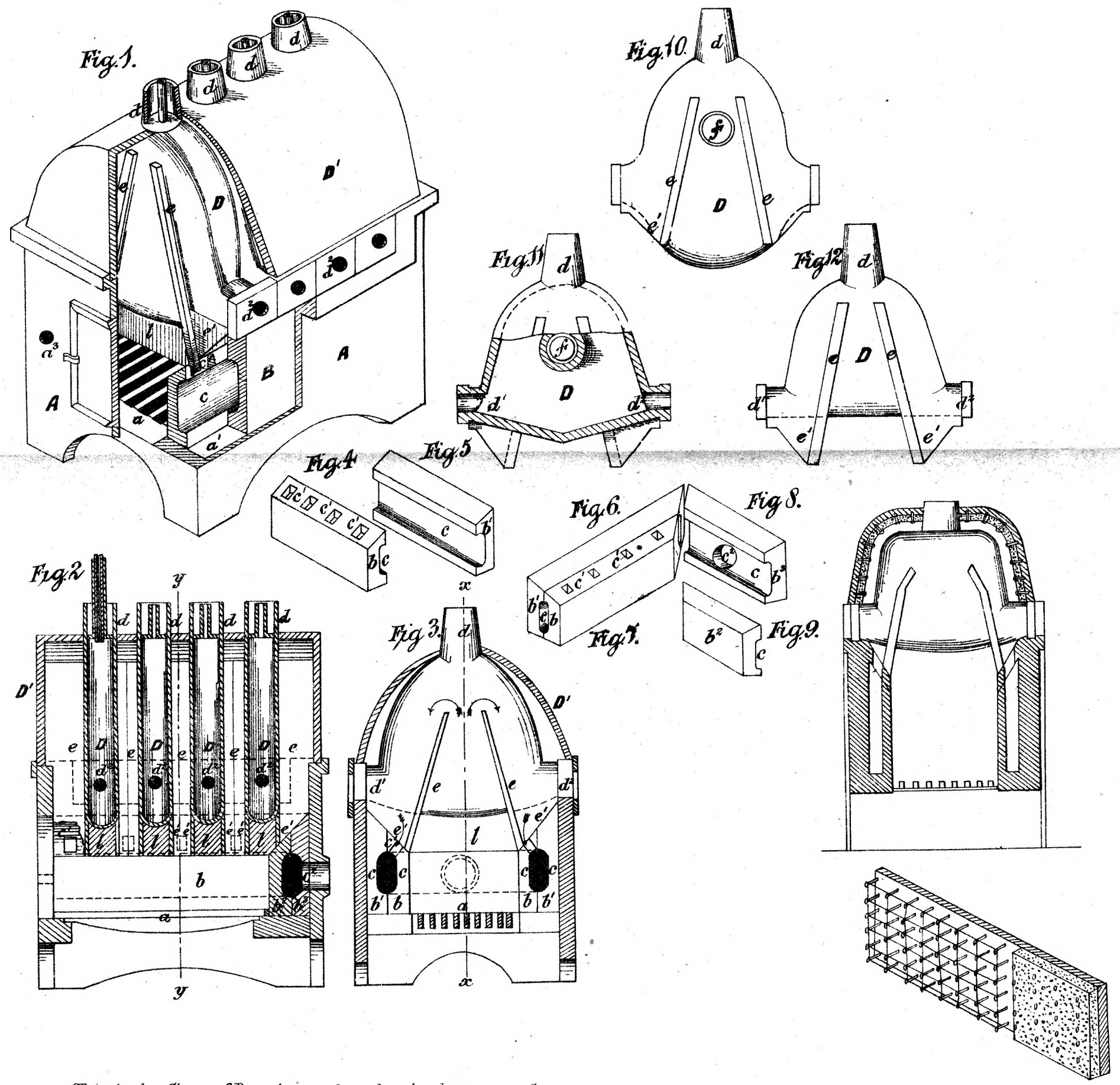
With reference to the application of Messrs. Rigg and M'Lean for Letters of Registration for "Improvements in the Apparatus for the manufacture of Gas" which has been referred to us, we have the honor to state that we have examined the specifications and drawings accompanying the same, and have now to report that we see no objection to the issue of Letters of Registration for the apparatus as figured and described.

Sydney, 13 December, 1880.
We have, &c.,
CHAS. WATT.
H. C. RUSSELL.

The Under Secretary of Justice.

[Drawings—one sheet.]

RIGG AND McLEAN'S-(SMITH'S)-PATENT.



This is the Sheet of Drawings referred to in the annexed Letters of Registration, granted to William Rigg and William McLean this twenty-seventh day of March, A.D. 1881.

PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE, SYDNEY, NEW SOUTH WALES. *Augustus Loftus.*



A.D. 1881, 31st *January*. No. 905.

**IMPROVEMENTS IN STOPPERS FOR BOTTLES FOR CONTAINING AERATED
OR GASEOUS LIQUIDS.**

**LETTERS OF REGISTRATION to John Lamont, for Improvements in Stoppers
for Bottles for containing Aerated or Gaseous Liquids.**

[Registered on the 1st day of February, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS
(commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of
the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-
Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting:

WHEREAS JOHN LAMONT, of Glasgow, in the County of Lanark, North Britain, merchant, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvements in manufactures, that is to say, of an invention intituled, "Improvements in Stoppers for Bottles for containing Aerated or Gaseous Liquids," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said John Lamont, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said John Lamont, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said John Lamont shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this thirty-first day of January, in the year of our Lord one thousand eight hundred and eighty-one.

[L.s.]

AUGUSTUS LOFTUS.

Improvements in Stoppers for Bottles for containing Aerated or Gaseous Liquids.

SPECIFICATION of JOHN LAMONT, of Glasgow, in the county of Lanark, North Britain, merchant, for an invention intituled "Improvements in Stoppers for Bottles for containing Aerated or Gaseous Liquids."

THIS invention relates to improvements in internal stoppers for bottles for containing aerated or gaseous liquids, the main object of the improvements being to render such stoppers lighter, and thereby lessen the risk of breakage, and to allow of the bottles being more easily filled and opened.

In carrying out my invention, I form the stem or body of the stopper of glass or other suitable material having a greater specific gravity than water, of a suitable length, and preferably of a slightly conical form; around the stopper and near the base thereof I form a groove of suitable shape to receive a ring or tube of rubber, and the bottom of the stopper is recessed or hollowed, whereby I ensure the stopper always falling to its proper position in the neck of the bottle from the weight of the head portion of the stopper.

It is to be understood that this improved stopper is specially constructed for use with bottles made according to the specification of English Letters Patent granted to me, dated the 2nd day of June, 1874, No. 1,923; but the improved stopper may be used with other bottles.

But to make my invention better understood, I will proceed to describe the same by reference to the accompanying drawing.

Figure 1 is an elevation of the stem or body of my improved stopper, which is preferably made of glass, but may be made of other suitable material having a greater specific gravity than water.

The stem or body *a* of the stopper is preferably made of a slightly conical form, as shown; *b* is the groove formed around the stem or body *a*, as clearly shown in figure 2, which is a section of figure 1; this figure also shows the recess or hollow *c*, in the bottom of the stem or body *a*, of the stopper. Figure 3 is an elevation of the stopper complete, *d* being the tube of india-rubber (shown in separate elevation at figure 7), placed around the lower end of the stem or body *a*, and fitting in the groove *b* therein, as shown in figure 4, which is a section of figure 3.

A stopper of this construction being placed in the interior of a bottle, and the bottle being filled with aerated water in the manner usual when internal stoppers are employed, the stopper, in consequence of the greater weight of its head portion, resulting from the recessed bottom *c* of the stem *a*, will fall into the proper position to close the bottle, as shown in figure 5, which is a section of a bottle made according to the specification of my said English patent, and closed with my present improved stopper. Figure 6 is a section of the said bottle showing the stopper in the position it usually occupies when the bottle has been opened and its contents discharged. A further advantage resulting from this construction of stopper is that the bottom end of the india-rubber tube *d* coming flush with the bottom of the stem or body *a*, avoids the risk of breakage either to the stopper or bottle when the bottle is opened, particularly when the stopper is made of glass.

Having thus described the nature of my said invention and the best means with which I am acquainted for carrying the same into effect, I wish it to be understood that I do not confine myself to the precise details herein laid down and shown in the drawing, as the same may be varied without departing from the peculiar character of my invention; for example, the shape of the stopper may be varied and other suitable heavy material than glass may be employed, and an elastic washer or ring may be employed instead of a tube; but what I claim is—

The improvements in stoppers for bottles for containing aerated or gaseous liquids as hereinbefore described, such improvements consisting in forming the stem or body of the stopper with a recessed bottom in combination with a ring or tube of vulcanized india-rubber around the lower part thereof, whereby the head of the stopper always falls foremost into the mouth of the bottle for effectually closing the same when the bottle is filled, as hereinbefore described and represented in the drawing, or any mere modification thereof.

In witness whereof, I, the said John Lamont, have hereto set my hand and seal, this twenty-first day of October, one thousand eight hundred and eighty.

Witness—

F. G. REDFERN, Patent Agent,
4, South-street, Finsbury, London.

JOHN LAMONT.

This is the specification referred to in the annexed Letters of Registration granted to John Lamont, this thirty-first day of January, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 21 December, 1880.

With reference to the application of Mr. John Lamont for Letters of Registration for "Improvements in Stoppers for Bottles containing Aerated Liquids," which has been referred to us, we have the honor to state that we have examined the specification and drawings accompanying the same, and have now to report that we see no objection to the issue of Letters of Registration.

We have, &c.,

CHAS. WATT.
THOS. RICHARDS.

The Under Secretary of Justice.

Fig 1



Fig 2



Fig 3



Fig 4



Fig 7



Fig 5

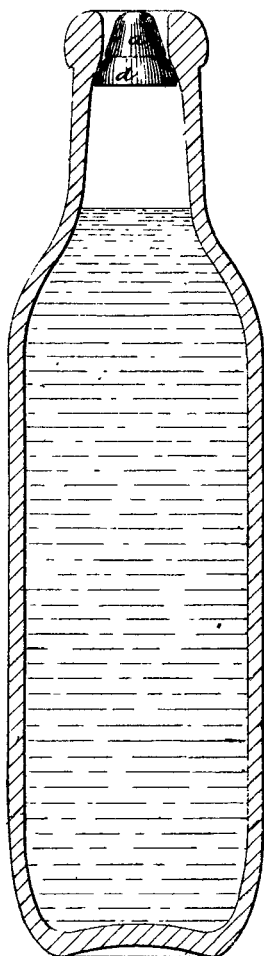
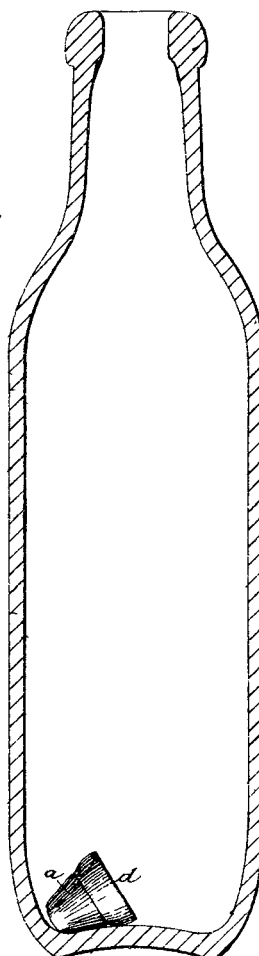


Fig 6



Witness
G. R. Kelfern

John Lamont

This is the Sheet of Drawings referred to in the annexed
Letters of Registration granted to John Lamont, this
thirty first day of January, A.D. 1881.

Augustus Loftus.



A.D. 1881, *8th February.* No. 906.

AN AUTOMATIC REVOLVING EARTH-SCOOP.

LETTERS OF REGISTRATION to Owen Blacket, for an automatic revolving Earth-scoop.

[Registered on the 9th day of February, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS, (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS OWEN BLACKET, of 119, Bathurst-street, Sydney, New South Wales, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "An automatic revolving Earth-scoop," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed ; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four ; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years : And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Owen Blacket, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof ; to have, hold, and exercise unto the said Owen Blacket, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended : Provided always, that if the said Owen Blacket shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this eighth day of February, the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

An automatic revolving Earth-scoop.

SPECIFICATION.

TO ALL WHOM IT MAY CONCERN:

BE it known that I, Owen Blacket, of 119, Bathurst-street, Sydney, New South Wales, have invented new and useful improvements in Earth-scoops, which improvements are fully set forth in the accompanying plan and specification:—

This invention, as shown in plan styled an automatic revolving Earth-scoop, being an improved method of removing earth, &c.

The scoop as shown in plan has two points from which the draught is taken, by which means the filling and discharging movements are given.

To fill the scoop the horse draws same with the bolt C held by catch B, so taking the strain from point B. When it is desired to overturn the scoop the handle E is lifted, which releases the bolt C by drawing it back from the catch B, so changing the draught strain from point B to centre-pin A by means of the bars F; the point of draught is thereby raised, and the scoop makes a complete revolution, the bolt C stopping same. The scoop is then ready for a fresh load.

Having described the mode of working, I would have it understood that I do not confine myself to precise details, so long as the nature of my said invention be retained.

I claim—

First—The principle of having two points of draught, one for filling and the other for overturning.

Second—The principle of disconnecting to draw from one point to another.

Third—The shape of side, so that the scoop may easily revolve.

OWEN BLACKET.

This is the specification referred to in the annexed Letters of Registration granted to Owen Blacket, this eighth day of February, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 20 December, 1880.

The application of Mr. Owen Blacket for Letters of Registration for an invention entitled an "Automatic revolving Earth-scoop" having been referred to us, we have examined the specification and drawing accompanying the same, and have now the honor to report that we see no objection to the issue of Letters of Registration as prayed for.

We have, &c.,

JAMES BARNET.

WILLIAM C. BENNETT.

The Under Secretary of Justice.

[Drawings—one sheet.]

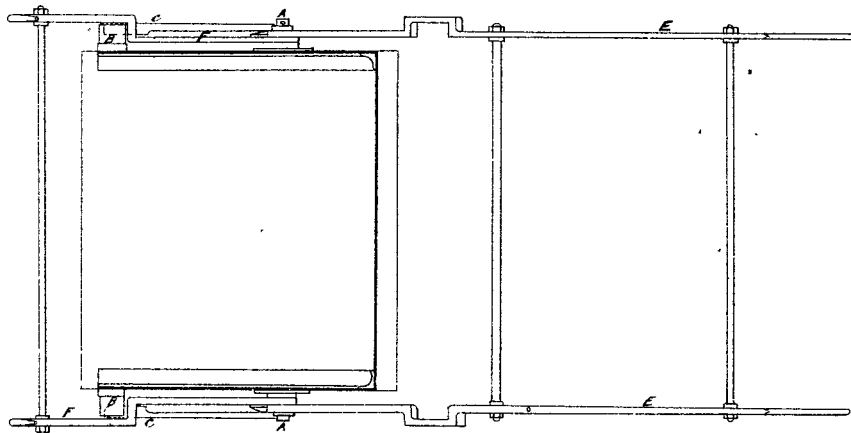
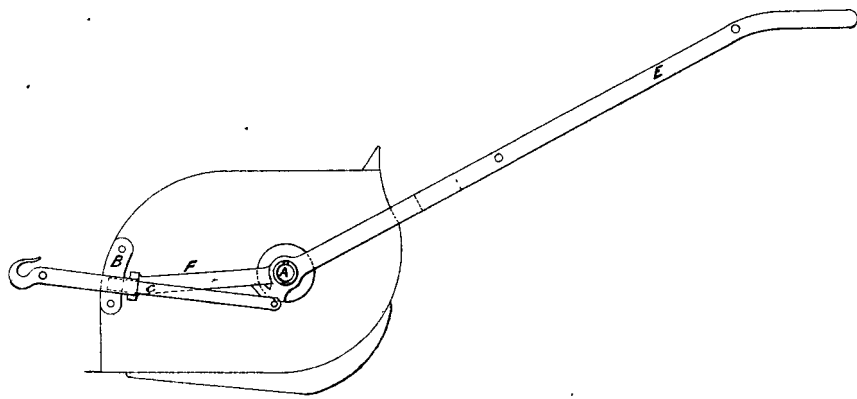
No. 907.

[Assignment of No. 613. See Letters of Registration for 1877, page 145.]

No. 908.

[Assignment of No. 862. See Letters of Registration for 1880, page 229.]

AUTOMATIC REVOLVING EARTH SCOOP.



Owen Blacket.

*This is the Sheet of Drawings referred to in the annexed
Letters of Registration, granted to Owen Blacket this eighth
day of February, A.D. 1881.*

Augustus Loftus.



A.D. 1881, 28th February. No. 909.

IMPROVED PROCESS FOR EXTRACTING OIL AND FAT.

LETTERS OF REGISTRATION to Thomas John Mullings, for a new and improved Process for extracting oil and fat and oily and fatty matters from wool and other substances, and the Apparatus connected therewith and applicable thereto.

[Registered on the 1st day of March, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS THOMAS JOHN MULLINGS, of London, England, gentleman, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention of "A new and improved Process for extracting oil and fat and oily and fatty matters from wool and other substances, and the Apparatus connected therewith and applicable thereto," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed ; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four ; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years : And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Thomas John Mullings, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof ; to have, hold, and exercise unto the said Thomas John Mullings, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended : Provided always, that if the said Thomas John Mullings shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this twenty-eighth day of February, in the year of our Lord one thousand eight hundred and eighty-one.

[I.S.]

AUGUSTUS LOFTUS.

Improved Process for extracting oil and fat.

SPECIFICATION of THOMAS JOHN MULLINGS, of London, England, gentleman, for an invention called "A new and improved process for extracting oil and fat and oily and fatty matters from wool and other substances, and the apparatus connected therewith and applicable thereto."

My invention relates principally to the extraction of oil and fat and oily and fatty matters from wool, but it is also equally applicable to the extraction of oily and fatty matters from woollen yarns or fabrics, and such other fibrous material or mixtures of materials as are from their nature affected in colour or quality when hydro-carbons are used for the purpose of extracting such oily and fatty matters, and are subsequently removed from the material under treatment by the slow process of admitting steam or using other means of raising the temperature to the respective boiling-points of such hydro-carbons, and so driving them off by evaporation.

The primary object of this invention, therefore, is to provide suitable apparatus and a process whereby oily and fatty matters may be extracted by the use of hydro-carbons without employing heat and so causing injury to the materials operated upon; and for this purpose I provide a cylindrical or other shaped vessel of suitable dimensions constructed of iron or other material, and furnished with a cover capable of being lifted or removed and rendered tight by a suitable joint or packing. Inside of this vessel I place a perforated or reticulated or otherwise suitably constructed cage or basket, which may either be a fixture, or be so fitted as to be capable of being lifted or otherwise moved into and out of position, and which said cage or basket will be adjusted in such a manner as to be capable of being made to revolve within the outer vessel by some one or any of the various modes of producing centrifugal action. Into this cage or basket I place the material to be treated (or the cage or basket may be first filled and afterwards placed in position) and adjust the cover, when I admit by suitable contrivances (such as are hereinafter more particularly described) carbon bisulphide (which I hereinafter for convenience designate as the agent), which passing through the material separates and removes the oily and fatty matters contained therein and then runs off by suitable means into a tank or reservoir, or direct into a still. This operation is continued until the material is cleared of such oily and fatty matters, which is easily ascertained by examination. When this is effected the agent remaining in the vessel is allowed to return to a tank or suitable reservoir, which operation can when the bulk of the agent has run off be speedily completed by setting in motion the revolving basket or cage containing the material. Water is then admitted, either under pressure or otherwise, for the purpose of cleansing or partially cleansing the material, and of washing out any agent which may remain, and the resulting liquid is allowed to pass off into a suitable reservoir, from whence the agent (if any be present) may be recovered. The revolving basket or cage containing the material is then again set in motion as before mentioned, and is continued in action until the material is dry. To assist this operation I in some cases employ a fan or blower, or adopt other suitable means for producing a current of air which in a cold or heated state is forced through the material intended to be dried. In some cases the air may, if necessary, be chemically or otherwise treated, but neither of these last-mentioned contrivances is a necessary adjunct to the apparatus connected with my invention.

And in order that my said invention may be fully understood, I shall now proceed more particularly to describe the same, and for that purpose the accompanying drawing is appended as an illustration, the same letters of reference indicating corresponding parts in the figures.

Figure 1 is a sectional elevation on line A B of a centrifugal drying machine designed and constructed specially to meet the requirements of this invention. Figure 2 is an outside elevation of the same machine. Figure 3 is a sectional plan on line C D of the same machine.

It is to be observed that the necessity of employing oil or grease for any of the bearings or moving parts of the apparatus with which the chemical agent employed may come in contact is wholly avoided, and this is an important feature in this part of my invention, but the same result may be obtained by constructing the apparatus in such a way that the bearings can be placed towards the top of the spindle, which might be lengthened, and above the overflow or level to which the agent will rise, and in this instance ordinary oiled bearings might be used.

A A is a case of cylindrical or other suitable form, B B a bottom plate for same, and C C a cover, all of which are constructed of iron or other suitable material or materials. The bottom plate B B is secured to the case A A by means of a faced and ground flanged joint bolted or secured in any other convenient manner; the outside edge of the bottom plate is constructed with a lip, D D, forming a trough for the reception of water which will cover the connecting joint between base and bottom plate. In this bottom plate immediately within the case A A is formed a channel or gutter, P P, for the purpose of draining the interior; around the top of the case A A another lip or trough, E E, similar to that described on B B, is provided, into which the rim of the cover F F is made to drop, thus forming when the trough is filled with water a sealed joint similar to the joint lastly before described. The surfaces in contact between cover and case are faced and ground. A bayonet or other suitable joint for securing the cover to the case may be provided. The bottom plate B B is provided with a cone in the centre, which carries at its top a conical bearing, G, for a central spindle, H. On this spindle is fitted a perforated or reticulated or otherwise suitably constructed basket, I I, with an open top so adjusted as to be capable of being lifted into and out of position, and firmly secured by suitable appliances to the central spindle H. To prevent loss of time and to avoid the necessity of striking any blow in the process of securing or removing the basket I prefer to use the following device:—To the top of the spindle I fit a deep nut, L, the outside diameter of which is smaller than the bore of the boss of the basket; I introduce a washer, K, recessed on its upper side one-fourth of an inch deep to receive the nut, and cut through on one side so that it may be withdrawn sideways from the spindle when the nut is lifted out of the recess, and the basket may then be lifted out of position. By this means it is only necessary to slacken or tighten the nut one-fourth of an inch to remove or fix the basket. The lower portion of the cone or bottom plate B B is formed into a stuffing-box, and is fitted with a gland, M. The lower end of the spindle H is made to run in a step, N, fitted with steel anti-friction discs, which by means of a passage through the side of the step, or some other suitable contrivance, are placed in communication with a water-box, O, so that the bearing of the spindle runs in water. The step N, the gland M, and cone bearing G are all fitted with metalined brushes

Improved Process for extracting oil and fat.

bushes with phosphor bronze or other suitable matrix, the purpose being to avoid the necessity for use of any oleaginous lubricant. A rotatory motion is given to the spindle by a pulley and belt, or other suitable appliances.

A hole is provided in gutter P P into which is fitted a pipe, Q, for the introduction of the agent; a second hole and pipe, R, are provided near the top of the case A A immediately under the trough E E for the overflow of the agent. Inside the case A A, and opposite to the pipe R, I prefer to fit a collecting box, S, the upper lip of which is placed as close as is convenient to the under side of the cover C C, for the purpose of making the effective outlet for the agent as high as possible. Another pipe and hole, T, figure 3, are provided, communicating with the gutter P P, by means of which the case may be drained of the agent. Another hole and pipe, U, are also provided, immediately below the trough E E, and in the side of the case A A communicating with a distributing pipe or suitable apparatus in the interior of the case, so arranged as to produce a fine spray or continuous thin sheet of water falling to the basket. An opening and pipe V may be provided in the side of case A A, through which a fan blast may be introduced, or other means may be provided for assisting the operation of drying. A corresponding opening and pipe, W, may be provided in the bottom plate B B for the exit of blast and vapour. All these pipes are provided with valves, and each may be opened or closed independently of the others.

For convenience only one pipe for each purpose is exhibited in the drawing, but any number and of any diameter may be provided to suit special circumstances.

I prefer the basket and the interior of the case to be tinned, enamelled, or otherwise suitably coated, and that the pipes should be of lead or galvanized iron, or other material treated to prevent oxidation.

The mode of conducting the operation is as follows:—The basket being filled with the material to be treated, and the troughs D D and E E filled with water, I remove the cover C C by suitable appliances, and adjust the basket I I in position upon spindle H and secure as above described, or the basket may be filled without being removed from the case. I then replace the cover and admit the agent through pipe Q, which rising through the material separates and removes the oily and fatty matters therein contained, and flowing over the top of the collecting-box S runs off by pipe R into a tank or reservoir, or direct into a still. This operation is continued until the material is cleared of grease, a test for which may be provided by means of a small cock in the pipe R. When this is effected the valve in pipe Q is closed, and that in pipe T, figure 3, is opened, allowing the agent remaining in the vessel to flow off to a tank or reservoir suitably placed near the machine. To complete this operation, I set in motion by belt or gearing moved by steam, or other power in the ordinary way, the spindle and basket. When the agent has been thrown off I stop the machine by means of a brake or other contrivance, and introduce water under pressure or otherwise through the pipe U, figure 3, and spray-pipe before described, for the purpose of cleansing or partially cleansing the material, and of washing out any of the agent which may remain. I adopt the device of introducing water in the form of a finely disseminated spray or thin continuous sheet of water, which will be found beneficial in hot climates or generally in heated temperatures, in order that any vaporized agent may be condensed and precipitated. The water (and agent if any) escapes by way of the pipe T, figure 3, to the storage tank before referred to, or to some other suitable reservoir where the agent (if any) may be recovered. The revolving basket is then again set in motion as before described and is continued in action until the material is dry, when the valve in pipe T may be closed. To complete this operation, I adjust where necessary a fan or blower or other suitable contrivance for obtaining a current of air, and the air so forced through enters by the pipe V, figure 3, and escapes by pipe W, figure 3, both of which have hitherto been closed by suitable valves. The air so used may be chemically or otherwise treated.

Having thus particularly described and ascertained the nature of this my said invention, together with the best method with which I am acquainted for carrying the same into practical effect, I wish it to be understood that I do not confine myself to the precise details hereinbefore described, and illustrated in the accompanying drawing, as the same may be varied without departing from the nature of the invention, but what I consider to be novel and original and therefore claim is—

Firstly—The process of extracting oils and fats and oily and fatty matters by bisulphide of carbon, in such a manner that the bisulphide of carbon with which the material is saturated after treatment may be separated by centrifugal action, and recovered from such material without the application of steam or other heat.

Secondly—The combination of parts forming the apparatus used for the above purpose constructed substantially as herein above particularly set forth and described, and as illustrated in the drawings.

In witness whereof, I, the said Thomas John Mullings, have hereto set my hand and seal, this nineteenth day of November, 1880.

THO. J. MULLINGS.

Witness—

A. ALBUTT,
4, South-street, Finsbury London.

This is the specification referred to in the annexed Letters of Registration granted to Thomas John Mullings, this twenty-eighth day of February, A.D. 1881.

AUGUSTUS LOFTUS.

Improved Process for extracting oil and fat.

REPORT.

Sir,

Sydney, 7 January, 1881.

The application of Mr. T. J. Mullings for Letters of Registration for "A new and improved Process of extracting oil and fat from wool and other substances, and the Apparatus connected therewith," having been referred to us, we have examined the specification and drawings accompanying the same, and have now the honor to report that we see no objection to the issue of Letters of Registration as prayed for.

We may, however, point out that the term "hydro-carbons" in the first page of the specification is improperly introduced, and is inconsistent with the remainder.

We have, &c.,
J. SMITH.
CHAS. WATT.

The Under Secretary of Justice.

[Drawings—one sheet.]

Fig. 1.

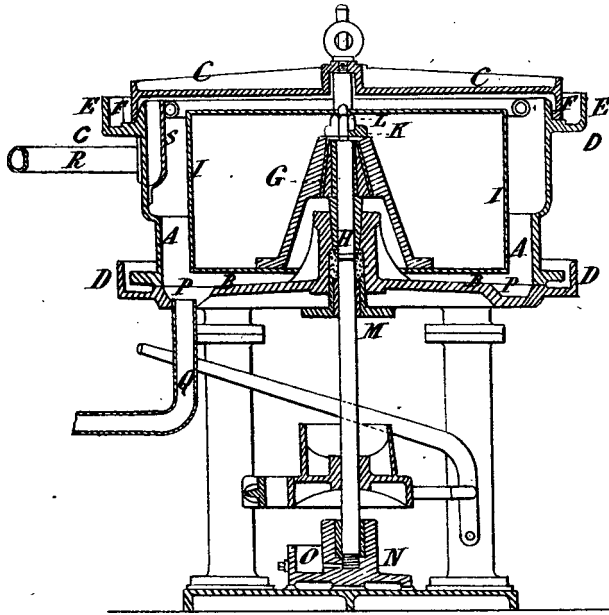


Fig. 2.

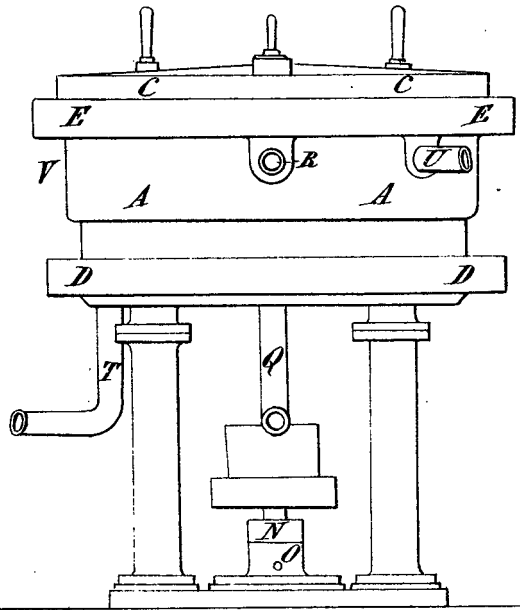


Fig. 3.

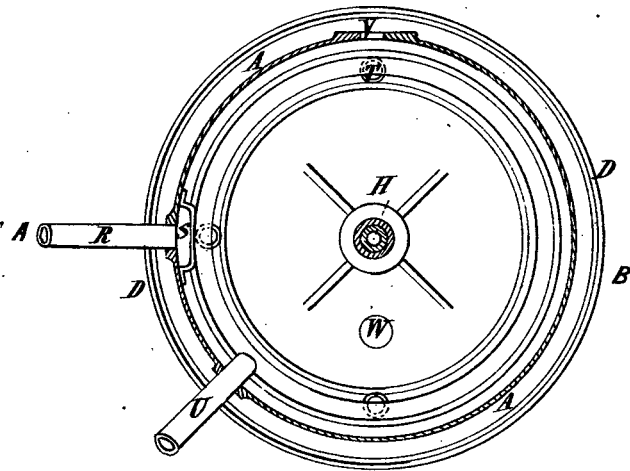


Fig. 5.

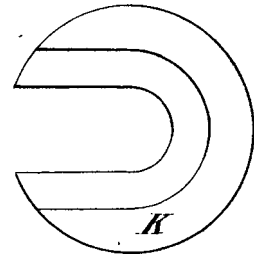
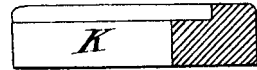


Fig. 4.

This is the Sheet of Drawings referred to in the annexed Letters of Registration granted to Thomas John Mullings, this twenty eighth day of February A. D. 1881

Thos. Mullings

Augustus Loftus.

Sig. 3A.



A.D. 1881, 7th March. No. 910.

IMPROVEMENTS IN SYSTEMS OF CONDUCTORS FOR THE DISTRIBUTION OF
ELECTRICITY, &c.

LETTERS OF REGISTRATION to Thomas Alva Edison, for Improvements in systems of Conductors for the distribution of Electricity as a lighting and motive-power agent, and appliances connected therewith.

[Registered on the 8th day of March, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS THOMAS ALVA EDISON, of Menlo Park, in the State of New Jersey, United States of America, electrician, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in systems of Conductors for the distribution of Electricity as a lighting and motive-power agent, and appliances connected therewith," which is more particularly described in the specification, marked A, and the two sheets of drawings, marked B and C respectively, which are hereunto annexed ; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four : and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years : And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Thomas Alva Edison, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof ; to have, hold, and exercise unto the said Thomas Alva Edison, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended : Provided always, that if the said Thomas Alva Edison shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this seventh day of March, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in systems of Conductors for the distribution of Electricity, &c.

A.

SPECIFICATION.

TO ALL WHOM IT MAY CONCERN: Be it known that I, THOMAS ALVA EDISON, of Menlo Park, in the State of New Jersey, United States of America, electrician, have invented an improvement in systems of conductors for the distribution of electricity as a lighting and motive-power agent, and in appliances connected therewith, of which the following is a specification:—

WHERE many translating devices for converting electricity into either power or light are arranged upon the multiple arc or derived circuit system, it is essential that, so far as possible, an equal electro motive force or "pressure" be maintained in all parts of the system.

When, however, each set of conductors are run out from the central station in a straight circuit, containing a number of translating devices, the pressure, when a number of devices are in operation, is apt to be greatest nearest the central station, and to diminish gradually toward the end of the conductors, this "drop" being due to the resistance of the main conductors.

The object of this invention is to obviate such irregularity, and to maintain practically throughout the entire system an equal pressure.

This I accomplish by using the conductors leading directly from the source of energy as feeding conductors only, placing no lamps ordinarily in the circuit connected directly to the source—placing the lamps or translating devices upon service or lamp circuits, which connect to and are fed by the feeding conductors, in such manner that all the lamp circuits are electrically distant substantially from the source of electricity by the same mass of conductor. By so doing, the greater portion, if not all the drop, occurs in the feeding conductors, the pressure in the service or lamp circuits being practically uniform at all points.

This invention may be carried into effect in several ways, of which the following are brief descriptions:—

One method consists in placing upon the conductors leading directly from the central station or source of energy no lamps, using such conductors only as feeding conductors to lamp circuit conductors, which they tap and feed into at their centres, such lamp circuit conductors being largest at their centres, and thence tapering to the ends, the lamps, where many are to be used, being placed in circuits derived from these lamp circuit conductors only.

From a central station several sets of feeding conductors may lead out, each feeding into its own set of lamp circuit conductors.

Where it is desired to use a few lamps near the central station they may be placed upon a direct circuit therefrom, with resistance at the commencement or home end of the circuit, sufficient to then reduce the electro-motive force of such circuit, so that it shall only be equal to that in the more distant circuits, and one or more of such circuits may be combined with the circuits before described.

When large buildings or blocks of buildings using many lamps are to be supplied, it may be desirable to lay therefor separate feeders insulated from each other.

While in my system I prefer to use round metallic circuits, it is evident that, by the introduction of proper grounds the earth may be used as half of the circuit.

It may be desirable in using round metallic circuits to add grounds as an aid to half the circuit, in which case such half the circuit may be of smaller conductors, provided its size be such that its resistance, added to that of the ground circuit, shall not exceed that of the other half of the circuit.

Where several central stations are used in a city, each having feeding conductors leading to lamp circuit conductors, of the description before noted, it may be advisable to connect the feeding circuits of all the stations, equalizing the electro-motive force or pressure throughout the entire system of the place where the central stations are located.

Another method consists in laying the service conductor in squares around a central station, the sets of service conductors (positive and negative in each set) being concentric to each other, so to speak, feeding circuits leading to and connecting with each service set at several points.

The service sets may also be connected together at several points, so as to aid in equalizing the pressure throughout the entire system.

In another method, two conductors, forming a complete metallic circuit, are laid entirely around each square or block as the service conductors of such block. Feeding conductors from the source of electricity lead to and connect with the service conductors, but upon opposite sides—that is, one conductor, say the one from the + pole, connects at some point to one service conductor of a block, while the one from the — pole connects to the other service conductor at a point exactly opposite to the other; so that the terminals of all house circuits of a block, or the points where the house circuits connect to the service conductors, are all equi-distant from the source, or that the same mass conductor intervenes.

A series of blocks may be so arranged, the feeding conductors leading to the extreme or opposite block, one to each of the series, the service conductors of the blocks being united by cross conductors, so that each block is distant electrically from the source by the same mass of conductor.

Where a conductor varying in size throughout its length is used it is preferable to make it a compound one, composed of several single wires of different lengths, one or two of which extend the whole length of the conductor, others ending at various points. These wires are not insulated, but merely grouped in a bunch, which have transverse fastenings at intervals, or which may be fastened together by branch conductors passing around where connections are formed.

It is preferable to form all conductors which vary in size, decreasing from some point in this manner; and it is to be understood, in these descriptions, that all such conductors are so made.

My system also contemplates the supply of electricity for both light and power. It is proposed that the current used for these purposes should be paid for at different rates. I therefore, where both power and light are desired, run two branch circuits from the mains into the house or locality of translation, one for the lights and one for the engines, a meter being placed in each.

The foregoing may be better understood by a reference to the drawings, in which are given diagrammatic representations of circuits, in which figure 1 illustrates a plan wherein the conductors are made larger at their home ends, gradually tapering to the outer end of the system. When

Improvements in systems of Conductors for the distribution of Electricity, &c.

When such plan is used it is preferable to make each conductor a compound one, composed of several single wires of different lengths, one or two of which extend the whole length of the conductor, others ending at various points, as shown in figure 1*b*.

These wires are not insulated, but merely grouped in a bunch, which have transverse fastenings at intervals, or which may be fastened together by branch conductors passing around where connections are formed, as shown in figure 1*a*.

It is preferable to form all conductors which vary in size, decreasing from some point in this manner, and it is to be understood, in these descriptions, that all such conductors are so made.

In figure 2, feeding conductors, 1-2 lead from central station C S, connecting with the lamp circuit 3-4, at about its centre; the conductors of the lamp circuit being largest at that point, and also larger capacity at that point than the feeding conductors.

By this arrangement most of the fall of pressure, or "drop," takes place in the feeding circuit, so that it cannot affect any lamps, while the "drop" in the lamp circuit is reduced very low, the "drop" from the centre of the lamp circuit to either terminal being only about one-fourth what the "drop" would be from *y* to *z*, if either end were connected directly to the central station.

Any desired number of lamp circuits may be so arranged, each having its proper feeding conductors, two so arranged being shown in figure 3.

In some instances, when it is desired to use a few lamps near the station, they may be placed directly upon main conductors and combined with the circuit shown in figures 2 and 3. As shown in figure 4, when feeders 5-6 connect with lamp circuit 9-10, arranged as in figures 2 and 3, while circuit 1-2, connected directly to C S, has a few lamps upon it, in which case a resistance should be used therein to lessen the electro-motive force in 1-2, to the same extent as it is lessened by the longer conductors 5-6.

With such arrangement may also be combined an ordinary terminal circuit, containing a few lamps, such as the circuit 13-14, in figure 5.

In figure 6 is shown direct or main feeding circuits 1-2 and 5-6, with lamp circuits, 3-4 and 9-10, with branch feeders, 7-8, 15-16, and 21-22, leading into side streets, supplying lamp circuits 17-18, 19-20, 23-24, and 25-26, the branch feeders being derived circuits from the main feeders, all constituting a multiple arc system.

In figure 7 feeding mains, 1-2, connect to the centre of the lamp circuit 3-4, while feeders 5-6, leading to a greater distance, and to a circuit where comparatively few lamps are required, connects to the end of lamp circuit 9-10, whose conductors gradually taper from the point of connection. This arrangement is sometimes desirable in sparsely settled localities, as involving economy in the laying of conductors.

In figure 8 is shown feeding conductors, 1-2, from which lead house feeders, *a b*, which connect to lamp circuit *a' b'*, which are of same description as circuits 3-4, figure 2.

Figure 9 shows a series of houses or buildings, *c, d, e, f*, to each of which leads a feeding circuit of insulated conductor, the lamp circuit of each house being thereby put in direct connection with the central station C S, the electro-motive force of any one lamp circuit not being affected by the others.

In figure 10 are two blocks of buildings, A B, composed each of several houses, *h h h*, separate feeding circuits, 1-2, and 3-4, leading to branch feeding circuits, from which lamp circuits lead into each house, each house or lamp circuit being provided with its own connection and meter.

In the arrangement shown in figures 8, 9, 10, the greatest portion of the fall or drop occurs in the conductors leading to the house or block lamp circuits, the force or pressure in the branches leading into the houses being maintained practically uniform thereby in each lamp circuit.

In figure 11 is illustrated the substitution of ground G G for one conductor, say 2 of figure 1 of the feeding conductors, a common ground being provided for all the lamps in one house lamp circuit.

In figure 12 is shown a complete metallic feeding circuit, 1-2, in which grounds G G are added as auxiliary to the portion 2 of the circuit.

While ordinarily a metallic circuit is to be preferred, by adding grounds one portion of the circuit may be of smaller conducting capacity, thus tending to economy of conductor. Care should be taken that the capacity of 2, however, is such that its resistance, and that of the grounds, be not greater than that of the portion 1 of the circuit.

In figure 13 is shown a series of central stations, C S, from each of which lead main feeding circuits, M (which may be of any desired number), each connecting to and feeding into a lamp circuit, *l c*.

The mains of all the stations are connected by conductors, *n n n*, so that all the stations are electrically connected into one general system, whereby the pressure throughout the entire system is equalized.

In figure 14 a house circuit, S, branches from the main circuit 1-2, the circuit S branching into two circuits, on one of which all the lamps are placed, the other being a motor circuit only, as shown; in each of which meters are placed, so that the amount of current used for each purpose may be determined.

In figure 15 the lamp circuit L C is fed by a number of feeding circuits connecting thereto on opposite sides alternately, 1-2, 3-4, and 5-6, forming three feeding circuits, by which arrangement a comparatively uniform force or pressure may be maintained throughout the entire system.

Figures 16 and 17 illustrate the method of laying the service conductors around blocks, with feeding conductors leading thereto from the central station. C S is the central station, around which, following the general direction of the blocks or squares of the locality, are laid the sets of conductors 1, 2, 3, &c., so that they are, so to speak, concentric with each other.

From the central station branch conductors lead to each of the main sets, 1, 2, 3, at a number of points. For instance, *a a'* lead to set 3, *b b'* to 2, *c c'* to 1. In figure 16 eight sets of branch conductors are shown, leading to each of the main sets.

In figure 17 two sets of main conductors, 1, 2, are shown, connected to the main station by four sets each, of branch conductors, *b b'*, *c c'*, differing, however, from figure 1, in that the main sets, 1, 2, are connected together by numerous sets of coupling conductors, *d d'*.

As proceeding from the central station each set of main conductors traverse a larger area of territory, and has a larger amount of work to do, if all the conductors were of the same size there would be increased resistance.

It is desirable, however, that each (no lamps on branch conductors or couplers) set should be of the same resistance, and that the same ratio of resistance of conductors to translating devices should exist in all the sets.

This

Improvements in systems of Conductors for the distribution of Electricity, &c.

This is accomplished by increasing the size of the conductors as they are laid further away from the central station.

Having determined the relative resistance which should exist between the resistance of the conductors and that of the sum of translating devices most profitably to be used with such conductors, the increase of size to be given is that which shall preserve such ratio, taking into consideration the increased length of conductors and the increased number of devices to be profitably supplied thereby.

By this method of laying and uniting the conductors an equal pressure or electro-motive force may be maintained throughout an entire system.

Figures 18, 19, 20, and 21 illustrate modifications of the last described system, which may be called the block or square system.

In these figures A is a central station, at which is located a suitable source of electricity, and from which lead feeding conductors, 1, 2.

B represents a block or square, around which are laid the service conductors, 3, 4.

Conductor 1 leads to 3, at 1, upon one side of the block, while 2 leads to 4, at 4, upon the opposite side of the block.

The greater portion of any fall of electro-motive force will occur in conductors 1, 2, while it will be constant at all points in the service conductors 3, 4, because every point in such conductors is distant from the source by exactly the same mass of conductor, as is evident from inspection of the diagram.

In figure 19 two blocks, B, are shown—conductor 1 leading to and connecting with 3 of block B, while 2 leads to and connects with 4 of B B, while cross conductors, 5, 6, connect the conductors of the blocks.

In figure 20 four blocks are shown, conductor 2 being connected to 4 of the right-hand blocks through a branch, 9, leading to both right-hand blocks, while one connects directly to both left-hand blocks. In this figure is shown a house circuit, *a a*, containing lamps, indicated by circles placed between *a a*.

In figure 21 two blocks are connected as in figure 19, while from the cross conductors, 5, 6, leads a derived circuit, 7, 8, leading to two other blocks, arranged as described.

Instead of two blocks, as in figure 19, any number may be used.

In all these plans each block and each house circuit are electrically equidistant from the source by which uniformity and equality therein is attained, the loss or drop of force occurring in the feeding circuits.

What I claim is—

First—The method of equalizing the pressure or electro-motive force throughout an electric, distributive, and translation system, consisting in using feeding circuits, which connect to and feed into circuits on which are arranged the translating devices, substantially as set forth.

Second—The combination with a circuit containing translating devices of a feeding circuit leading thereto from the source of energy and containing no translating devices, substantially as set forth.

Third—The combination in one system of a main circuit connected directly to a source of energy, and containing translating devices, and provided with means for lessening its force or pressure to that of the average of the system; a circuit not directly connected to the source of energy, containing translating devices; and a feeding circuit, connecting the latter circuit with the source of energy, substantially as set forth.

Fourth—The method of equalizing the pressure or electro-motive force in the lamp or translating circuits, by connecting the same to the source of energy by feeding circuits in which occur the greater percentage of fall of force, substantially as set forth.

Fifth—The combination of a number of insulated wires of different lengths, grouped together and fastened at intervals, forming a gradually tapering conductor, substantially as set forth.

Sixth—The combination with one derived circuit of two branch circuits, for different classes of translating devices, each containing a meter and a feeding circuit, substantially as set forth.

Seventh—The combination with one lamp circuit of a series of feeding circuits, substantially as set forth.

Eighth—The combination with one side of an entire metallic circuit of a series of ground connections as auxiliary thereto, whereby a lesser conductor may be used in such half, substantially as set forth.

Ninth—The method of laying the conductors in an electrical supply system, consisting in laying them in sets concentrically, as explained, each set being connected to the central station at several points, substantially as set forth.

Tenth—The method of laying the conductors in an electrical supply system, consisting in laying them in sets concentrically, as explained, each set being connected to the central station by several sets of branch conductors, and the various sets being connected to each other by several sets of coupler conductors, substantially as set forth.

Eleventh—As an improvement in the art of distributing electricity for use as a lighting and motive agent, the method of laying the conductors, consisting in laying around each block the service conductors, and uniting the same to the source of electricity by feeding conductors arranged as set forth, all substantially as herein shown and described.

Twelfth—

Improvements in systems of Conductors for the distribution of Electricity, &c.

Twelfth—As an improvement in the art of distributing electricity for use as a lighting and motive-power agent, the system of conductors set forth, consisting of service conductors laid around each block, feeding conductors connecting them to the source of electricity, and united to them at the points designated; and cross conductors connecting the service conductors of a series of blocks, substantially as set forth.

Signed by me, this 20th day of October, A.D. 1880.

THOMAS ALVA EDISON.

Witnesses—

CHAS. H. SMITH.

J. HART.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to Thomas Alva Edison, this seventh day of March, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

We have the honor to inform you that we have carefully examined the specification and drawings accompanying Mr. Thomas Alva Edison's application for Letters of Registration for "Improvements in the systems of Conductors for the distribution of Electricity as a lighting and motive-power agent, and appliances connected therewith," and we see no objection to the application being granted.

We have, &c.,

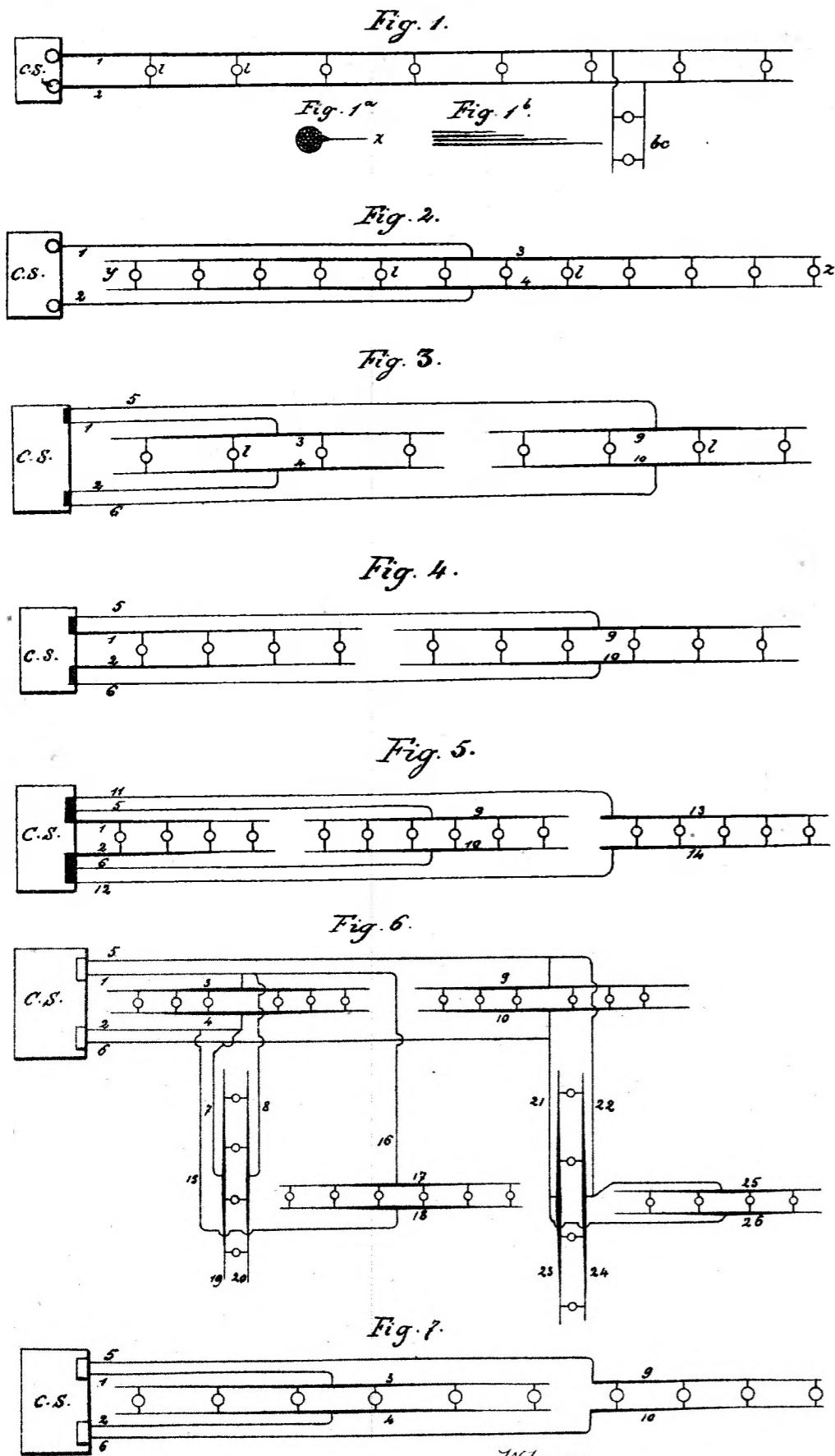
E. C. CRACKNELL.

H. C. RUSSELL.

The Under Secretary of Justice.

[Drawings—two sheets.]

B.



Witness
 Chas. H. Smith
 J. Hall

Inventor
 Thomas Alva Edison

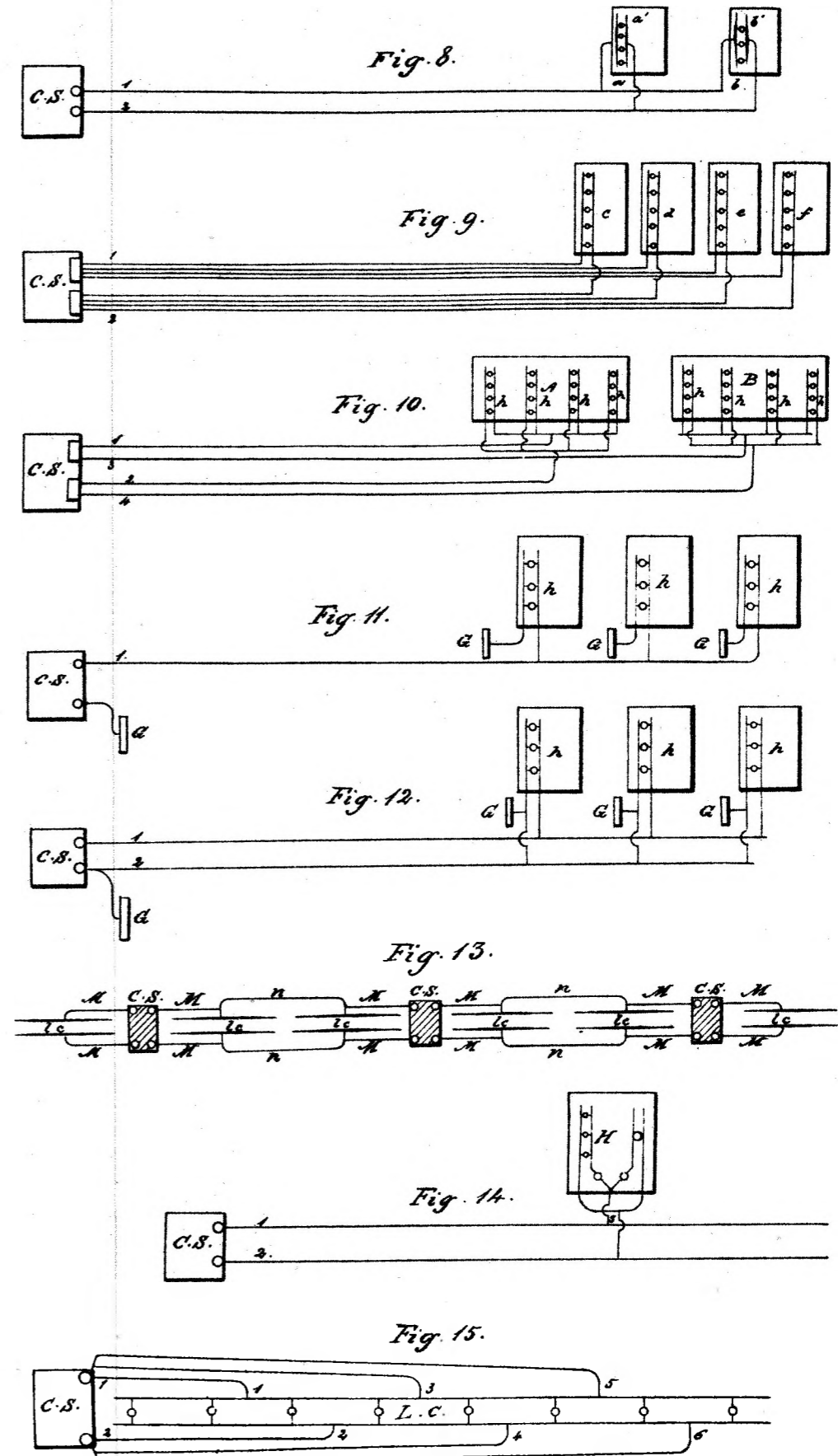
This is the Sheet of Drawings marked B referred to in the annexed Letters of Registration, granted to Thomas Alva Edison this seventh day of March, A. D. 1881.

Augustus Loftus.

(Sig. 34.)

PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE, SYDNEY, NEW SOUTH WALES.

[910]



C.

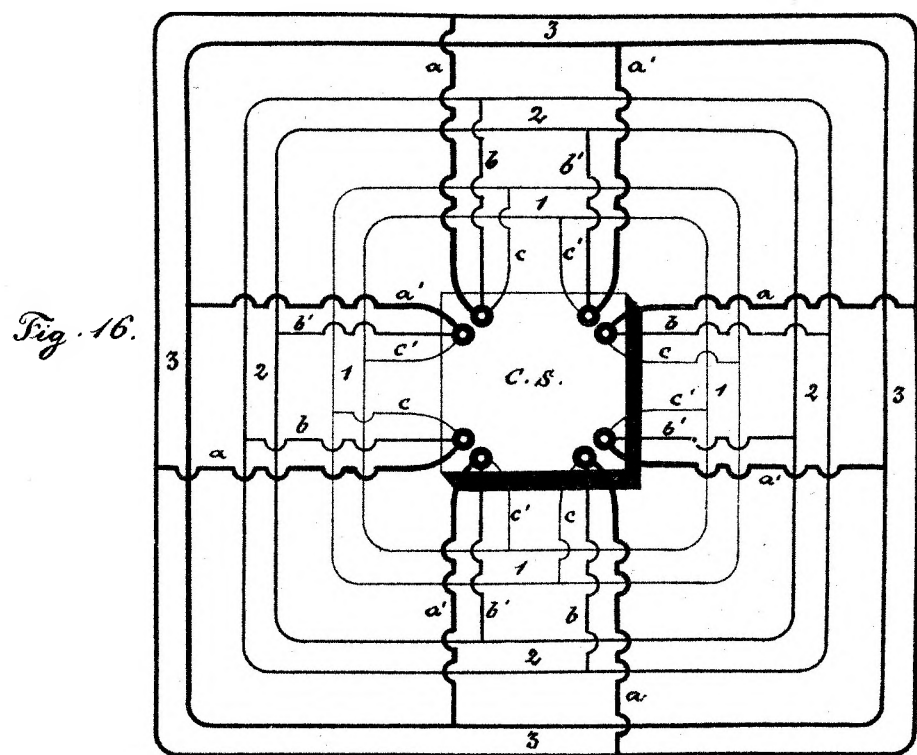


Fig. 16.

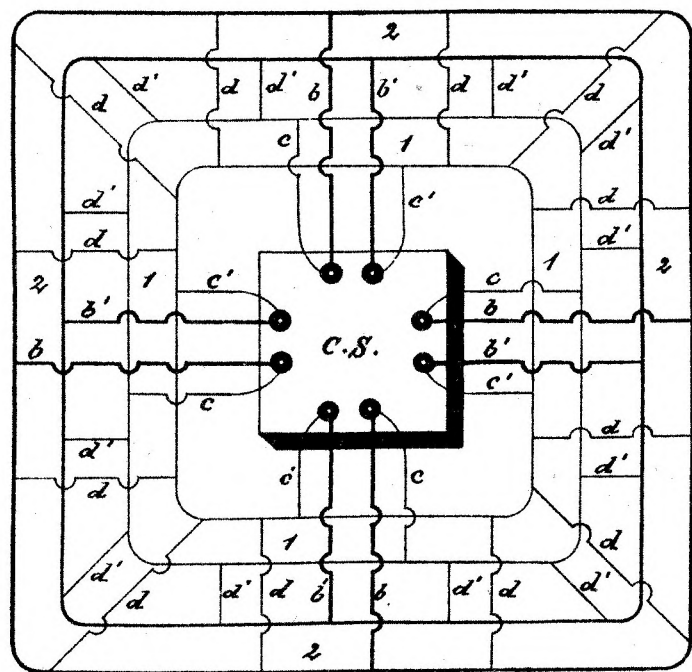


Fig. 17.

Witnesses
 Chas. H. Smith
 J. Heath

Inventor
 Thomas Alva Edison

This is the Sheet of Drawings marked C referred to in the annexed
 Letters of Registration, granted to Thomas Alva Edison
 this seventh day of March, A.D. 1881. Augustus Loftus.

PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE,
 SYDNEY, NEW SOUTH WALES.

(Sig. 34.)

Fig. 18.

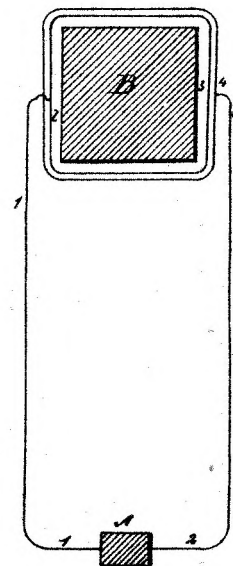


Fig. 19.

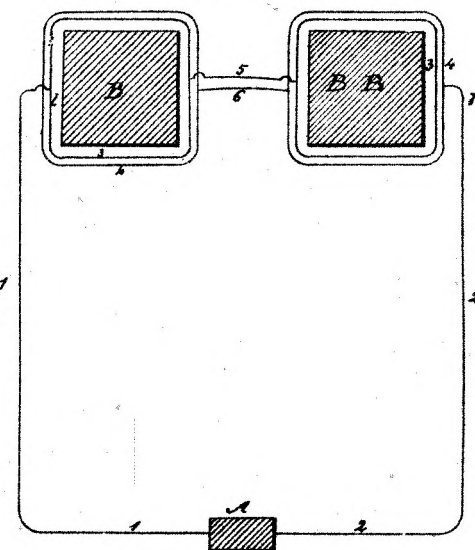


Fig. 21.

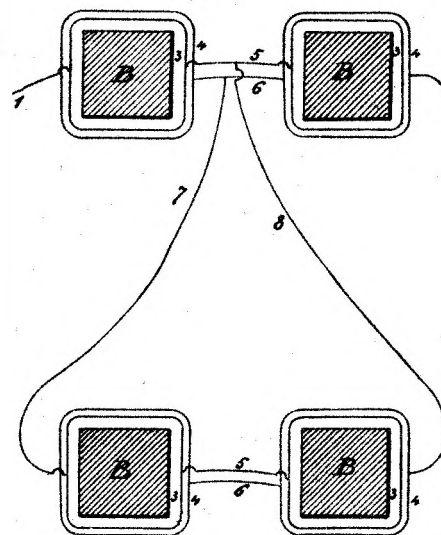
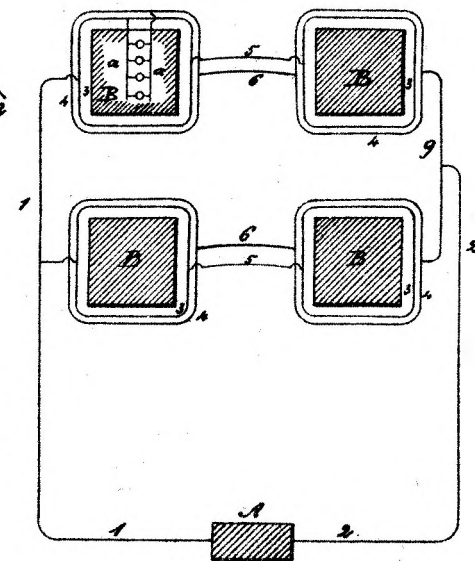


Fig. 20.





A.D. 1881, *7th March*. No. 911.

IMPROVEMENTS IN APPARATUS AND ARRANGEMENTS FOR TELEPHONIC AND MICROPHONIC PURPOSES.

LETTERS OF REGISTRATION to Louis John Crossley, for Improvements in Apparatus for telephonic and microphonic purposes.

[Registered on the 8th day of March, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS LOUIS JOHN CROSSLEY, of Halifax, in the county of York, England, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled, "Improvements in apparatus and arrangements for telephonic and microphonic purposes," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed ; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four ; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years : And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Louis John Crossley, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof ; to have, hold, and exercise unto the said Louis John Crossley, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended : Provided always, that if the said Louis John Crossley shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this seventh day of March, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in apparatus for telephonic and microphonic purposes.

SPECIFICATION of LOUIS JOHN CROSSLEY, of Halifax, in the county of York, England, for an invention entitled, "Improvements in apparatus and arrangements for telephonic and microphonic purposes."

THIS invention consists in transmitting and receiving or reproducing sounds by means of electric currents, for the purpose of conveying messages, and for other useful purposes; and the invention also relates to improvements in the construction of the transmitters and electro-magnetic telephone receivers, and in the methods of connecting or joining up the transmitters and receivers.

The conductors or semi-conductors used for varying the resistance of a current of electricity are constructed with four conductors, or preferably semi-conductors of electricity, which lie loosely in four other conductors or semi-conductors, which are mounted upon a piece of wood or other suitable material, and are connected with an induction coil or coils. The conductor or semi-conductor of electricity is enclosed within a suitable case of circular or other shape, by which means the instrument may be placed in any desired position—either horizontally, perpendicularly, or otherwise (but by preference it should be placed in a perpendicular position), without interfering with the adjustment of the instrument, and by which means no metallic or other springs are needed, nor is a diaphragm of a delicate nature necessary, and the instrument will be free from all variations of temperature, and once fitted up and connected no further adjustment will be necessary or even desirable.

The receiver is constructed with an electro-magnet having a coil of wire on one pole; the other pole of the electro-magnet has no coil of wire, but is bent up to the same height as the first pole; an armature is fitted over the electro-magnet, which may be secured on one side only if desired, leaving the armature free on the other side, and to adjust the electro-magnet to any required height a spring is employed, which is actuated by a screw; the spring is fitted in the box.

In the methods of connecting up the transmitter and receiver with an induction coil or coils, I connect the line with the improved transmitter and electro-magnetic receiver; the batteries are placed in the line (but only a single battery at either end of the line may be employed if desired), and by this method of joining up both a primary and secondary current will flow in the line, and the sounds given out by the receivers will be increased.

Or by another method the single transmitter, with a battery at one end of the line and a receiver are employed, but a battery, together with a transmitter and receiver, may be employed and used with advantage at each end of the line, and the batteries may be joined up in such a manner that the current from either one will strengthen the other.

Another method consists in joining up with only the secondary current flowing to line, and with one battery, but two may be used with advantage, one at each end.

But in order to enable my improvements to be better understood, I will proceed to describe the same by reference to the accompanying drawing, in which figure 1 represents a circular box, within which is enclosed the conductors or semi-conductors and induction coil; figure 2 horizontal section, and figure 3 vertical section of the same; figure 4 represents the conductor or semi-conductor mounted on a piece of wood; figure 5 represents a sectional elevation of the improved receiver; figure 6, side elevation with section of box; and figure 7, plan of the same with the lid removed; figure 8 represents one method of connecting or joining up two improved electro-magnetic receivers and improved transmitters with two batteries in a line; figure 9 represents a simple method of connecting or joining up the improved electro-magnetic receiver and transmitter, with a battery in a line without induction coil; and figure 10 represents another method of connecting or joining up two improved electro-magnetic receivers and transmitters, with one battery in the line.

Similar letters are employed to represent similar or corresponding parts.

In figures 1, 2, 3, and 4, A is a box in which is fitted an induction coil, B, but other coils may be fitted in the box; over the coil is fitted a lid, C, to which is secured a wooden disc, D, or the disc may be made of any other suitable material; to the disc are secured carbon blocks, or four conductors or semi-conductors of electricity, EEEE, in and between which lie loosely four other conductors or semi-conductors of electricity, FFFF; a mouth-piece, G, is fitted to the lid C, and terminals HHHH are secured on the outside of the box. This instrument may be placed in any desired position, but by preference in a perpendicular one, without interfering with the adjustment of the instrument, and no metallic or other springs, nor a diaphragm of a delicate nature, are required; besides which the instrument will be free from all variations of temperature. In figures 5, 6, and 7 the electro-magnetic receiver is constructed with an electro-magnet having a coil of wire, I, on a pole, J; the other pole, K, of the electro-magnet is bent up to the same height as the pole J, and without a coil of wire; an armature, L, is fixed at one side, and is free on the other side if desired; a spring, M, is fitted in the box N, which is actuated by a screw, O, to allow of adjusting the electro-magnet to any required height. If desired the action of the armature may be transferred to a diaphragm of some metallic or non-metallic substance, by means of a light lever or levers, or by a screw or fine wire connecting the two, by which means the sounds may be increased. In figure 8 the batteries ZZ are placed in a line (but a single battery at either end of the line may be employed), and the induction coils BB, which are fitted in the boxes of the transmitters, are employed with the conductors or semi-conductors E and F, so as to work with electro-magnetic receivers R, and by this method of joining up both a primary and a secondary current will flow in the line, and the sounds given out by the receivers R will be increased.

In figure 9 only a single transmitter with a battery, Z, at one end of the line and a receiver, R, at the other, is shown, but I would have it understood that a battery together with a transmitter and receiver may be used with advantage at each end of the line, the batteries being joined up in such a manner that the current from either one will strengthen the other.

In figure 10 the diagram shows a method of joining up in which only the secondary current will flow to line, and in the plan only one battery, Z, is shown in the line circuit, although two may be used with advantage, one at each end, and a separate battery, Z, is only shown in connection with the transmitters R.

The diagrams and arrangements shown in the drawing at figures 8, 9, and 10, will be readily understood by electricians, and from the description hereinbefore given.

Having

Improvements in apparatus for telephonic and microphonic purposes.

Having now particularly described and ascertained the nature of the said invention, and in what manner the same is to be performed and carried out in practice, what I claim is,—

The improved arrangements or apparatus for telephonic and microphonic purposes, substantially as hereinbefore set forth and described, in which invention the important points or features are the combination of a number of conductors or semi-conductors, and connecting the same, substantially as and for the purpose described, and represented in the accompanying drawing.

In witness whereof, I, the said Louis John Crossley, have hereto set my hand and seal, this twenty-fifth day of November, in the year of our Lord one thousand eight hundred and eighty.

Witness—

WALTER JOS. TURNER.

LOUIS J. CROSSLEY.

This is the specification referred to in the annexed Letters of Registration granted to Louis John Crossley, this seventh day of March, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 21 January, 1881.

We have the honor to inform you that we have carefully examined the papers and drawings in connection with the application of Mr. Louis John Crossley for Letters of Registration for an invention entitled "Improvements in apparatus and arrangements for telephonic and microphonic purposes," and there appears no objection to the application being granted.

We have, &c.,

E. C. CRACKNELL.
H. C. RUSSELL.

The Under Secretary of Justice.

[Drawings—one sheet.]

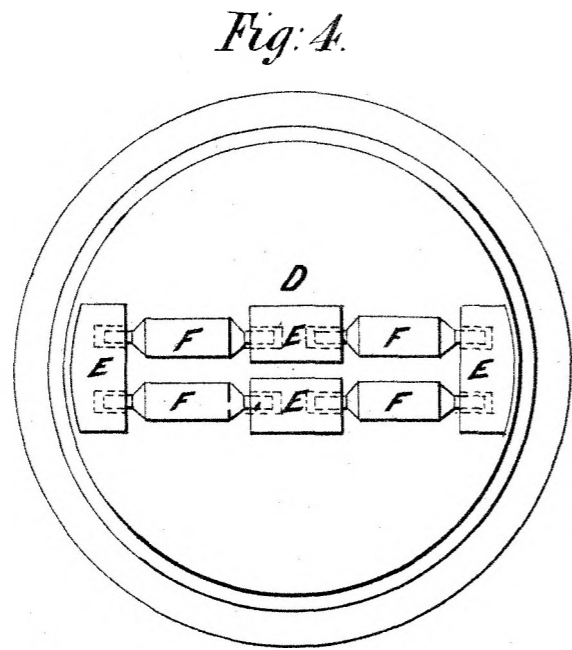


Fig. 4.

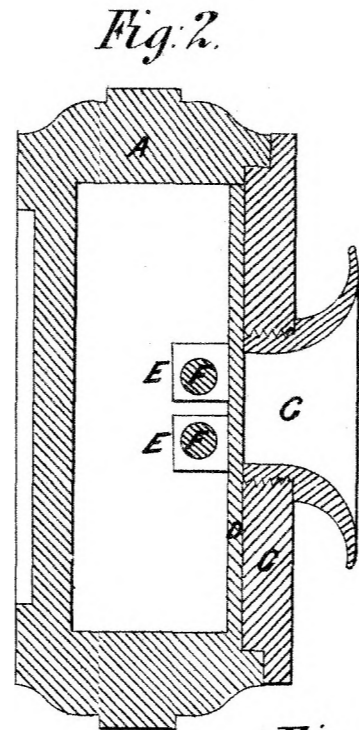


Fig. 2.

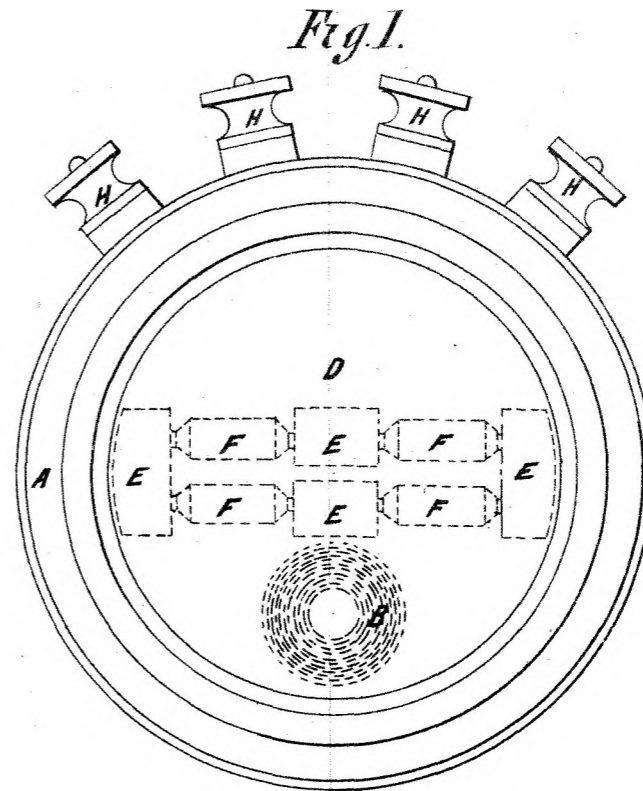


Fig. 1.

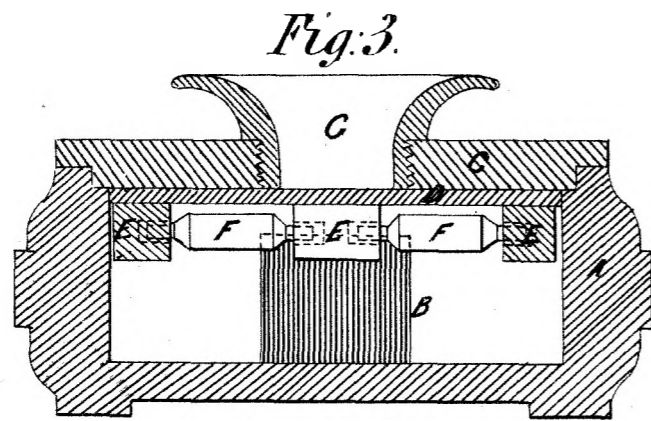


Fig. 3.

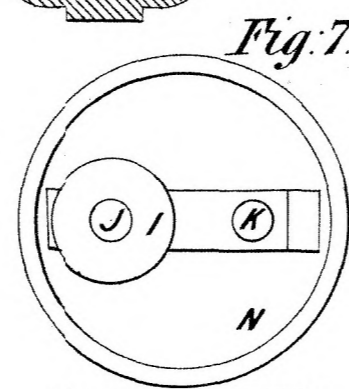


Fig. 7.

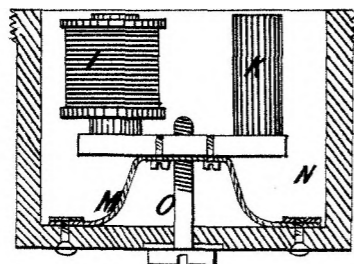


Fig. 6.

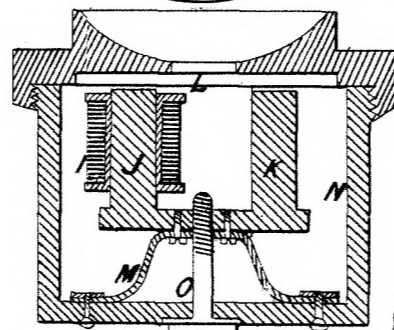


Fig. 5.

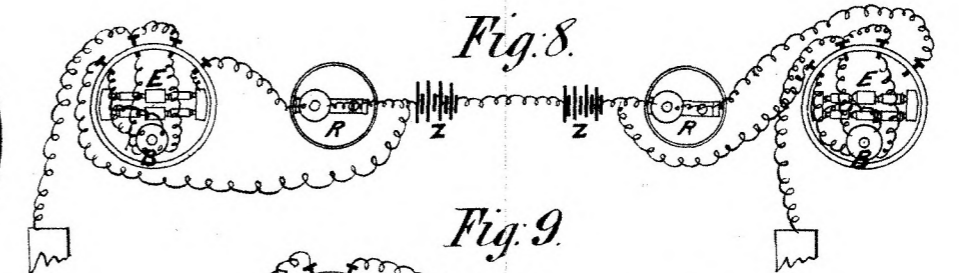


Fig. 8.

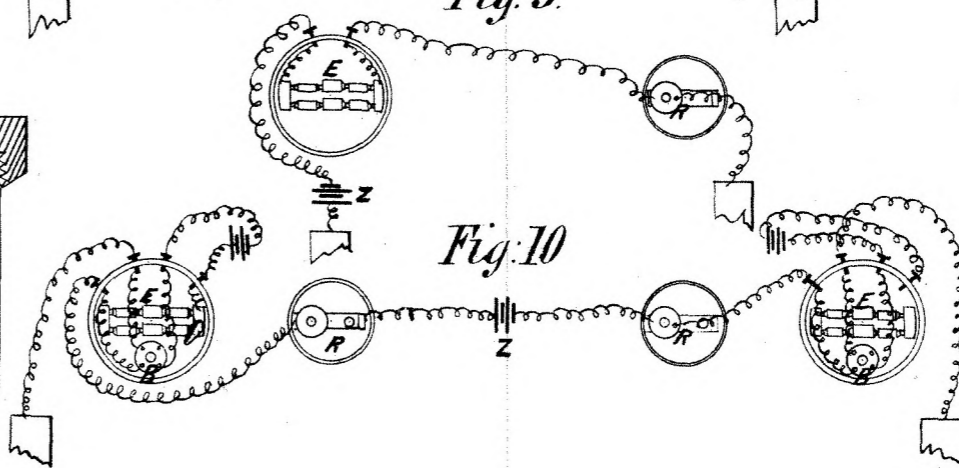


Fig. 9.

Fig. 10.

This is the Sheet of Drawings referred to in the annexed Letters of Registration granted to Louis John Crossley, this seventh day of March, A. D. 1881.

Augustus Loftus.



A.D. 1881, 7th March. No. 912.

A VEBERMETER.

LETTERS OF REGISTRATION to Thomas Alva Edison, for Improvement in means for measuring the amount of electrical current flowing through a circuit, which is denominated a Vebermeter.

[Registered on the 8th day of March, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS THOMAS ALVA EDISON, of Menlo Park, in the State of New Jersey, United States of America, electrician, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvement in means for measuring the amount of electrical current flowing through a circuit, which is denominated a Vebermeter," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed ; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four ; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years : And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Thomas Alva Edison, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof ; to have, hold, and exercise unto the said Thomas Alva Edison, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended : Provided always, that if the said Thomas Alva Edison shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this seventh day of March, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

A Vebermeter.

SPECIFICATION.

TO ALL WHOM IT MAY CONCERN :

BE it known that I, THOMAS ALVA EDISON, of Menlo Park, in the State of New Jersey, United States of America, electrician, have invented an improvement in means for measuring the amount of electrical current flowing through a circuit, which is designated a Vebermeter, of which the following is a specification.

In any system of furnishing to consumers electricity for light, power, or other purposes, it is desirable that means be provided which shall accurately measure the current used.

It is also desirable that this measure of current should be automatically indicated and registered in a manner analogous to the registration of gas or water flow.

The object of this invention is to provide means for attaining these results, to which end it consists, broadly speaking, in using balanced plates in a depositing cell, so arranged, in connection with other devices, that the deposition of metal upon one plate causes an over-balancing, which sets in operation registering devices and devices reversing the circuit through the cell.

In practice, devices, combinations, and circuits somewhat as follows are used :—

A depositing cell is used in which the plates are suspended, but insulated from a balanced arm, to which is attached a lever arm, on which is a weight adjustable on a lever arm, so that the amount of excess of weight upon one plate over the other, required to cause a tilting of the balanced arm, may be determined and regulated.

The cell, so arranged, is placed in a branch circuit, that is a circuit derived from one member of the circuit supplying electricity to the translating devices, containing a resistance so arranged that a definite fraction of the current used shall traverse the branch circuit and depositing cell.

It is evident then that as the weight of one plate is increased by the deposition of (say) copper from the solution, it will tip the balanced arm whenever the weight of the increase becomes sufficient to over-balance the weight alluded to, as on the lever arm.

The lever arm moving causes a movement of a registering apparatus, registering each tip, and at the same time causes a reversal of the current through the cell, the effect of which is that the copper is absorbed or removed from the now heavier plate and deposited upon the lighter, until it in turn becomes the heavier, causing another tipping, another registration, and another reversal.

As the amount of current needed to cause the deposition of metal enough to cause the tipping is known, and as it is a definite percentage of the entire current, the registration may indicate the total amount of current ; or, as the ratio existing between current and feet of gas for illuminating effect has been determined, the registration may indicate the equivalency in light of feet of gas.

As stated, the tipping of the balanced arm and attached lever arm causes a movement of a registering apparatus and a reversal of the current through the depositing cell.

It may cause this directly by having either the balanced or the lever arm connected directly to a register and to a reverser, or indirectly by setting into operation intermediate mechanism.

In the latter case the following is a convenient arrangement :—

Two magnets are used with their poles placed oppositely, between which plays an armature lever, one end of which is attached to the prime motor of the register, the other end playing in the open part of a fork or Y, whose upper ends operate a reverser.

The play of the Y is limited by two set screws, one on either side, with a circuit connection from each to one of the magnets, the connection from the left-hand screw being to the right-hand magnet, and from the right-hand screw to the left-hand magnet.

The play of the weighted lever arm before referred to is determined by two set screws, each screw being connected with the magnet upon its side.

From one member of the circuit containing translation devices is a circuit connection to the Y, while the lever arm is connected to the other member. In this circuit is interposed a very large resistance, so that but a small percentage of the current passes therethrough, simply enough to operate an ordinary electro-magnet,

A circuit then may be formed through either magnet, in which are two breaks, one closed by the weighted lever at the end of its movement, the other by the Y at the end of its movement ; the circuit being shifted from one magnet to the other, as the lower arm is tipped by one plate receiving its determined load by deposition.

Around each magnet is a short circuit of large resistance, which affords a path for the extra or induced current, avoiding spark therefrom at the contact points.

The same principle, namely, the effecting of a registration by the over-weighting of a plate by deposition, may also be carried into effect by mounting upon a shaft a series of plates which radiate therefrom. This shaft is journalled in a suitable case, which is filled with the proper depositing solution nearly up to the shaft.

Upon the shaft are a series of commutator blocks, one for each plate.

Commutator springs are so arranged as to bear simultaneously upon the blocks of the plates remote from each other in the fluid, a branch circuit from one member of the consumption circuit being connected to the springs.

As deposition proceeds, one plate becomes so loaded as to cause a partial rotation of the shaft, which causes the circuit to be formed through another plate, which becoming loaded causes further rotation, bringing another plate into the circuit, whereupon the first plate is again in circuit, but in such relation as to be the plate which is reduced to afford material for deposition upon the other plate in circuit, each plate being thus successively loaded and stripped, the movement from one pole to the other, causing by loading by deposition, being registered by the rotation of the shaft.

The invention may be carried into effect in many other ways, but the ones here described are sufficient to illustrate its principle.

Instead

A Vebermeter.

Instead of a balanced arm from which the plates are suspended, a spring balance may be used, the plate as it becomes loaded acting on a spring, to make the necessary circuit connections at the pre-determined point.

In the drawings, figure 1 is a view, partly perspective partly plan, showing the form first described, while figure 2 is the second plan or modification.

In figure 1, A is any suitable containing cell, provided with a cover, B, upon which is a balanced arm, *a*, attached to a shaft, *b*, pivoted in suitable bearings or supports attached to the cover.

From the ends of the arm *a* are suspended the plates C C', forming the anode and cathode of the cell.

Upon the end of *b* is a lever arm, *d*, upon which slides the weight *e*', provided with means for securing it in any desired position.

At its lower or free end, *d* is provided with contact points which take against the set screws 8, 9, which limit its motion.

E E' are two electro-magnets whose poles face each other, acting upon armatures upon a lever, F, pivoted at *k*, playing between the two magnets, and so connected at its lower end with a register, H, as to operate it upon each vibration of the armature lever.

At its upper end, F takes between the limbs of the fork D, pivoted at *i*, to whose upper end is attached an arm, *g*, taking between contact springs or levers, *f f'*, which in connection with *e*, form a reverser; *h* is a small spring having a projection at its end taking over a small projection upon D, with sufficient force to hold it against accidental displacement.

1, 2 are the main conductors of a system from which lead conductors, 15, 16, to and through the place of consumption.

From 15 a circuit is formed through the depositing cell by 11 *g f'*, 12 C C', 13 *f e*, 14, the direction of the current in the cell being determined by the contacts of *f f'* and *e* in the reverser. Between 11 and 14, in 15, a resistance, R', is placed, adjusted to cause a definite and determined fraction of the entire current traversing 15 to pass through the cell.

A circuit for the magnets, E E', is formed as a derived or multiple arc circuit to 15, 16, by 15 3 D, and then in one position of D by 14 E', 5, 9, *d*, 10, 16, or in another position of D by 15, 3 D, *l'*, E, 6, 7, 8, *d*, 10, 16.

In 10 a resistance, R, is placed adjusted to the resistance of the main circuit, so that only a small amount of current, simply enough to make E or E' effective, shall traverse the circuit through them.

Short circuits around E E' are formed containing resistances, *r r'*, for the purpose of absorbing the extra or induced current, lessening or avoiding spark at the contact points.

The operation is as follows:—Suppose the parts to be in the position shown in figure 1, and the current flowing through the cell so that C is the anode and C' the cathode.

As metal is deposited upon C', it gradually overbalances C, swinging *d* out of the perpendicular, until finally it takes against screw 9, whereupon the circuit through E' is closed, *via* 10, *d*, 9, 5, 4, *l*, D, 3.

E' attracts F, causing it to operate the register H; F, in moving toward E', strikes D, causing it to break circuit at *l*, and carrying it over against *l'*; at the same time the arm *g* is carried in the reverse direction, leaving *f'*, and allowing it to contact with *e*, and at the same time contacting with *f* and causing it to break contact with *e*, causing the current to pass through the cell in the reverse direction.

C' now becomes the anode, and the metal deposited thereon is dissolved therefrom and carried to C, which finally becoming the heavier causes a repetition of the operations described.

It is evident that the reverser and register might be actuated directly by *d*, but the devices shown are more accurate and delicate, and destructive sparks at the contacts are greatly lessened if not entirely obviated.

In figure 2, K is any suitable case, in which rotates a shaft from which project radial plates, *n*, *o*, *p*, &c., dipping into the fluid O. The plates are insulated from each other, and each is attached to a commutator block; *m m'* are commutator brushes or springs arranged to bear upon the blocks of the plates remote from each other in the fluid. To *m m'*, lead conductors, 19, 20, completing a branch circuit from the house or consumption circuit.

Suppose the current to flow in such direction that *n* is the anode and *p* is the cathode; as *p* becomes loaded it sinks in the fluid, causing it to rotate, which movement is registered upon a register attached thereto.

This movement has brought *o* in contact with *m*, making it the anode, and *r* in contact with *m'*, making it the cathode.

When *r* becomes loaded it causes a rotation, when *p* becomes the anode and *s* the cathode, whereupon the metal formerly deposited thereon is dissolved off.

In both forms each plate is alternately an anode and a cathode, receiving a deposit only to have it stripped off, the very act of deposition setting in operation agencies which causes the change from anode to cathode, and agencies which register the change.

The register H may be made so as to indicate vebers or current units, or, as the relation between current and gas for light production is known, it may indicate the number of feet of gas which would be equivalent in light production to the amount of current registered.

While these devices are shown in a branch circuit, so that only a portion of the current passes therethrough, it is evident that they may be placed directly in the circuit.

While the circuits controlling the mechanical devices are here shown as branch or multiple arc circuits, it is evident that they may be battery local circuits.

It is also evident that all the mechanical devices may be actuated by clockwork which is controlled by the balanced arm or lever.

As this arrangement registers the exact number of vebers or current units passing therethrough, I have applied to it the term *vebermeter*.

What

A Vebermeter.

What I claim is—

- First—An electro-depositing cell in which each plate becomes alternately anode and cathode, substantially as set forth.
- Second—The method of measuring a current of electricity, consisting in causing a definite portion to pass through a depositing cell, containing balanced plate or plates, the overbalancing of the plates causing a registration and a change of the anode and cathode relation of the plates successively, substantially as set forth.
- Third—The combination of a decomposing cell, balanced polar plates therein, and a registering apparatus controlled by the overloading of either plate, substantially as set forth.
- Fourth—The combination of a decomposing cell, balanced polar plates therein and a reverser, reversing the direction of the current through the cell and controlled by the overloading of either plate, substantially as set forth.
- Fifth—The combination of a decomposing cell, balanced polar plates therein, and registering apparatus and means for reversing the direction of the current through the cell, the register and reverser being controlled by the overloading of either plate, substantially as set forth.
- Sixth—The combination with two magnets of a common armature lever playing between them, and a contact device operated by the lever, the lever on its attraction by either magnet, causing a break in the circuit of the magnet attracting it, and closing a break in the circuit of the other magnet.
- Seventh—The combination with an armature lever playing between two magnets and operating as described, of a reverser actuated by the armature lever on its movement in either direction, substantially as set forth.

Signed by me, this twenty-eighth day of October, A.D. 1880.

Witnesses—

CHAS. H. SMITH.
GEO. T. PINCKNEY.

THOMAS ALVA EDISON.

This is the specification referred to in the annexed Letters of Registration granted to Thomas Alva Edison, this seventh day of March, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

We have the honor to inform you that the application of Mr. Thomas Alva Edison for Letters of Registration (S1,801, 15 January) for an invention entitled "Improvements in the means of measuring the amount of electrical current flowing through a circuit" has been examined by us, and we see no objection to his application being granted.

Sydney, 25 January, 1881.
We have, &c.,
E. C. CRACKNELL.
GOTHER K. MANN.

The Under Secretary of Justice.

Fig. 1.

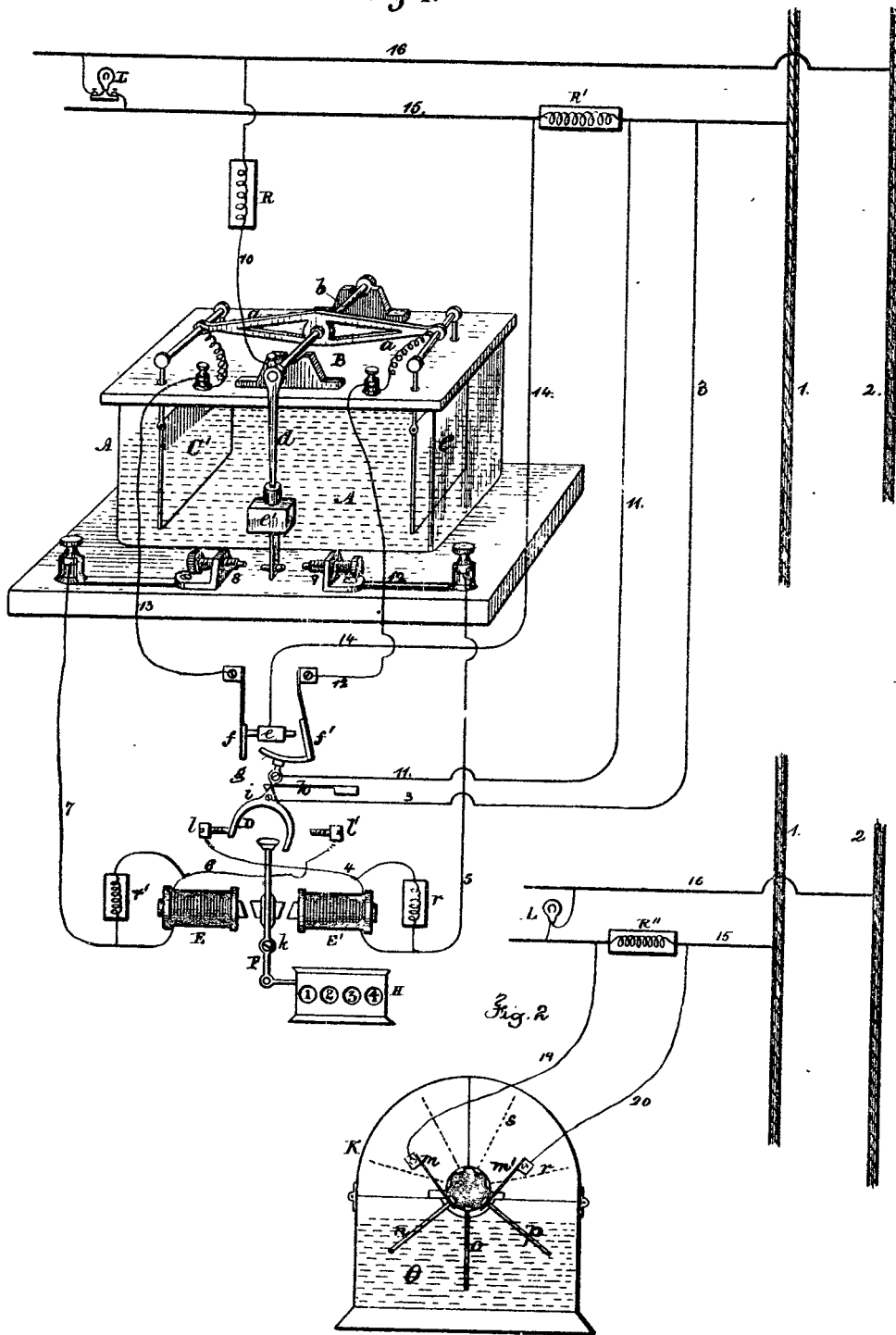
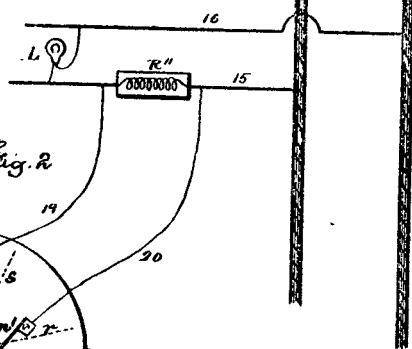


Fig. 2.



Witnesses

Charles Smith
Geo. J. Winkney

Inventor

Thomas alva Edison

This is the Sheet of Drawings referred to in the annexed Letters of Registration, granted to Thomas Alva Edison this seventh day of March, A.D. 1881.

Augustus Loftus.

(SIG. 34.-)



A.D. 1881, 7th March. No. 913.

AN INSTRUMENT FOR THE SIMULTANEOUS IGNITION OF SAFETY OR OTHER FUSES.

LETTERS OF REGISTRATION to William Bickford Smith and George John Smith, for an instrument or contrivance for the simultaneous ignition of a number of safety or other fuses.

[Registered on the 8th day of March, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting:

WHEREAS WILLIAM BICKFORD SMITH and GEORGE JOHN SMITH, both of Tuckingmill, in the county of Cornwall, England, safety fuse manufacturers, have by their Petition humbly represented to me that they are the authors or designers of a certain invention or improvement in manufactures, that is to say, of an invention entitled "An instrument or contrivance for the simultaneous ignition of a number of safety or other fuses," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed; and that they, the said Petitioners, have deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and have humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to them for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration, grant unto the said William Bickford Smith and George John Smith, their executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said William Bickford Smith and George John Smith, their executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said William Bickford Smith and George John Smith shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this seventh day of March, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

An instrument for the simultaneous ignition of safety or other fuses.

SPECIFICATION of WILLIAM BICKFORD SMITH and GEORGE JOHN SMITH, both of Tuckingmill, in the county of Cornwall, England, safety fuse manufacturers, for an invention entitled "An instrument or contrivance for the simultaneous ignition of a number of safety or other fuses."

THE object of our said invention is to provide a means of uniting several fire-bearing fuses, either quick or slow burning or explosive, in one recipient, to which fuses ignition is conveyed by a single fire-bearing fuse, a suitable ignition sheet or wad being interposed betwixt the ends of the several fuses and the single fuse, as will now be described with reference to the accompanying drawings.

Fig. 1 represents a section of an instrument according to our invention. A is a small cylinder of tin plate, zinc, wood, cardboard, or other suitable material, the diameter of the said cylinder being proportioned to the number of fuses which it is desired to ignite simultaneously. Into one end of the cylinder there is fitted a socket or block, B, formed of wood or other suitable material, through the centre of which a hole is bored, the diameter of which is proportioned to the size of the single fuse by which the number of fuses are to be ignited. At the base of the block or socket B, within the cylinder A, and placed close against the end of the hole through B, we insert a disc, wad, or cap, C, made of, containing, or saturated with an explosive or inflammable material. An inflammable disc or wad which we find suitable is made of open cotton fabric soaked in a composition of about 60 parts best gunpowder, 28 parts methylated spirit, and 12 parts water thickened with gum tragacanth to a consistency of thick syrup. These proportions and materials may however be varied. In some cases we simply interpose a layer, C, of gunpowder between the ends of the fuses D and E.

The ends of the several fuses D, intended to be simultaneously ignited, are brought together and inserted within the cylinder A, so that they abut against the inflammable disc, wad, or cap, C. The ends of these fuses are then securely fastened within the cylinder by cord or wire, or by the compression of the cylinder upon them, or by other means. A convenient mode of securing them is to tie them tightly round with a cord, H, and to bring the ends of the cord *h h* up on each side of the casing A, and tie them over the shoulder of B. The single fuse E, by which the others are to be ignited, is inserted through the hole in the block or socket B so that its end abuts on the reverse side of the inflammable disc or wad C.

By the ignition of the exterior of the single fuse E and the transmission of the fire through it the inflammable disc or wad C is ignited, and by it the whole number of fuses D whose ends are contained in the cylinder are simultaneously ignited in the manner intended.

The whole of the exterior of the igniting instrument, including the points of egress of the fuses to be ignited, and of the igniting fuse and the interstices between the former, may be advantageously varnished or coated with a solution or compound of india-rubber, gutta-percha, tar, or other suitable water-resisting material.

Fig. 2 shows a modification of the arrangement above described, according to which the ends of the several fuses D to be simultaneously ignited are inserted each through a separate hole in a plate, F, which may be close to the end of the casing and soldered thereto, or may be at some distance from the end and attached to the casing by a couple of wires, G, or simply kept in its place by the rigidity of the fuses passed through it, and the adhesion caused by the water-proofing composition applied. For facilitating the spreading out of the fuses D, the plate F may be, as shown in fig. 2, larger than the mouth of the casing A, and instead of supporting it by wires G G, the casing itself may be trumpet-mouthed and have the plate soldered to its mouth.

Having thus described the nature of the said invention and in what manner the same is to be performed, we claim—

The construction, substantially as herein described, of an instrument for effecting the simultaneous ignition of a number of fuses from one fuse, the ends of the fuses being arranged to abut against an inflammable disc or wad within a casing.

In witness whereof, we, the said William Bickford Smith and George John Smith, have hereunto set our hands and seals, this twenty-ninth day of November, one thousand eight hundred and eighty.

WILLIAM BICKFORD SMITH.
GEORGE JOHN SMITH.

Witness—VIVIAN PEARCE,
Hayle, Commercial Clerk.

This is the specification referred to in the annexed Letters of Registration granted to William Bickford Smith and George John Smith, this seventh day of March, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

We have the honor to inform you that we have carefully examined both drawings and specification (81,797, 15th January), accompanying Messrs. William Bickford Smith and George John Smith's application for Letters of Registration for an invention entitled "An instrument or contrivance for the simultaneous ignition of a number of safety or other fuses," and we see no objection to Messrs. Smith's application being granted.

The Under Secretary of Justice.

Sydney, 25 January, 1881.

We have, &c.,

E. C. CRACKNELL.
GOTHER K. MANN.

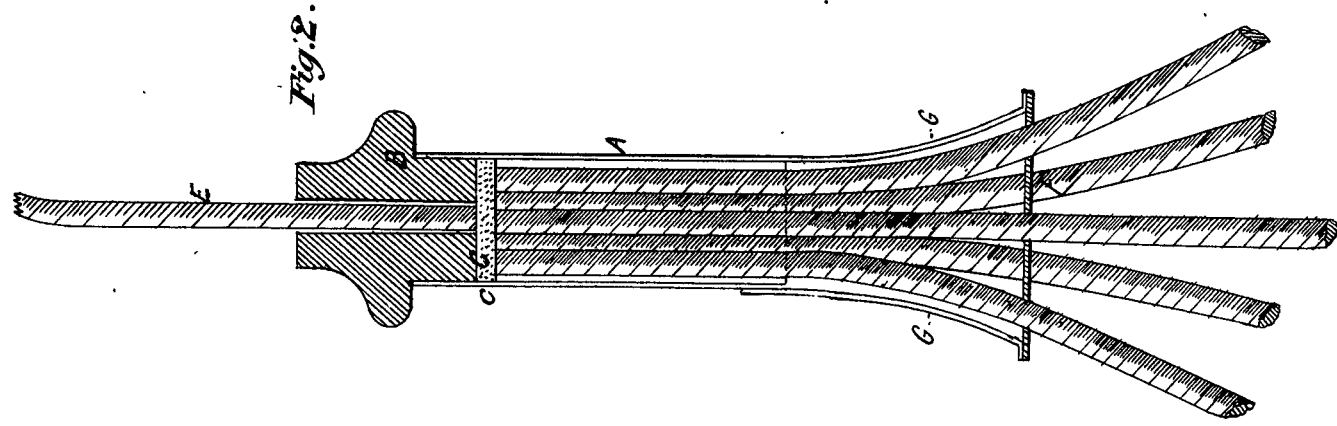


Fig. 2.

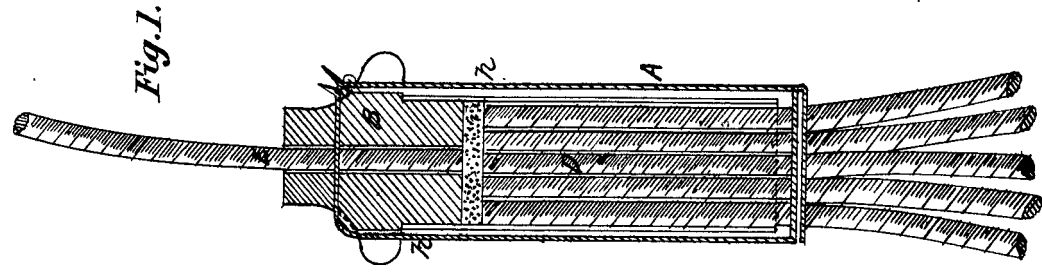


Fig. 1.

*This is the Sheet of Drawings referred to in the annexed
Letters of Registration granted to William Bickford Smith
and George John Smith, this seventh day of March, A.D. 1881.
Augustus Loftus.*



A.D. 1881, 7th March. No. 914.

AN IMPROVED APPARATUS FOR EXTRACTING GOLD FROM PYRITES.

LETTERS OF REGISTRATION to Henry Rosales, for an improved Apparatus for extracting Gold from Pyrites.

[Registered on the 8th day of March, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting:

WHEREAS HENRY ROSALES, of Walhalla, in the Colony of Victoria, mining engineer, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "An improved Apparatus for extracting Gold from Pyrites," which is more particularly described in the amended specification and the sheet of drawings which are hereunto annexed; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Henry Rosales, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said Henry Rosales, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said Henry Rosales shall not within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this seventh day of March, in the year of our Lord one thousand eight hundred and eighty-one.

[L.s.]

AUGUSTUS LOFTUS.

An improved Apparatus for extracting Gold from Pyrites.

AMENDED SPECIFICATION of HENRY ROSALES, of Walhalla, in the Colony of Victoria, mining engineer, for an invention entitled "An improved Apparatus for extracting Gold from Pyrites."

THE ordinary process of extracting gold from pyrites is to first calcine and then grind and amalgamate them. This involves considerable expenditure in the erection of a suitable furnace and in the labour and fuel necessary to carry on the calcination. Now, I dispense with the calcination altogether, and grind the pyrites raw. This has been done before, but mercury has invariably been mixed with the pyrites, so as to grind and amalgamate at the same time. Now, I find that a larger percentage of gold may be obtained and the loss of mercury reduced by grinding the raw pyrites without mercury, and afterwards amalgamating the ground material with mercury in separate vessels. This percentage is largely affected by the degree of fineness to which the pyrites are reduced—the smaller the particles the greater the result.

The grinding without mercury I prefer to conduct in a Chilian mill, and the subsequent amalgamation of the ground material with mercury I conduct (with the addition of about 2 or 3 ounces of caustic soda per charge of 125 lbs. of ore, the whole being in a moist state) in Tyrolese mills and dollies, the former being improved by the addition of metal surfaces coated with mercury to the faces of both runner and basin, and the latter being improved by the addition of a metal surface coated with mercury to the basin only. Before running the pulp into the amalgamating vessels I shovel it into a distributing trough, and there dilute it with a constant flow of water. Other rotatory amalgamating contrivances may be substituted for the Tyrolese mills or dollies, but in each case their surfaces must be covered with a metal plate coated with mercury. The diluted pulp discharged from the last Tyrolese mill of each set is allowed to run to waste. The mercury is kept clean by distributing in the dollies and Tyrolese mills about 3 ounces of sodium amalgam per charge of (say) 125 lbs. of dry ore.

The drawings hereto attached illustrate the method I prefer of arranging the several contrivances herein mentioned.

I claim—

The combination with my process of rotatory amalgamating vessels, such as Tyrolese mills and dollies, having their faces coated with amalgamated metal plates.

In witness whereof, I, the said Henry Rosales, have hereto set my hand and seal, this twelfth day of November, one thousand eight hundred and eighty.

Witness—

EDWD. WATERS,
Melbourne, Patent Agent.

HENRY ROSALES.

This is the amended specification referred to in the annexed Letters of Registration granted to Henry Rosales, this seventh day of March, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 9 December, 1880.

Having had under our examination the documents transmitted under your B.C., 19 and 27 November, 1880, No. 9,321, in reference to the petition of Mr. Henry Rosales, praying for a grant of Letters of Registration for an "Improved process of and apparatus for extracting Gold from Pyrites," we do ourselves the honor to report thereon as follows:—

The first claim of Mr. Rosales, viz., of grinding the pyrites raw and without mercury, and subsequently amalgamating them when ground in separate vessels with mercury, and either with or without an alkali or oxidizing salt, we consider inadmissible, as *not* novel.

While *separate* crushing and amalgamation is frequently resorted to, the use of an alkali is embodied in a patent (No. 288) granted in New South Wales, on 30th October, 1871, to Messrs. Wilson and Williams. Separate crushing is incidentally referred to in this patent.

The use of an alkaline earth, such as lime, is patented by Messrs. Joseph, Muir, & Bensusan, under No. 802, February 20, 1880.

As to Mr. Rosales' second claim,—though the use of amalgamated metal plates in machinery applied to amalgamation of auriferous and argentiferous ores is common, yet the use of amalgamated metal plates as described by Mr. Rosales to the surfaces of rotatory amalgamating machines appears to us novel, and we see no objection to Letters of Registration being granted referring to that portion of Mr. Rosales' specification (sub No. 2), should he deem it expedient after his claim sub No. 1 has been disallowed.

We have, &c.,

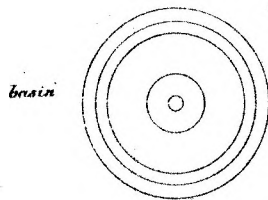
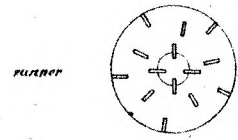
A. LEIBIUS.

E. C. CRACKNELL.

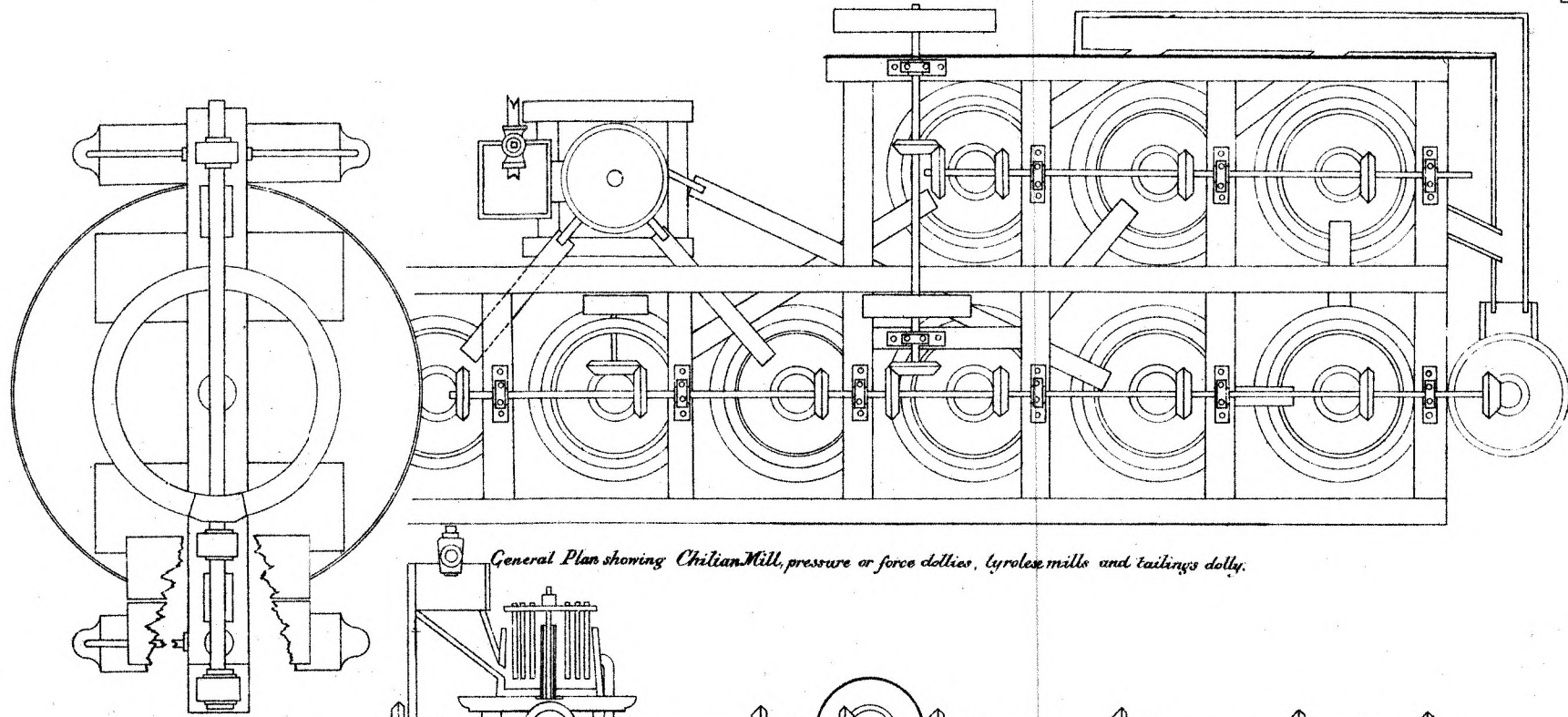
The Under Secretary of Justice.

NOTE.—The suggestion of the Board having been accepted by Mr. Rosales, Letters of Registration were issued accordingly.

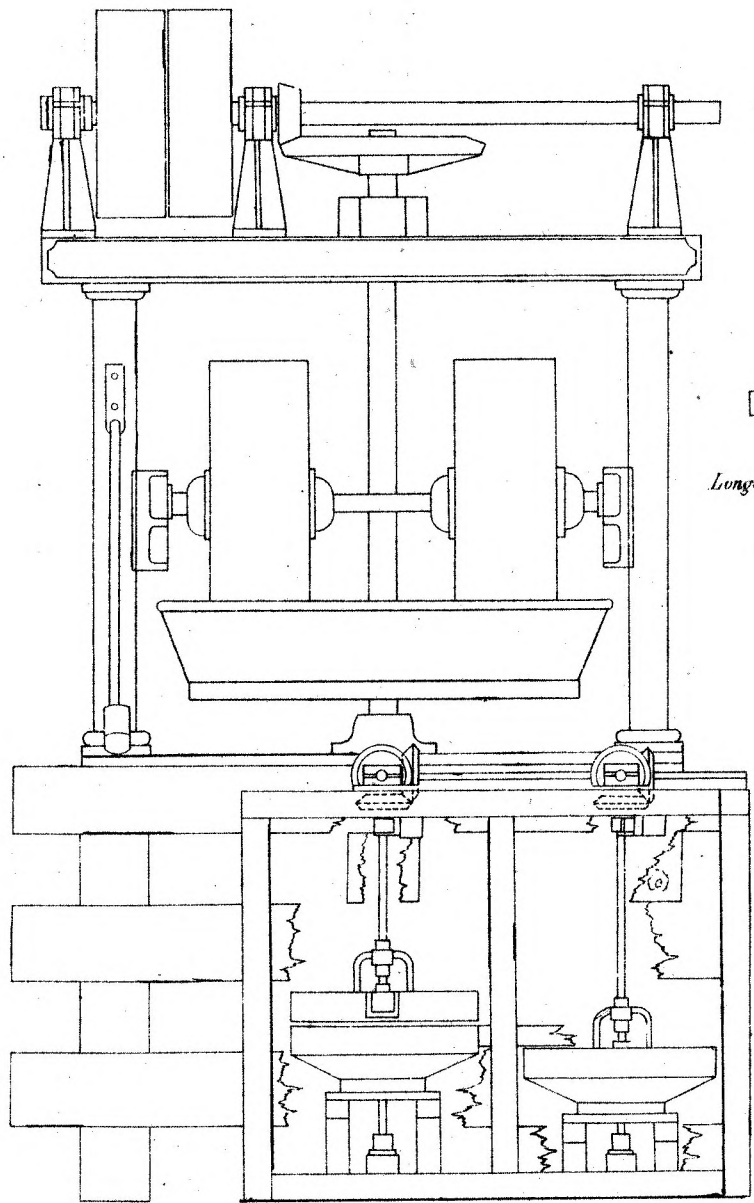
**H. ROSALES.
PATENT.**



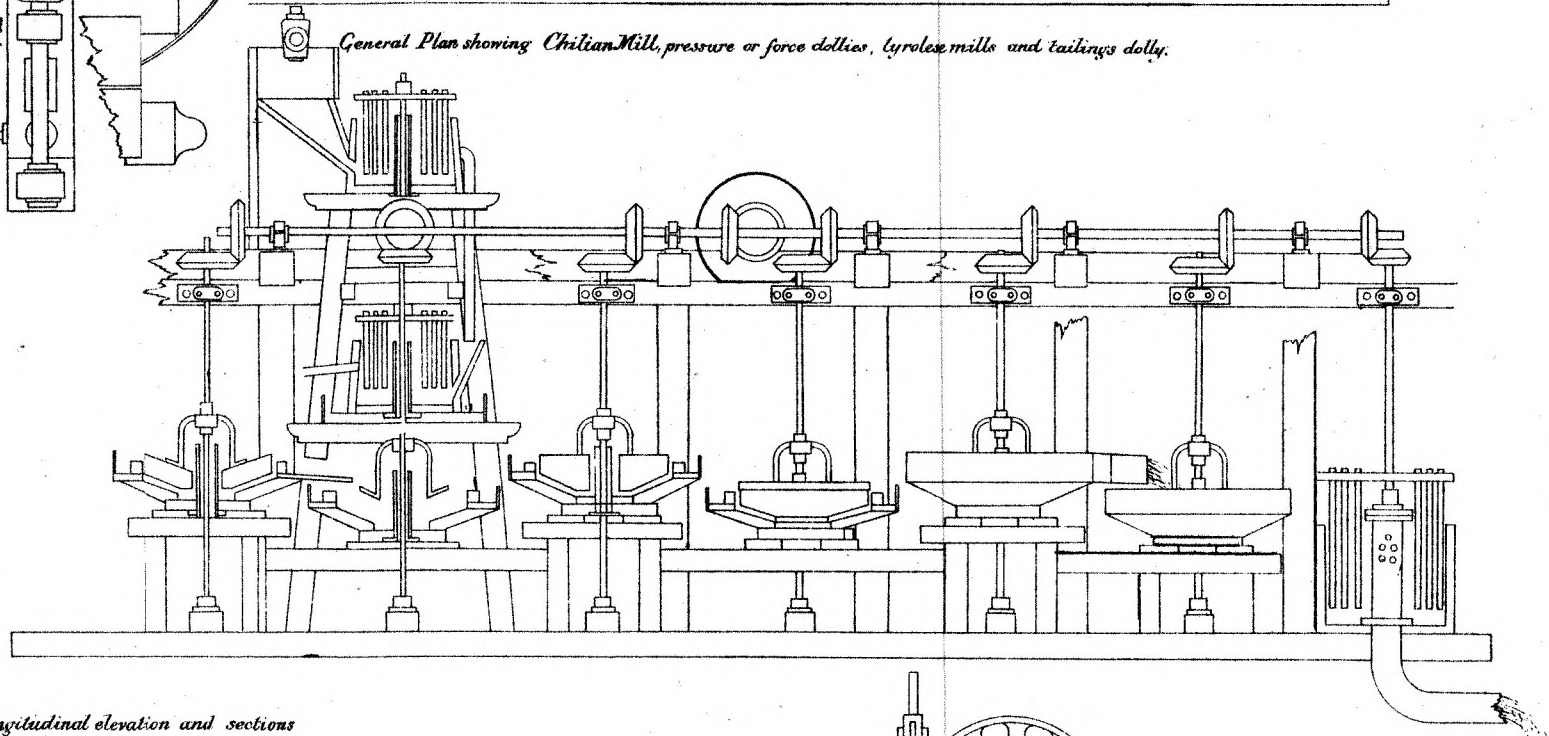
Plan of a basin and of the runner
of a tyrolase mill both lined with
steel copper.



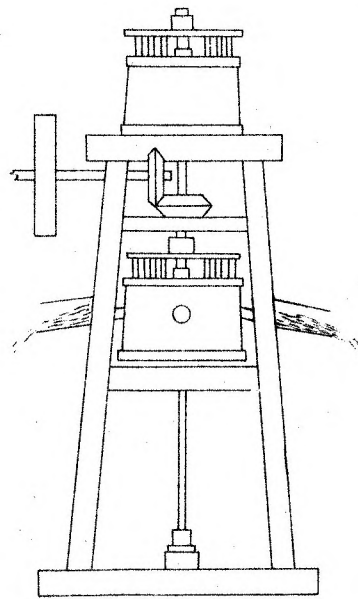
General Plan showing Chilean Mill, pressure or force dolly, tyrolase mills and tailings dolly.



(34.-) End elevation showing Chilean mill
and tyrolase mills.



Longitudinal elevation and sections



End elevation of pressure
or force dolly.

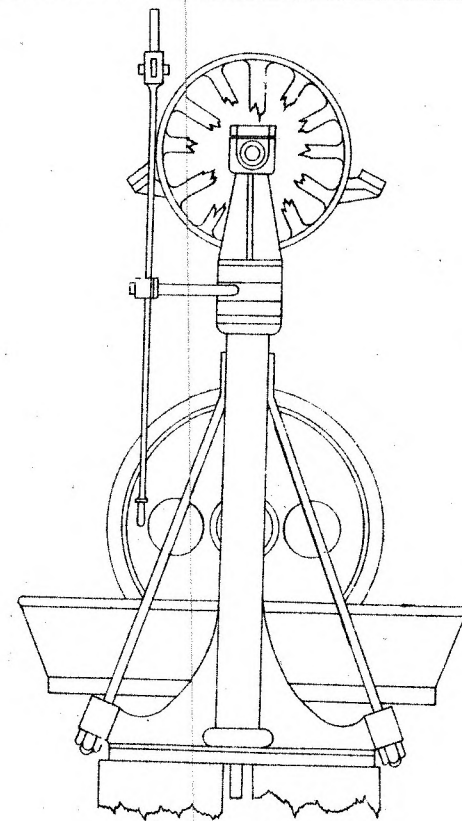


PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE,
SYDNEY, NEW SOUTH WALES.

This is the Sheet of Drawings referred to in the annexed
Letters of Registration, granted to Henry Rosales this seventh
day of March, A. D. 1887.

Augustus Loftus.



A.D. 1881, 28th March. No. 915.

GRIERSON'S KEYED WOOD AND COMPOSITE PAVEMENT.

LETTERS OF REGISTRATION to John Walter Grierson, for a keyed wood and composite Pavement.

[Registered on the 28th day of March, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS JOHN WALTER GRIERSON, of Melbourne, in the Colony of Victoria, gentleman, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "A keyed wood and composite Pavement," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed ; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four ; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years : And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said John Walter Grierson, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof : to have, hold, and exercise unto the said John Walter Grierson, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended : Provided always, that if the said John Walter Grierson shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this twenty-eighth day of March, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Grierson's keyed wood and composite Pavement.

SPECIFICATION of a keyed wood and composite Pavement, invented by JOHN WALTER GRIERSON, of Melbourne, in the Colony of Victoria, gentleman, for roads, streets, street crossings, footpaths and crossings, stables, stalls, carriage drives; garden walks, verandah and warehouse floors, cellars, tennis lawns, yards, approaches to buildings, &c., &c.

My invention, as shown on plan drawn to $1\frac{1}{2}$ -inch scale, also by model made to $\frac{1}{4}$ size, consists of wood blocks cut wedge shape and keyed together, so as to form one continuous and compact whole; the keys prevent vibration, and hold the blocks down and together on their respective bearings. The blocks being wedge-shaped take their bearings from the sides, thus forming a continuous arch, and are rammed at each end or side to form the abutments.

The mode and method of laying down the pavement is—1st. To fix the blocks together with the keys, as shown by model either in sections or as a whole, according to the lengths required. 2nd. The ground line is prepared to the depth, incline, or curve required, and a layer of broken metal of $2\frac{1}{2}$ -inch, or a greater or lesser gauge as may be required, spread to an even surface 3 inches or more in depth; upon this bed of metal the wood portion of the pavement is laid, and the spaces shown by sections AB and CD on plan and by model are filled in with broken metal of $1\frac{1}{2}$ -inch gauge, composed of any description of flinty rock or basalt. 3rd. The $1\frac{1}{2}$ -inch metal is gradually filled in and rammed to a firm bearing and consistence to within 2 inches of the surface, the remaining 2 inches being filled with asphalt, concrete, or cement, flush to the surface, and rolled with a heavy roller.

The size of the blocks drawn on and described by plan and model are $7 \times 5 \times 9$ inches deep, dipped in coal tar, and specially designed to prevent slipping, and for the greater security of horse traffic. The keys are $2\frac{1}{2} \times 2$ inches, coated with coal tar. The key grooves or sinkings in blocks are $\frac{3}{4}$ inch deep by 2 inches wide.

The foregoing are the sizes for streets, roads, or street crossings of ordinary traffic, but if required for very great wear and extraordinary traffic the blocks and keys can be made and fixed to greater depths, even 2 feet, and larger or smaller on their surface. For footpaths and other work described in the preamble to these specifications, the blocks to be $4 \times 3 \times 4$ inches, and for tennis lawns, verandah floors, walks, and yards, $3 \times 3 \times 3$. The keys in all instances to be proportionate to the size of the blocks used. The blocks and keys may be of any description or kind of durable wood, and the keys may be of iron of proportionate size, or the blocks may be bound together for various purposes with a rod of iron.

I do not claim for wood, asphalt, concrete, cement, metal, or tarring wood for preservation, but I do claim, as the novelty of my invention herein described and illustrated by plan and model—

- 1st. For the keys and their use, as shown by plan and model.
- 2nd. For the shape of blocks, and the mode and method of putting the whole together to receive the metal, asphalt, concrete, or cement.
- 3rd. For the elasticity, economy, and durability of the pavement.
- 4th. For the general combination and arrangement herein described, and illustrated in my drawings, for its freedom from dust, and non-necessity for watering.

JOHN WALTER GRIERSON,
Inventor.

This is the specification referred to in the annexed Letters of Registration granted to John Walter Grierson, this twenty-eighth day of March, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

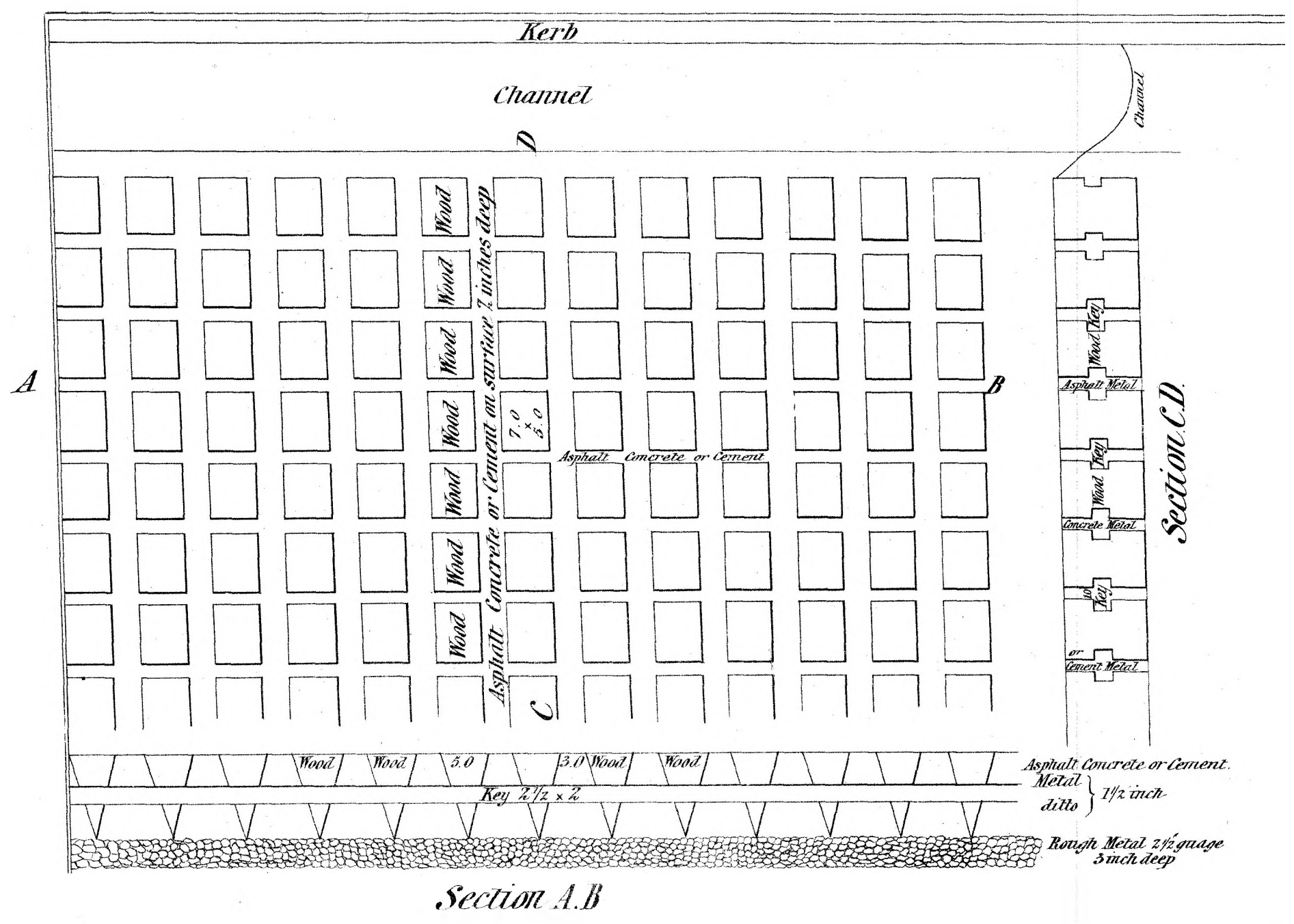
The application of Mr. John Walter Grierson for Letters of Registration for "Grierson's keyed wood and composite Pavement" having been referred to us, we have examined the specification, drawings, and model accompanying the same, and have now the honor to report that we see no objection to the issue of Letters of Registration as prayed for.

Sydney, 28 January, 1881.
We have, &c.,
JAMES BARNET.
E. O. MORIARTY.

The Under Secretary of Justice.

[Drawings—one sheet.]

PLAN OF GRIERSONS KEYED WOOD & COMPOSITE PAVEMENT



This is the Sheet of Drawings referred to in the annexed Letters of Registration granted to John Walter Grierson, this twenty eighth day of March A.D. 1881.

Augustus Loftus.



A.D. 1881, 26th March. No. 916.

IMPROVEMENTS IN FIRE-BARS AND FURNACES.

LETTERS OF REGISTRATION to John Alves, for Improvements in and relating to Fire-bars and Furnaces.

[Registered on the 28th day of March, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS JOHN ALVES, of Dunedin, in the Provincial District of Otago and Colony of New Zealand, engineer, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in and relating to Fire-bars and Furnaces," which is more particularly described in the specification and the sheet of drawings which are hereunto attached ; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four ; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years : And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said John Alves, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof ; to have, hold, and exercise unto the said John Alves, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended ; Provided always, that if the said John Alves shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this twenty-sixth day of March, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Fire-bars and Furnaces.

SPECIFICATION of JOHN ALVES, of Dunedin, in the Provincial District of Otago and Colony of New Zealand, engineer, for an invention entitled "Improvements in and relating to Fire-bars and Furnaces."

My invention relates—first, to fire-bars; second, to fire-bridges in furnaces; and third, to rakes for use with my fire-bars.

As to fire-bars.—My improvements consist, first, in making their faces with a longitudinal knife-edge or ridge instead of a flat surface; second, in making the sides of each bar to taper from one end to the other and third, in so setting them in position as to admit of the space between them gradually widening from one end to the other (produced by the tapering sides), and also so as to leave a narrow space between them and the fire-box on all sides.

As to fire-bridges.—My improvements consist, first, in making their base or lower part of cast iron, with slots or air spaces to admit the air from the front end of the fire-bars into the body of the front of the furnace; and second, in building a brick superstructure on said iron base, said brick superstructure having projecting horns at each side to throw the flames higher than they otherwise would go, and with an iron plate at the top of the brick-work, to admit of its being braced together by iron tie-rods proceeding from the top to the bottom of the bridge.

As to rakes.—My improvement consists in making them with teeth which will fit into the spaces formed by my fire-bars.

Referring now to my drawings. Figure 1 shows longitudinal section of the fire-box of a tubular boiler constructed according to my invention, whilst figures 2 and 3 show respectively transverse section and plan of the same. *a* are the fire-bars, resting on bearers *b*; *d* are the dividing pieces between the bars, and *u* the space at either end and on either side of them; *l* are the spaces between the bars, which it will be seen gradually widen from the back of the fire-box to the front. *L* is the furnace door. *A* is the cast iron substructure or base of the fire-bridge, which rests on space or distance pieces *c*, so as to leave draught spaces, *c'*, underneath it. The upright part of this cast iron part, marked *f*, is to protect the tube plate *p* from the injurious effects of the cold air; *m* are the slotted air spaces in the face of this part of the bridge, *B* is the brickwork thereon, and *C* the horns of such brickwork; *o o* are iron plates, and *u* tie-rods for bracing the brick superstructure to the iron substructure of the fire-bridge, the space *r*, and if necessary space *r'*, being packed with fire-clay; *t* are the tubes. When the bridge is dispensed with, the bars are made longer at the front, to prevent fuel falling through.

Figures 4 and 5 show respectively plan and longitudinal section of another mode of using my fire-bars. Here are two longitudinal bars, *a a*, joined together at the ends, and with my fire-bars, *e*, placed across from one to the other at an angle, although of course they may be set straight across if so desired.

Figure 6 shows at *A* a cross section of bars in figure 4 with alternate broad and narrow bars; at *B*, cross section showing side bars and cross bars and dividing pieces; at *C*, section of three bars together, the centre one deeper than the others, *a* being the longitudinal bars and *e* the cross bars.

Figure 7 shows rake with teeth or edge suitable for cleaning the fire-bars, as shown in figure 6; whilst figure 8 shows rake suitable for cleaning the fire-bars, as shown in figure 2.

As to the fire-bars.—The width of the spaces between them is regulated to suit the description or quality of fuel used, and their depth according to the strength required. They may all be of the same depth, or some of one depth and some of another. The dividing pieces are made to fit the spaces required, and are kept below the bevelled part of the bars, to allow the rake to pass without obstruction, and also to allow the air free play upon the coal, which the dividing pieces in the ordinary way do not, as the fuel rests on the dead flat surface of the bar without air space. The bars and the dividing pieces may be constructed separately, or two or more may be joined together to suit the length and breadth of the furnace or fire-box, but so as to leave a space on either side of the fire-box and at the back, for the purpose of causing the flame and heated air to keep to the sides of the fire-box. In some cases the bars are put across the furnace, or cross bars are put between two longitudinal bars, according to the description of the furnace and the draught, but the tops are bevelled to a knife-edge or ridge, as shown. The object of this part of my invention is to expose to the fullest extent the underneath surface of the fuel to the action of the atmosphere. By it the air is in contact at once with the fuel throughout the whole area of the grating, inasmuch as in going through the air spaces the air spreads on either side and fills the grooves caused by the bevel of the bars, and, as only the sharp edges of the bars touch the fuel, there is no obstruction to the admission of air to every part of the fuel. In the ordinary furnace bars a little more than about one-fourth is air space, the bars occupying the remainder of the grating area. The bevelled edge bars create a better draught. The sharp edges of the bars also prevent the fuel from clinkering to a great extent, as on forming on the edge of the bar the clinker turns down the slope of the bar, the action of the air makes it brittle, the sharp edge breaks it, and it falls through between the bars in small pieces instead of forming a cake or sheet of slag on the top of the bars. The air having a free passage the bars are less liable to be overheated or burnt, and consequently a saving in wear and tear is effected. Less attention to the firing is necessary, as the bars keep clean, and the frequent admission of cold air into the fire-box by opening the furnace door is prevented. The spaces at the back of the furnace being required only to free the ashes at that part, less the portion which is carried towards the tube plate by the blast, are made to taper narrow towards the back, and by graduating the spaces wider towards the front of the furnace the ashes which are made at that part as well as the portion carried from the back are enabled to pass through, and the air being admitted to a greater extent the combustion is more perfect, and the accumulation of ashes and clinkers at the front of the furnace is materially lessened. Where more than one length of bar is used, and two ends abut against each other, the space pieces are kept a proper distance from the ends to prevent obstruction to the air passing to the fuel. If preferred, my fire-bars may be made without any taper and with a uniform width of space between them; they may also be set on a level, or on an incline, and may be used without the fire-bridge, and for ranges, grates, and stoves of every description.

The slots or air spaces in front of the cast iron part of the fire-bridge are to create a back current of air into the fuel next to it and to cause better combustion of the fuel, so that the air from below the bars may freely get through the fuel. At the back and ends of the bridge a safety plate for the protection of

Improvements in Fire-bars and Furnaces.

of the tube plate and sides of fire-box is fixed, the top of the bridge resting on the top edge of the safety plate, and there secured in position by slots or dove-tails, a space allowing for the rivet heads being left between the tube plate and safety plate for fire-clay packing, and the bottom edge of the safety plate being provided with a fillet to hold such packing. This safety plate may be separate, as above described, or cast as part of the bridge, or if desired the bridge may be used without the safety-plate. Instead of the cast-iron portion of the bridge being protected by fire-bricks bolted to it as before described, a hollow vessel, similar in form and made of boiler-plate or other suitable material, attached to or forming part of the boiler, so as to be supplied with water, might be substituted. The object of this part of my invention is to obtain a blast at the front of the furnace, thereby creating a better draught and preventing any accumulation of fuel at the front of the fire-box. The whole of the fire space doing its full amount of work at the same time, and the heat being more intense at the front of the furnace, will consume a certain percentage of the smoke which passes over it. The horns are designed for the purpose of causing the flames to rise towards the upper tubes, thereby distributing the flame and heated air more evenly through the tubes. The combustion by means of these improvements is rendered more complete; there is no deposit of ashes either in the boiler tubes or smoke-box, and the flames being more evenly distributed through the tubes there is less destruction to the tubes and tube plate, and so a saving both in labour and in wear and tear is effected. Owing to the better draught, there is more complete combustion of the fuel and a better diffusion of the heat throughout the furnace; steam is more quickly generated, and a less quantity of fuel required. The fire-bridge can be extended round the furnace if required.

Having thus described the nature of my invention and the manner of performing same, I would have it understood that what I believe to be new and therefore claim as my improvements in and relating to fire-bars and furnaces is—

- First—Making fire-bars with a longitudinal knife-edge or ridge for the upper face, either with or without tapering sides, and setting them (when they have tapering sides) in such a way as that the space between them gradually widens from one end to the other, and so as to leave a narrow space all round between them and the fire-box.
- Second—Making fire-bridges with a cast-iron substructure, having slots or air spaces to admit the air from the back end of the fire-bars, and erecting a brick superstructure or water chamber thereon, braced or bolted together, substantially as herein described and explained.
- Third—Making rakes with teeth to fit into the spaces between and clean my fire-bars, substantially as herein described and explained.

In witness whereof, I, the said John Alves, have hereto set my hand and seal, this tenth day of December, one thousand eight hundred and eighty.

JOHN ALVES,

By his duly authorized Attorney,
EDWD. WATERS.

Witness—W. S. BAYSTON,
Clerk to Edwd. Waters,
Melbourne, Patent Agent.

This is the specification referred to in the annexed Letters of Registration granted to John Alves, this twenty-sixth day of March, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 2 February, 1881.

We do ourselves the honor to inform you that we see no objection to the issue of Letters of Registration in accordance with Mr. John Alves' petition, specification, drawings, and claim for "Improvements in and relating to Fire-bars and Furnaces," transmitted for our report under your blank cover communication of 14th December, No. 80-10,249.

We have, &c.,
JOHN WHITTON.
E. O. MORIARTY.

The Under Secretary of Justice.

[Drawings—one sheet.]

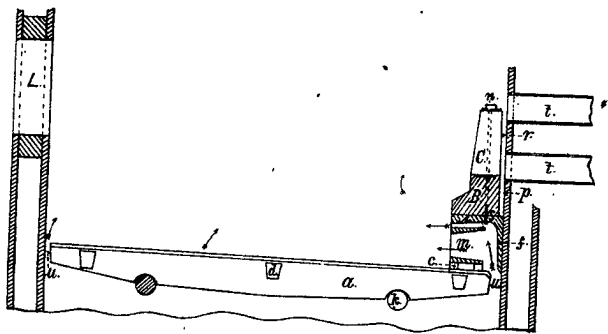


Fig. 1.

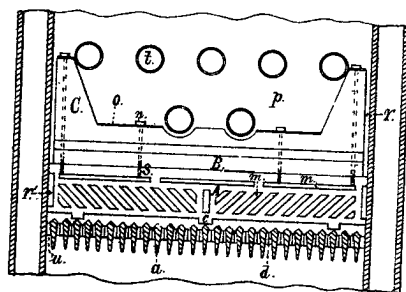


Fig. 2.

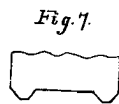


Fig. 7.

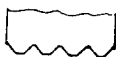


Fig. 8.

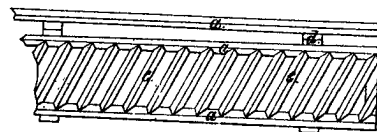


Fig. 4.

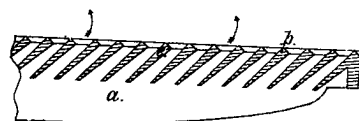


Fig. 5.

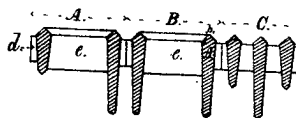


Fig. 6.

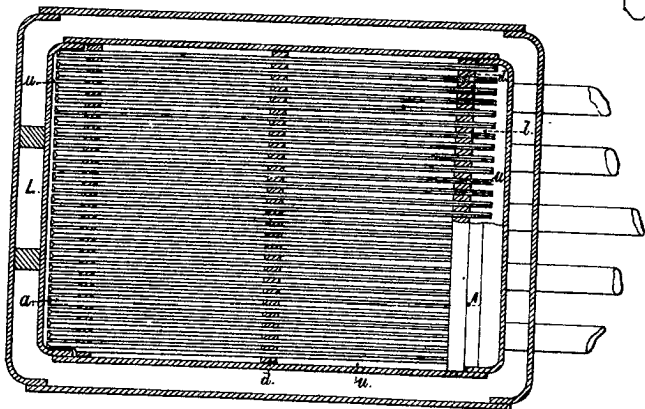


Fig. 3.

Henry Howarth

Alfred E. Allenby

John Allen

(34-)

PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE, SYDNEY, NEW SOUTH WALES

This is the Sheet of Drawings referred to in the annexed Letters of Registration, granted to John Allen this twenty-sixth day of March, A.D. 1881. Augustus Loftus.



A.D. 1881, 26th March. No. 917.

IMPROVEMENTS IN SEWING-MACHINES.

LETTERS OF REGISTRATION to Lebbens Baldwin Miller and Philip Diehl,
for Improvements in Sewing-machines.

[Registered on the 28th March, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting:

WHEREAS **LEBBENS BALDWIN MILLER** and **PHILIP DIEHL**, both of Elizabeth, in the State of New Jersey, United States of America, have by their Petition humbly represented to me that they are the authors or designers of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in Sewing-machines," which is more particularly described in the specification, marked A, and the two sheets of drawings, marked B and C respectively, which are hereunto annexed; and that they, the said Petitioners, have deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and have humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to them for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein, and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said **Lebbens Baldwin Miller** and **Philip Diehl**, their executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said **Lebbens Baldwin Miller** and **Philip Diehl**, their executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said **Lebbens Baldwin Miller** and **Philip Diehl** shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this twenty-sixth day of March, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Sewing-machines.

A.

SPECIFICATION of **LEBBENS BALDWIN MILLER** and **PHILIP DIEHL**, both of Elizabeth, in the State of New Jersey, United States of America, for an invention entitled "Improvements in Sewing-machines."

THE invention has reference to the shuttle mechanism of sewing-machines, the feed mechanism, and the presser-foot mechanism thereof, and consists of certain constructions and combinations of mechanical devices, which are set forth in detail in the claims at the close of this specification.

All of the said features of invention need not necessarily be embodied in the same machine; but in order that the invention may be fully understood, a representation is given in the accompanying drawings of the principal parts of a sewing-machine, embodying all of the said features in the best form in which they have been embodied by us at the present date.

Figure 1 is a plan of the shuttle with the bobbin-holder removed. Figure 2 is an edge view of the shuttle. Figure 3 is a cross-section taken on line *aa*, figure 1, of the shuttle and bobbin-holder and bobbin. Figure 4 is a similar section, showing the bobbin-holder turned out from the aperture in the shuttle, so that the bobbin or cop can be taken out and a fresh one slipped into the holder. Figure 5 is an edge-view of the shuttle, as seen from the direction shown by the arrow, figure 1; the bobbin and bobbin-holder are in this view also shown turned out from the aperture in the shuttle. Figures 6 and 7 are back and front views of the bobbin-holder and bobbin held by it. Figure 8 is a section of the shuttle taken on the line *bb*, figure 1, with the tension spring removed. Figures 9 and 10 are views of this spring; and figure 11 shows a screw-pin which serves to regulate the tension, and also serves as an axis for the bobbin-holder. Figure 12 is a diagram showing the point of the shuttle bent or deflected. Figures 13 and 14 show a shuttle formed with a groove around the outer circular portion of its circumference to work over a corresponding projection on the shuttle-race, instead of a projection on the shuttle working into a recessed groove in the race, as in the shuttle shown at figures 1, 2, 3, 4, and 5. Figures 15 to 20 show a modified construction of the shuttle, to better enable a uniform and elastic tension to be maintained on the under thread, and to enable the tension to be readily varied as required, and still at the same time provide a simple and durable thread-case, and one that is convenient for receiving and holding the thread. The thread-case in this shuttle is made in two parts, hinged together. Figure 15 represents a face-view of the shuttle with the thread in it, and shows the manner in which such thread is passed through the tension device to the place of delivery. Figure 16 is an edge-view of the same shuttle, showing especially the device for locking the thread-case, and by the same mechanism obtaining and regulating the pressure or tension on the thread. Figure 17 is a cross-section through the line *bb*, figure 15, showing the manner of hinging together the under and upper parts of the thread-case. Figure 18 is a cross-section through the line *ee*, figure 15, showing especially the locking and tension device above referred to. Figure 19 is an inner face-view of the shuttle, with the upper part or cover of the thread-case removed; and figure 20 shows the inner face of the upper part or cover of said thread-case, and also the manner in which the thread rests on it and passes out through the tension device to the place of delivery. Figure 21 shows a face-view of the shuttle-driver, shuttle-race, and shuttle working therein. Figure 22 shows a section of the shuttle-race, and also shows the shuttle and shuttle-driver by which the shuttle is caused to oscillate in the circular race. These views show the horn of the shuttle-driver which comes in front of the body of the shuttle projecting forwards to serve as a guard to keep the shuttle thread out of the way of the needle as the needle descends. Figures 23 and 24 are views of the lower end of the needle-bar, to show the way in which the needle is secured to it. Figure 25 is an underside view of the table or bed of the machine, to show the way in which the lifting motion is given to the feed-bar, by which the work is moved forwards. Figure 26 is a top-view of the sewing-machine. Figure 27 represents a side-view of the same, with the side-plate of the needle-arm removed. Figure 28 represents an end-view of the same.

The general form of the sewing-machine represented in the said drawings does not differ materially from that of many shuttle machines in common use, there being a bed-plate, *G*, with which the other parts are connected, a strong arm, *P*, to support the needle-bar above the cloth-plate *Y* of the bed *G*, and a driving shaft, *R*, extending through the needle-arm *P*, to drive the needle-bar. The needle-bar *S* is arranged to slide up and down in the head *T* of the needle-arm *P*, and motion is transmitted to the needle-bar *S* from the driving-shaft *R*, through the intervention of a crank-pin, *a*, and a connecting-rod, *b*. The under thread, which is interlooped with the needle thread to form the stitch, is, according to this invention, carried by an oscillating shuttle, *A*, which is caused to oscillate in a circular shuttle-race, *X*, by means of an oscillating shuttle-driver, *Z*, carried by the shuttle rock-shaft *Z*¹, which is arranged below the table-plate *Y* of the machine.

The shuttle represented at figures 1 to 11 consists mainly of three principal parts, firmly combined or connected together, these three parts being the bobbin-case *A*, the beak proper *d*¹, and the beak-shank *d*²; the bobbin *c* is made in the form of a flatted spool, whose thickness is less than its diameter, and the cavity of the shuttle in which the bobbin is held is of the same form.

The external profile of the bobbin-case portion of the shuttle is a pointed oval, whose exterior curve corresponds with the circle of the shuttle-race. The office of the beak proper *d*¹ is to enter the loop of the needle thread presented by the needle, and the office of the beak-shank *d*², which intervenes between the beak proper *d*¹ and the bobbin-case, is to hold the said loop while the needle is rising until the needle-eye is clear of the work being sewed, but without material elongation of the loop, so as to obviate the pulling of the thread downward through the needle-eye while it is in the work, and the great friction upon the thread incident to that mode of operation.

For the purpose of holding the loop of needle thread without elongation, the beak-shank *d*² may be of uniform cross-section throughout its length; but in order that the friction upon the needle thread may be reduced to the lowest limit during the rise of the needle-eye through the work, the thread is permitted to rise with the needle until the needle-eye is clear of the work, and this rise is permitted by the peculiar form of the beak-shank *d*², which, commencing at the butt of the beak proper *d*¹, diminishes in cross-section as it approaches the bobbin-case.

The butt of the beak proper corresponds in position with the position of the needle when its eye during rising is just below the work or thereabouts; hence when the needle-eye rises through the work the reduced beak-shank of the shuttle moving through the loop of needle thread permits it to contract, and

Improvements in Sewing-machines.

and consequently permits the needle thread to move upward through the work with the needle in its ascent. By the continued forward oscillation of the shuttle in its race the bobbin-case of the shuttle follows the beak proper d^1 , and by its oval form spreads or extends the loop sufficiently to permit the bobbin to pass through it; but as this spreading is done after the needle has risen through the work, the whole area of the needle-hole is free for the movement of the needle thread, which in consequence is then readily drawn down through the needle-hole to form the extended loop.

The advantages incident to the construction of the shuttle with a beak-shank, d^2 , intervening between the beak proper d^1 and the bobbin-case, although attained most readily with an oscillating shuttle, are not restricted to the latter, because a shuttle fitted to move in a straight shuttle-race may be constructed with a beak-shank succeeding the beak proper and preceding the bobbin-case, provided the extent of movement of the shuttle be sufficient to permit this construction.

The delivery eye e of the shuttle is at its inner edge near the centre of the circular shuttle-race, so that the distance from the delivery eye to the sewing point remains approximately the same, notwithstanding the change in the position of the shuttle in its race. The delivery eye, however, is not at the said centre or axis of oscillation of the shuttle, but is purposely arranged at a short distance from that axis, and at the side thereof which is nearer the outer rim of the shuttle. Hence when the shuttle is retrograded (by the return movement of the oscillating shuttle-driver Z), the descent of the delivery eye or its movement from the work exerts a pull upon the shuttle thread and draws it home to finish the stitch.

The thread from the bobbin is conducted to the delivery eye e of the shuttle, but in its passage to that bobbin is operated upon by a thread tension, by means of which the tension upon the shuttle thread can be varied. The shuttle thread tension consists in this instance of a spring, s , and screw, h , which can be turned to cause the spring to press more or less firmly upon the thread, and so adjust its tension or resistance to being pulled from the shuttle. The shuttle thread is guided to the thread tension by an internal eye, through which the thread passes from the bobbin.

In order that the shuttle thread may readily be threaded or passed into the internal and delivery eyes of the shuttle, these eyes are each provided with a slit leading into them, through which the thread can be slipped into the eye. The free end of the tension spring is shaped and adjusted to rest in the slit of the delivery eye, serving as a guide for the thread into or from the delivery eye, and yielding sufficiently to the pressure of the thread to admit it into the delivery eye; but when the thread is in the eye, stopping the slit and preventing the thread from falling out. It is obvious that, in place of the tension spring, serving not only to apply friction to the thread but also to close the slit leading to the delivery eye, and so prevent the thread dropping out from the eye, a separate spring might be used for this latter purpose.

The delivery eye for the thread is shown at e , figures 1, 5, and 8, and the slits to the delivery eye and to the internal eye are shown at s^1 and s^2 , figures 1, 5, and 8. The shuttle tension spring s , figures 1, 5, 9, and 10, is so shaped that when the head of the tension screw h is caused to press more or less upon it, the spring will press more or less upon the thread as it passes from the internal eye to the delivery eye, and put more or less tension upon it. At the same time the free end e^1 (figures 1, 5, 9, and 10) of the spring will rest in the slit s^1 of the delivery eye, closing the same and preventing the thread from falling out.

To thread the shuttle it is only necessary to draw the thread through the slit s^2 , figures 1, 5, and 8, whence it will slip under the tension spring to the slit s^1 , and past the end of the spring e^1 into the delivery eye.

The body of the shuttle, as shown at figures 1, 3, and 4, has an aperture or opening formed through it to receive the bobbin, and a narrow rim, n , is left all around the back edge of the aperture for the bobbin to rest against. The shuttle is further cut away near the butt of the beak, as clearly shown in figures 1, 3, and 4, to afford space for the introduction and manipulation of the U-shaped bobbin or cop-holder B, figures 3, 4, 5, 6, and 7. This U-shaped bobbin or cop-holder is free to turn on the stem or shank of the screw h , and is formed with a spring, V, composed of a slip cut from the outer limb of the bobbin-holder. The holder is adapted to receive and slightly clip, and so hold the bobbin or cop. The spring V bears upon a pin, p , as shown in figures 3 and 4, so that the holder may be sprung out from the aperture in the shuttle into the position shown at figures 4 and 5, to deliver or receive the bobbin or cop without the shuttle being removed from the machine, or having received the bobbin or cop it may be closed into the aperture of the shuttle, as shown at figure 3. The inner limb y of the holder supports the bobbin or cop on the interior side, and carries it out from the aperture when the holder is opened. The end of the spring V, where it bears upon the pin p , is bent, as shown at figures 3 and 4, so that it retains the bobbin-holder in a fixed position, either when opened or closed, as the case may be. In place of the spring V being formed of a slip cut from the outer limb of the bobbin-holder, a spring formed of a separate piece and fixed to the bobbin-holder may be used, and be adjusted to bear upon the pin p , substantially in the same manner as before described.

The extreme point d of the beak of the shuttle is bent or deflected, as shown in figures 4 and 12, in order to give room for the needle to pass the beak-shank, and yet permit the point of the beak to pass close to the needle n^1 in the act of catching the loop, as shown by the dotted line in figure 12.

At C, figure 1, the shuttle may be made with a projection or raised surface on the face, for the purpose of exerting by lateral pressure an additional pull upon the thread, when the shuttle is being retrograded at the time of closing the stitch.

The shuttle may either be formed with a groove around its outer circumference, as shown at figures 13 and 14, to work over a corresponding projection on the shuttle-race, or may be formed with a projecting rim to enter a groove in the shuttle-race, as shown at figures 1, 2, 3, 4, 6, and 22.

In the modified form of shuttle shown at figures 15 to 20 the thread-case consists of under and upper portions, A and B, hinged together, as shown at a , each of which is hollowed out in the centre, so that when brought together they will form a box-like receptacle, D, for the thread. The edges or rims, where the two portions A and B bear against each other when brought together, are left wide enough to give a sufficient surface for the tension on that portion of the thread (a^1) which is passed between them, as hereafter described. One portion, A, of said thread-case is provided with a spring, E, one end of which

is

Improvements in Sewing-machines.

is rigidly attached to it; and the other portion, B, is provided with a screw, C, having an enlarged end, d , which projects beyond the inner surface of said portion B, and is so arranged that when the under and upper portions A and B of said thread case are brought together the point of this end d will encounter the free end of the said spring E. As this end d first increases in circumference from the point towards the head of said screw C, and then (before it reaches the surface of B) decreases, being in form somewhat similar to two cones placed base to base, its action when the two portions A and B of the thread-case are pressed together will be first to force the spring E outward towards its largest circumference, and then, after its largest circumference has passed the spring E, to receive the point of said spring E on the inclined surface of its inner bevel or cone, and thus, by the pressure of said spring on said inner bevel, draw and lock together the two portions A and B of the thread-case.

When the thread is placed in one portion of said receptacle D (the case being held in the position shown by figure 15) its free end is allowed to hang down to the left of the locking device (as indicated by the dotted line at a^2 , figure 15). The under and upper portions A and B of the thread-case are then pressed together, the free end of the thread a^1 is drawn to the right around the screw C, near its centre, and between the under and upper surfaces of the rims of the portions A and B of said thread-case, in the direction shown by the dotted lines, to the place of delivery at a^3 . The spring E being rigidly attached to one portion, A, of said thread-case, the pressure of its free end on the upper inward bevel of the end d of the screw C (the other end of said screw being attached to the portion B) will cause the inner rim surfaces of the two portions A and B to be drawn together and to compress the thread between them. The elasticity of the spring E will make this an elastic pressure sufficiently yielding to permit the passage of any inequalities or lumps in the thread. The screw C works in a hole tapped to receive it in the upper portion B of said thread-case; and it is evident that, by turning said screw C so that the end d will be drawn toward the said portion B, the pressure of its inner bevel on the spring E, and consequently the pressure on the thread passing between the inner rim surfaces of the portions A and B of the thread-case, will be increased, while by turning said screw C in the opposite direction such pressure will be decreased.

To obtain these results it is not necessary to hollow both portions of said thread-case, as the cavity may be formed wholly or partly in either, but we prefer it as shown. We also, by preference, and in order to increase the thread-containing capacity of said thread-case, cut away the centres of the portions hollowed out to contain the thread, leaving merely a small projection or flange g to secure the outer edge of the bobbin, cop, or ball placed in the receptacle.

The shuttle-driver Z has two horns, h h^1 , which operate upon the shuttle to drive it. One of these horns, h , bears against the butt of the shuttle when driving it forward; the other horn, h^1 , bears against the forward end of the bobbin-case of the shuttle near the butt of the shuttle-beak. There is sufficient play between the horns and the shuttle for the passage of the loop of thread between them.

In order to keep the shuttle thread out of the way of the needle as the needle descends, we make the horn of the shuttle-driver which comes in front of the body of the shuttle to project forwards in the direction of the shuttle-beak, as shown at figures 21 and 22, space being left for the needle to descend between the prolongation of the horn and the beak. When the shuttle moves forwards in the direction of the arrow, figure 21, it passes through the loop of thread thrown out from the needle. When the shuttle moves backwards in the opposite direction the horn h^1 comes against the shuttle thread, where it passes from the delivery eye in the shuttle to the work, and deflects this thread away from the path of the needle, and the forward prolongation of the horn keeps the shuttle-thread so deflected during the descent of the needle. The horn also serves to prevent the needle from being strained or diverted away from the shuttle. At figure 22* we have shown how the horn may be made not only to prevent the needle being strained or diverted away from the shuttle, but also to prevent its being strained or diverted toward the shuttle. To effect this the prolongation of the horn is made wider than shown at figure 22, and a slot is formed in it for the lower end of the needle to enter. The slot is made wider at one end, as shown, so that the needle in descending is sure to enter it, whilst the other end is narrowed, so that at the time when the shuttle is moving forward, and its point is about to enter the loop of needle-thread thrown out from the needle, the lower end of the needle is supported on both sides, and prevented from being strained or diverted either towards or away from the shuttle, so ensuring that the shuttle point shall not come against the needle, and also ensuring that the loop of thread thrown out from the needle shall not be moved away from the point of the shuttle, and the shuttle point so fail to enter the loop.

Also, in order to clamp the needle of a sewing-machine to the needle-bar which carries it, we insert the shank of the needle into a longitudinal groove formed at one side of the end of the bar. The shank of the needle rests in this groove, and projects somewhat beyond the surface of the bar, and is held in the groove by a ring clamp which embraces the end of the bar, and is drawn against the shank of the needle by a set screw or similar device, as shown at figures 23 and 24. The shank of the needle is thus clamped to the bar by a surface bearing extending the whole depth of the clamp. The arrangement also permits the use of needles having shanks of various sizes. The lower portion of the needle-bar wherein the groove is formed is cut away on one side, so that the groove and needle inserted into it may be in the central line of the needle-bar. D¹ is the needle with its shank D; E is the ring clamp; and F a set screw screwing through the clamp, and bearing against the needle-bar, so as to cause the clamp to grip the shank of the needle between itself and the needle-bar.

The shuttle rock-shaft Z¹, by which the shuttle-driver is driven, is itself driven from the driving-shaft R above by means of a crank, j , connecting-rod, j^1 , and arms, j^2, j^3, j^4 , two of which, j^2, j^3 , project from the intermediate rock-shaft Z², and the other from the shuttle rock-shaft Z¹. The adjacent arms, j^3, j^4 , of the two rock-shafts Z¹, Z², are connected by means of a pivot and friction wheel or truck secured to one arm, j^4 , and working in a slot of the other arm, j^3 . (See figure 29.)

The object of the intermediate rock-shaft Z² is to enable the shuttle rock-shaft Z¹ to be rocked through an arc of greater extent than would be convenient if the connecting rod j^1 from the crank should be connected directly with the arm of the shuttle rock-shaft. This object is attained by the arrangement of the axis of the two rock-shafts in a plane passing through the middle of the vibrations of the arms, or thereabouts, and by constructing the arm j^3 of one rock-shaft, Z², to lap by the axis of the other rock-shaft, Z¹, so that the curves described by the arms of the two rock-shafts intersect each other. Hence, although

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although the straight line extending between the two extreme positions of the centres of the pivot connecting the arms (as represented by the dotted line $x x^3$, figure 29) is the same for both arms, yet the arc described by the shorter arm, j^1 , appertaining to the shuttle rock-shaft (as represented by the dotted line $x x^1 x^3$, figure 29) is of much greater angular extent than the arc described by the arm j^3 of the intermediate rock-shaft, as represented by the line $x x^2 x^3$, figure 29.

The work is fed past the line of movement of the needle by means of a feed-dog, K, which is secured to a feed-bar, K¹. This feed-bar is caused to rise and fall crosswise of its length, so as to take hold of the work and to release it; and is also caused to move to and fro longitudinally, so as to move the work or feed it, and to retrograde preparatory to making each fresh feeding movement.

The rising and descending movements of the feed-bar K¹ are effected by connecting one end, m , of it with an arm on the end of a rock-shaft, L, which receives motion from another rock-shaft, Z², which also gives a rocking motion to the rock-shaft of the shuttle-driver, as before described. The shaft Z² receives its rocking motion from a rod, j^1 , which passes from an arm upon it to a cam on the driving-shaft R.

The feed-bar is caused to move to and fro longitudinally by connecting it with the driving-shaft R, by means of a cam, n^* , connecting rod, n^{**} , toggle links, n^2, n^3 , and rock-shaft, n^4 , fitted with arms n^5, n^6, n^6 , to one of which one end of the toggle links is applied, while the other two arms, n^6, n^6 , hold a pivot, n^7 , which connects them with the end of the feed-bar K¹. As the pair of arms n^6, n^6 , are upright or thereabouts at the middle of their vibrating movement, and they then stand crosswise of the length of the feed-bar K¹, their vibration causes the longitudinal movement of that bar. The rock-shaft n^4 is arranged at the end of the feed-bar opposite that at which the rock-shaft L is arranged, and the two rock-shafts support the feed-bar between them.

In order that the extent of the longitudinal movement of the feed-bar may be varied for the purpose of varying the length of feed, the fulcrum pivot i (figure 30) of the toggle links n^2, n^3 , at the end thereof which is furthest from the arm n^5 of the rock-shaft n^4 is not fixed, but is secured to an adjusting arm, N, so that it may be moved. The axis of the pivot i^1 of this adjusting arm is set near the axis of the pivot which connects the connecting rod n^{**} with the elbow-joint of the toggle links, the length of the adjusting arm N between the axis of its own pivot i^1 , and the axis of the fulcrum pivot i which connects the arm with the end of the toggle links, being the same or thereabouts as the length of the adjacent toggle link n^2 ; hence the fulcrum pivot i of the toggle links can be raised or depressed by moving the adjusting arm N up or down, and the effect of this movement is to make the links form a greater or less angle with each other at the time when the feed-bar is retrograded to its most backward position. The greater the angle which the links form with each other the more will the arm n^5 of the rock-shaft be vibrated when the elbow-joint of the links is raised to straighten the two into line or thereabouts, and the greater will be the feeding movement of the feed-bar; hence the feeding movement can be varied as required by raising or depressing the adjusting arm N, so as to raise or depress the fulcrum pivot of the toggle links n^2, n^3 .

In order that the adjusting arm may be moved conveniently, its end is entended through a slot in the casing of the machine, and is fitted with a handle, N¹. This system of operating the feed-dog through the intervention of toggle links having an adjustable fulcrum pivot possesses the advantages of making the movement of the feed-dog positive in both directions, of dispensing with a spring to retrograde the feed-dog, and of making the movement practically noiseless. It is not, however, essential that the connections between the toggle links and the feed-bar should be precisely such as are shown in the drawings, as the form and construction of these connections may be varied as found expedient.

The work to be sewed is held to the surface of the feed-dog K by means of a presser-foot, L², which is pressed downward by a spring, l , working in a socket in the upper end of the presser-bar L¹; and a lever, l^1 , is provided to lift and lower the presser-foot when the work is to be entered upon or withdrawn from the machine.

A presser-foot operated by a spring exercises a constant pressure upon the work, but it is expedient to relieve this pressure at times when the needle is in the work, so as to enable the work to be more readily turned when sewing curved seams, and also when the seam is sewed over a lap or doubled portion of the fabric. This relief is generally effected by hand, but in order that the pressure of the presser-foot in the machine represented in the drawings may be relaxed automatically when required, a special lifting mechanism is provided for the purpose. To this end a cam, P* (figure 31), is connected with the driving-shaft, for the purpose of lifting the presser-foot slightly at each revolution of the driving-shaft. This cam operates upon an elbow-lever, P¹, which is pivoted to the needle-arm P, and has the end of its horizontal arm p^1 slotted to receive one end of a cramp stud, q , which is thus raised and allowed to descend by the action of the cam P*. The shank of this stud is inserted in a slot formed in the bar L¹ of the presser-foot, and projects laterally from it, the sides of the stud being notched to embrace the sides of the presser-bar, so that the stud is combined directly with the presser-bar without the intervention of any intermediate device.

The fit of the notches of the stud upon the presser-bar is loose, so that the presser-bar may be moved up and down in the notches as long as the stud stands at right-angles or thereabouts with the presser-bar, but the upward movement of the stud (by the movement applied to its outer end by the lever P¹) cramps the stud upon the presser-bar, so that the latter is then grasped and lifted with the stud, and when the stud is lowered the presser-bar is lowered with it.

In order that the presser-foot may be free to rise and descend at times when the stud is not being lifted or lowered, a stop, t , is formed in the head T of the needle-arm P, to stop the descent of the shank of the stud a little before the outer end of the stud reaches the limit to which it is lowered by the cam P*, so that the continued downward movement of the outer end of the stud after its shank is stopped by the stop rocks the stud upon the presser-bar, causing the stud to stand when in its lowest position at right-angles with the presser-bar, and frees the bar from the grasp of the stud.

The rocking of the stud in the opposite (or upward) direction, when the cam raises the outer end of the stud, is ensured by the action of a small spring, p^2 , placed in the head of the needle-arm, which spring slightly resists the raising of the shank of the stud when its head is raised by the cam and lever, and thus ensures the cramping of the shank of the stud upon the presser-bar.

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A stop pin, t^1 , is provided to determine the position of the elbow-lever, and consequently of the head of the stud when the cam is not acting on the stud. In consequence of the freeing of the grasp of the stud upon the presser-bar at all times except when the cam P^* is operating upon the stud, the presser-bar is free to vary its position according to the varying thickness of the work, but as the stud works upon the presser-bar with the capacity to grasp any part of the presser-bar which may be embraced by it, the stud when operating will always raise the presser-bar and presser-foot a fixed distance, however the distance between the presser-foot and the table-plate may vary by reason of variations in the thickness of the work being sewed. The lifting mechanism thus adjusts itself to the variations in the thickness of the work without requiring any attention on the part of the operator for such adjustment.

In order that the lifting mechanism may however be thrown out of operation when it is not required to work, a conical-pointed stop screw R^* (figure 32) is provided to screw through a hole in the needle-arm head T ; in a position to pass below the shank of the cramp stud q , and raise it at least as high as the cam P^* can raise it. When therefore the stop screw is turned inward the cramp stud becomes for the time inoperative.

In order that the conical point of the stop screw may operate properly upon the stud, the under side of the shank of the stud is bevelled, so as to form an incline plane upon which the conical point of the stop screw acts as a wedge. The cam for operating the stud and the stop pin may of course be replaced by equivalent mechanical devices or substitutes for performing their respective functions.

The loop of needle thread is taken up after the passage of the shuttle mainly by means of a vibrating take-up lever, S^* , operated at the proper times by a cam, T^* , upon the driving-shaft. A vibrating yielding spring take-up, V^* , is employed in connection with the positive take-up lever S^* , to hold the needle-thread with a yielding force, and adapt the size of its loop more perfectly to the irregular form of the shuttle than would be possible with a positive take-up, without involving great care and expense in the formation of the take-up cam.

As the parts of the machine which have not being described need not differ substantially from those of sewing-machines in common use, it has not been deemed necessary to describe them.

What is claimed as the invention is—

- First—The sewing-machine shuttle constructed with a beak proper, and with a beak-shank which intervenes between the beak proper and the bobbin-case, and is of uniform cross-section from the butt of the beak towards the bobbin-case, substantially as before set forth.
- Second—The sewing-machine shuttle constructed with a beak proper, and with its beak-shank diminishing in size as it extends from the butt of the beak proper towards the bobbin-case, substantially as described and represented.
- Third—The adaptation and combination of the circular shuttle-race and a shuttle constructed with a beak-shank intervening between its beak proper and its bobbin-case, substantially as described and represented.
- Fourth—The shuttle for a sewing-machine constructed substantially as before set forth, with a projection on its face whereby at a particular juncture of the retrograde movement of the shuttle, in addition to the pull exerted from the delivery eye by the movement of the shuttle, a lateral pressure is exerted on the thread, having the effect to tighten the stitch.
- Fifth—The U-shaped bobbin or cop-holder constructed substantially as before set forth, and arranged to open out from or close into the aperture of a shuttle for a sewing-machine, to deliver the bobbin or cop, or to return it to its place in such shuttle.
- Sixth—The shuttle for a sewing-machine constructed substantially as before set forth, with the circular aperture or opening through it, and having the beak d^1 , beak-shank d^2 , and extreme point of the beak bent or deflected.
- Seventh—The shuttle for a sewing-machine having the circular aperture or opening through it, and having the beak d^1 , beak-shank d^2 , and bobbin or cop-holder B , or it might be a spring arm for retaining the bobbin in the aperture, substantially as before set forth.
- Eighth—The combination of the U-shaped bobbin or cop-holder B , the spring V , and pin p , with the body of the shuttle, substantially as before set forth.
- Ninth—The shuttle for a sewing-machine substantially as before set forth, having a slit leading into the internal eye, and a slit leading into the delivery eye, and also having a tension spring, s , pressing upon the thread as it passes from one eye to the other.
- Tenth—The shuttle for a sewing-machine constructed substantially as before set forth in such manner that the bobbin thread may be introduced into the delivery eye and confined therein, either through and by the means of a slit leading into such eye, or by passing such thread under the free end of a spring which will cover the entrance to said eye and keep in the thread, or by a combination of both such slit and spring.
- Eleventh—The combination with a body of a shuttle for a sewing-machine of a spring, s , adjusted in a recess in the periphery of the shuttle body and shaped as described, so that it will operate as a tension on the bobbin thread, and also as a stop in the slit of the delivery eye to prevent the thread from falling out.
- Twelfth—The oscillating shuttle for a sewing-machine, having the delivery eye at or near the centre of oscillation, and having a groove along the outer circular portion of its circumference to work over a corresponding projection on the race, or formed with a projecting rim to work in a groove in the race.
- Thirteenth—A shuttle for a sewing-machine, consisting of two portions so constructed as to form together a box or receptacle for the thread, provided with an elastic locking or latching device, which when the said case is closed causes the inner rim or edge surfaces of these two portions to press towards each other, so that a steady but elastic pressure or tension will be exerted on the thread as it is drawn out between them.
- Fourteenth—In a shuttle for a sewing-machine constructed of two portions hinged together, the elastic locking or latching and tension device consisting of the enlarged end d or its equivalent, attached to and projecting from one portion of such case, and the spring E , or its equivalent, attached to the other portion; both formed and arranged to act together, substantially in the manner and for the purposes described.
- Fifteenth—

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- Fifteenth—In a shuttle for a sewing-machine constructed of two portions hinged together, and fastened when closed by an elastic locking device, the adjusting screw C, or its equivalent, when attached to one portion of such case, and arranged to act in conjunction with the enlarged end *d* and spring E, or their equivalents, for the purpose of varying the pressure or tension on the thread.
- Sixteenth—In a shuttle for a sewing-machine, the combination of its under portion A provided with the spring E, and its upper portion B provided with the adjusting screw C, and enlarged projecting end *d*, or their equivalents, for the purpose of receiving, holding, and securing the thread, and also of obtaining an elastic pressure or tension on it as it is drawn out and supplied to the machine, and of varying such tension when desired, substantially as shown and described.
- Seventeenth—The adaptation and combination of mechanism for driving the shuttle through the intervention of adjacent connecting vibrating arms, substantially as described and represented.
- Eighteenth—The construction of circular shuttle-race with an internal peripheral groove or projection for guiding the shuttle, and with a movable front plate or gate to permit the shuttle to be applied to said groove, substantially as described and represented.
- Nineteenth—The adaptation and combination of the circular shuttle-race, the shuttle-driver for moving the shuttle to and fro in said race, and the shuttle having a thread-delivering eye slightly distant from the centre of said shuttle-race, so that the said thread-delivering eye is caused to move from the work during the retrograde movement of the shuttle, and draw the shuttle thread home to finish the stitch, substantially as described and represented.
- Twentieth—Forming the horn *h*¹ of the shuttle-driver to project forwards and act as a guard for the shuttle thread, substantially as described.
- Twenty-first—Forming a slot in the forward end of the horn *h*¹ of the shuttle-driver, substantially as and for the purpose described.
- Twenty-second—The adaptation and combination of the feed-bar and two rock-shafts arranged to operate upon the opposite ends of said feed-bar, substantially as described and represented.
- Twenty-third—The adaptation and combination of the toggle links, the movable fulcrum pivot thereof, and the adjusting arm for regulating the movement of the feed-bar and the length of the stitch, substantially as described and represented.
- Twenty-fourth—The improved means, substantially as described, for securing the needle to the needle-bar.
- Twenty-fifth—The adaptation and combination of mechanism for relieving the pressure of the presser-foot when the needle is in the work, as described and represented.

In witness whereof, we, the said Lebbens Baldwin Miller and Philip Diehl, have hereunto set our hands and seals, this fourteenth day of October, 1880.

Witness—

JAMES MEEHAN,
No. 215, East 61st Street, New York City.

LEBBENS BALDWIN MILLER.
PHILIP DIEHL.

This is [the specification, marked A, referred to in the annexed Letters of Registration granted to Lebbens Baldwin Miller and Philip Diehl, this twenty-sixth day of March, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

We do ourselves the honor to state, in reply to your blank cover communication of the 24th ultimo, No. 81/1,016, transmitting for our report Messrs. Lebbens Baldwin Miller and Philip Diehl's specification, drawings, and claim of "Improvements in Sewing-machines," that we are of opinion that the prayer of the Petitioners may be complied with.

Sydney, 10 February, 1881.

We have, &c.,
GOTHEK K. MANN.
THOS. RICHARDS.

The Under Secretary of Justice.

C.

1917

Fig. 26.

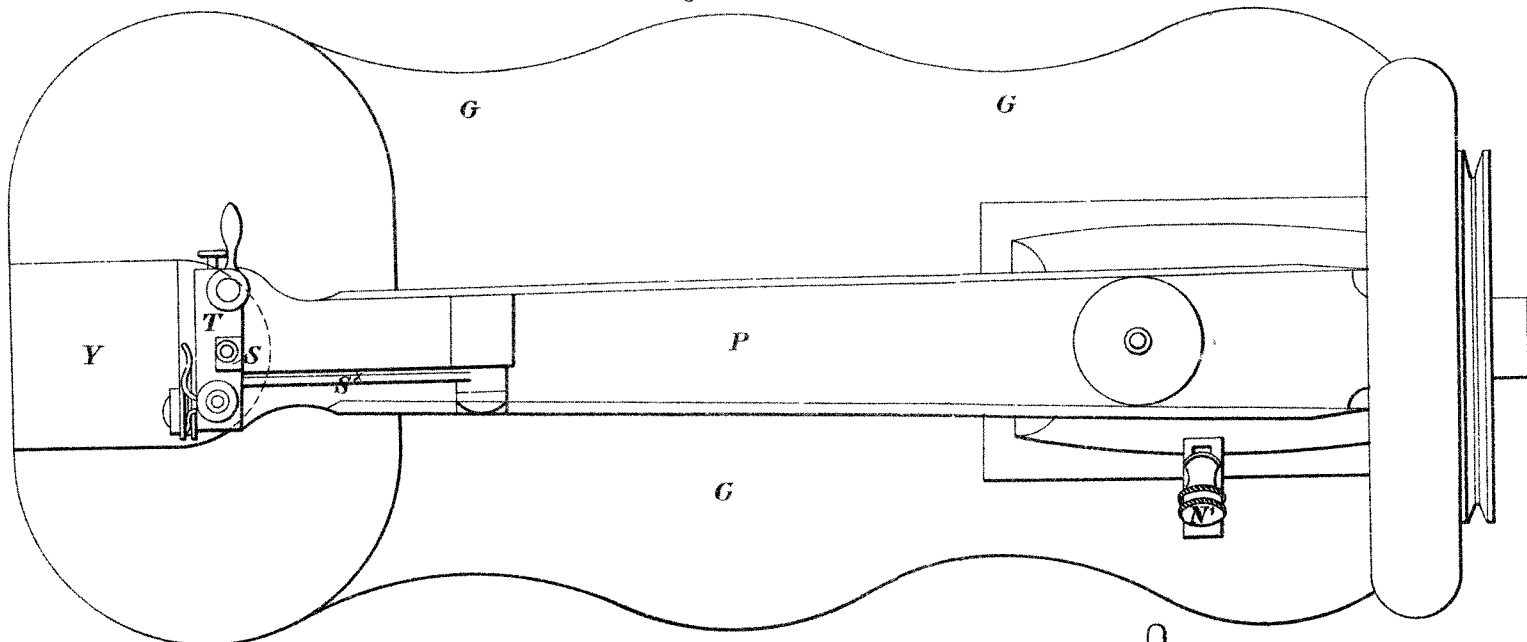


Fig. 27.

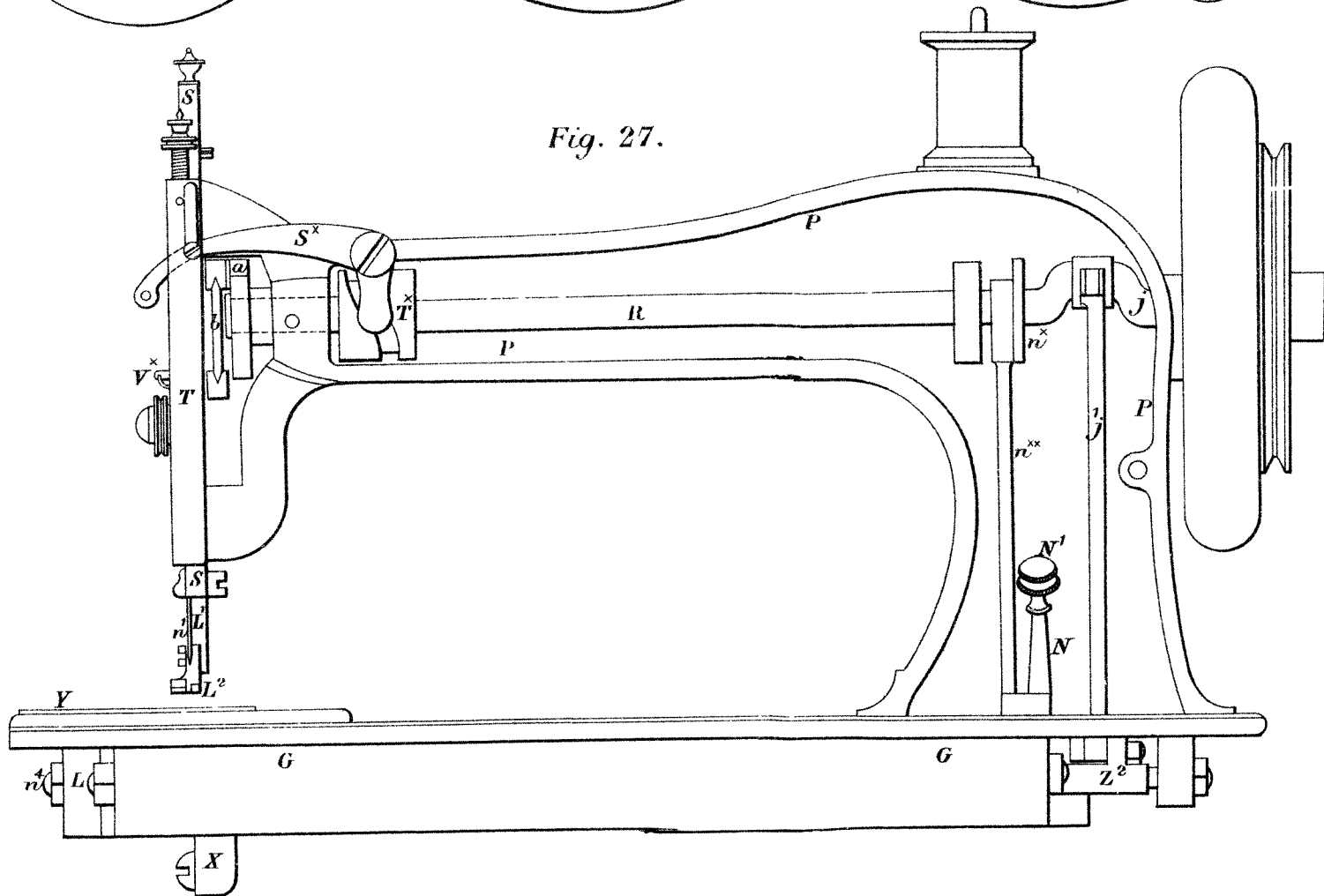


Fig. 29.

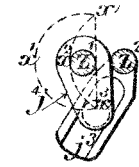


Fig. 30.

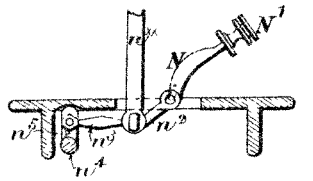


Fig. 28.

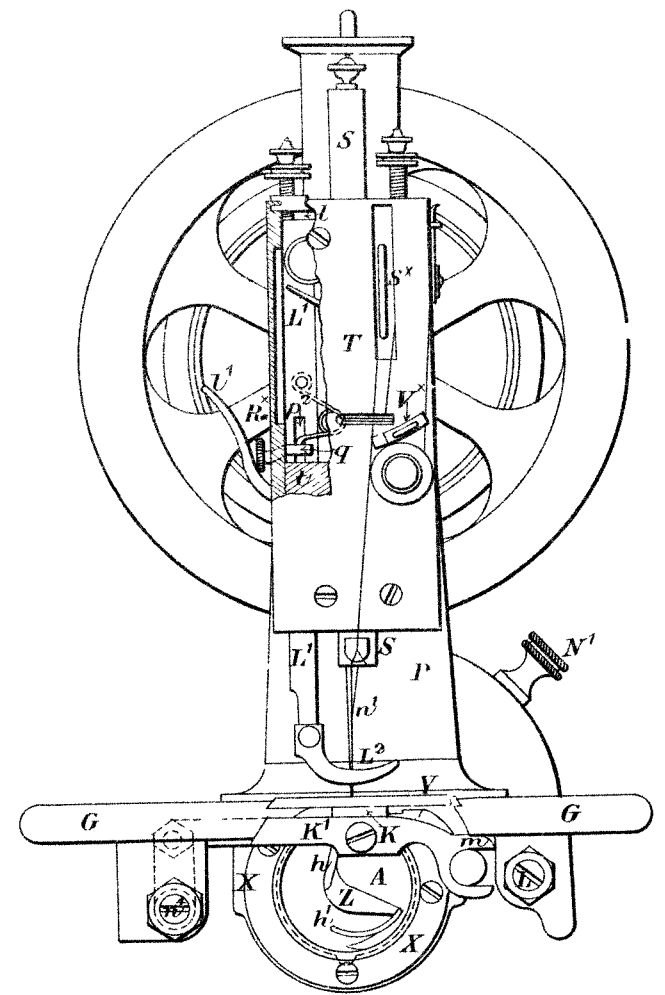


Fig. 31.

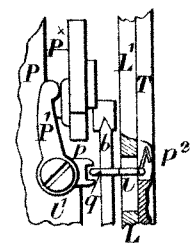


Fig. 32.

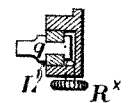
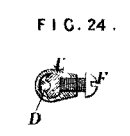
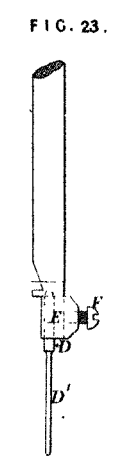
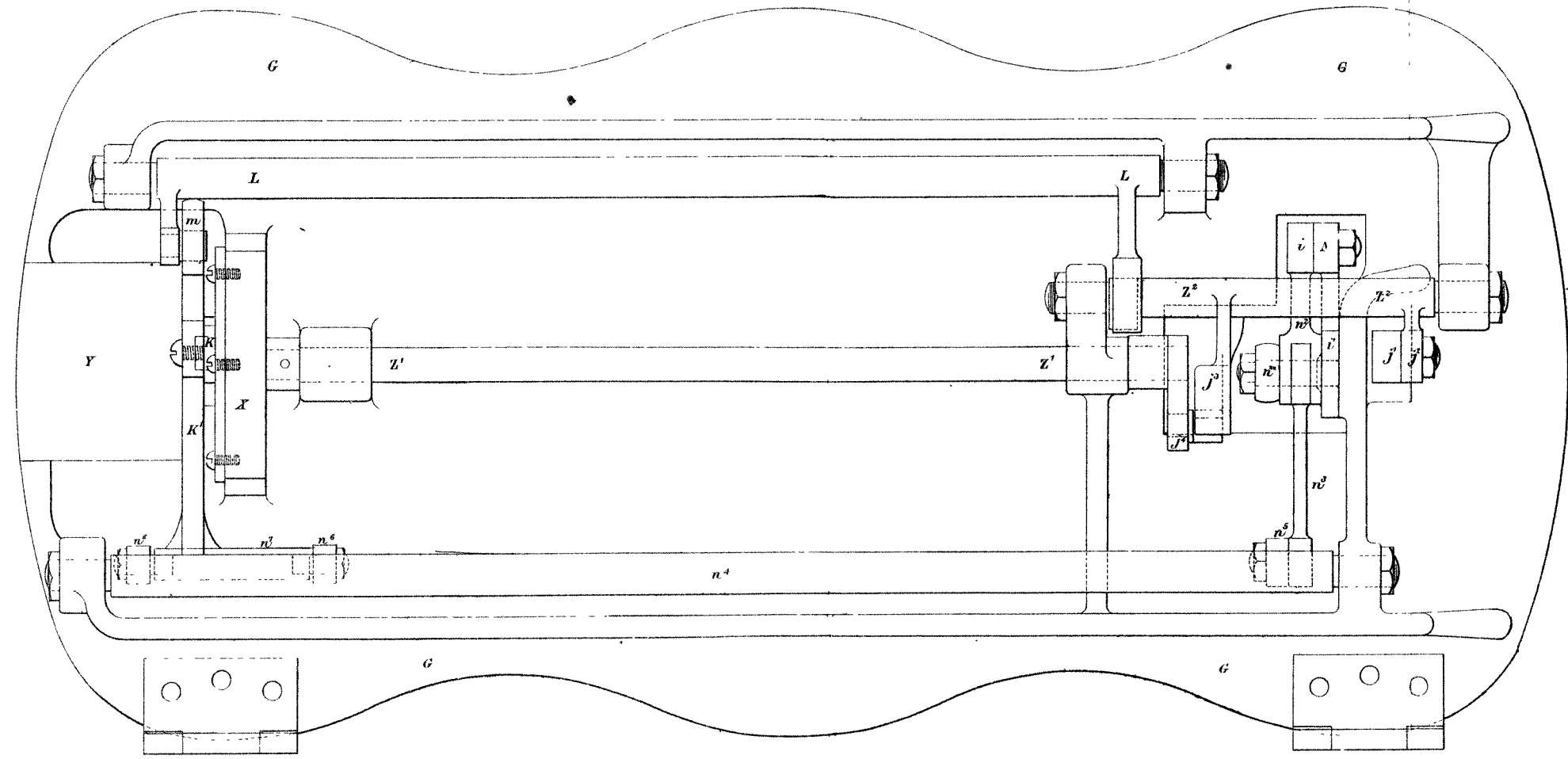
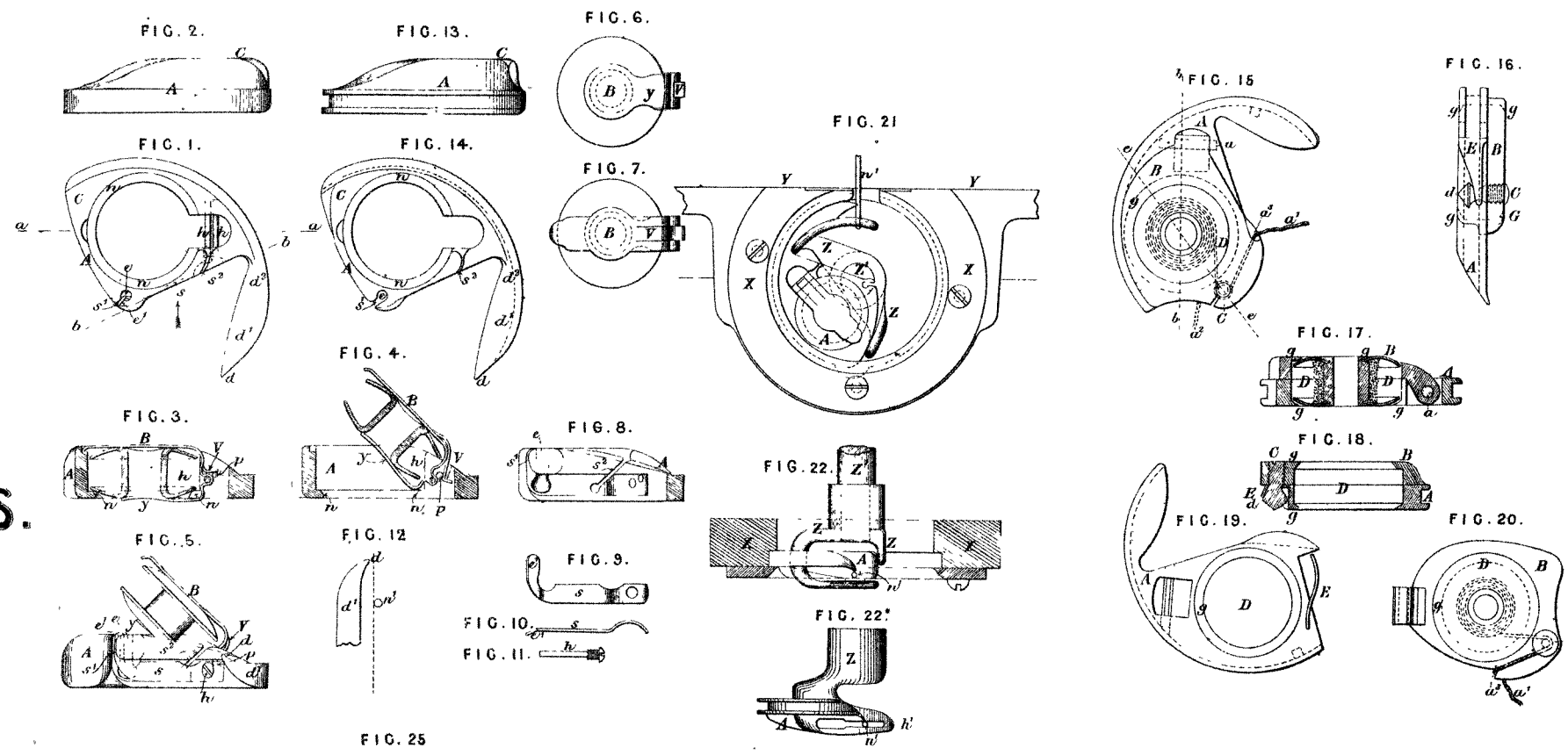


Fig. 34-

PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE SYDNEY, NEW SOUTH WALES

This is the Sheet of Drawings marked C referred to in the annexed Letters of Registration, granted to Lebbens Baldwin and Philip Diehl this twenty-sixth day of March, A. D. 1881. Augustus L. of us.

MILLER & DIEHL'S
 IMPROVEMENTS
 IN SEWING MACHINES.



This is the Sheet of Drawings marked B entered to the aforesaid
 Letters of Registration, granted to Leobers Balwin Miller and
 Philip Diehl this twenty-sixth day of March, A.D. 1881. Augustus Loftus.



A.D. 1881, 26th March. No. 918.

IMPROVEMENTS IN MOTOR ENGINES.

LETTERS OF REGISTRATION to Frederick Edward Blackett Beaumont, for Improvements in Motor Engines worked by compressed air or other elastic fluid under high pressure.

[Registered on the 28th day of March, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS FREDERICK EDWARD BLACKETT BEAUMONT, of No. 4, Broad Sanctuary, Westminster, in the county of Middlesex, England, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in Motor Engines worked by compressed air or other elastic fluid under high pressure," which is more particularly described in the specification, marked A, and the three sheets of drawings, marked B, C, and D, respectively, which are hereunto annexed; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Frederick Edward Blackett Beaumont, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said Frederick Edward Blackett Beaumont, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said Frederick Edward Blackett Beaumont shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this twenty-sixth day of March, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Motor Engines.

A.

SPECIFICATION of FREDERICK EDWARD BLACKETT BEAUMONT, of No. 4, Broad Sanctuary, Westminster, in the county of Middlesex, England, for an invention entitled "Improvements in Motor Engines worked by compressed air or other elastic fluid under high pressure."

IN the specification to British Letters Patent granted to me on the 1st January, 1876, No. 7, was described a method of equalizing the power of an engine worked by elastic fluid stored at considerable pressure in a reservoir, by causing the said fluid to act by expansion successively in two or more cylinders of increasing diameters, so arranged that in the first instance, when the air is at high pressure, only the cylinder of small diameter is put in direct communication with the reservoir, but that as the air pressure decreases the cylinder or cylinders of larger diameter is or are consecutively put in direct communication with the reservoir.

One part of the present invention relates to improved means for effecting such successive communication between the reservoir and the cylinder or cylinders of larger diameter after the pressure has become reduced to a certain extent.

In the motor engine described in the before-mentioned specification this communication was established by means of a series of slides respectively covering ports leading from a channel that communicated directly with the air-reservoir to each of the cylinders.

According to the present improvement, the cylinders being double-acting, the air-reservoir communicates directly with the smallest or high pressure cylinder only, by passages governed by lift valves; this cylinder communicates by ports and passages provided with valves with the second cylinder, so that the compressed air expands into the latter after doing duty in the former; and in like manner, if a third cylinder be employed the compressed-air is admitted into this from the second cylinder through ports and passages provided with valves. When by continued working the pressure in the air reservoir has sunk to a certain extent, the admission valves to the high pressure cylinder are raised and kept off their seats, so that the compressed air then passes freely into both ends of this cylinder, thereby putting its piston *in equilibrio*, and the air then finds its way through the ports and passages connecting the first and second cylinders into the latter, the piston of which is consequently then worked by the full pressure in the reservoir. In like manner, if a third cylinder be used, the admission valves to the second cylinder may also be raised off their seats when the air pressure has again sunk below a certain degree, so as to allow the air from the reservoir to pass through both the first and second cylinders to the third cylinder. In order to render the expansion of the compressed air fully available, I, according to another part of my invention, work the first cylinder with a cut-off, the mechanism for effecting which is so arranged that the degree of expansion can be gradually diminished, as the air pressure in the reservoir decreases. For this purpose the admission lift valves are worked by the middle of a double-ended lever, one end of which is actuated from an eccentric crank or cam on the engine shaft, so that if the other end of the lever worked on a fixed fulcrum, the valve would be raised off its seat during the whole stroke, or nearly so, of the piston. The other end of the lever is, however, not fixed, but supported by a roller resting upon a sliding piece to which a reciprocating motion is imparted from the piston rod, and this sliding piece has at a certain point a drop or incline, so that when by its motion this drop or incline is brought under the roller, the end of the lever in dropping allows the valve, which had previously been raised by the action of the other end of the lever, to close on its seat, so as to effect the cut-off. On the return motion of the sliding-piece the one end of the lever is again raised by the incline, but the other end of the lever being at that time moved or permitted to move in the contrary direction, the valve is not opened by such motion. By adjusting the position of the sliding-piece relatively to the end of the lever, so as to bring the drop under the lever at an earlier or later part of the piston's stroke, the period of the cut-off and degree of expansion can be correspondingly varied. When the cylinder, being double-acting, is provided with an admission valve at each end, both the sliding pieces for the valves are adjusted by a rod screwed through them with right and left-handed screw threads, so that by turning the rod more or less the sliding pieces are simultaneously adjusted to effect the cut-off at the period required.

The above described arrangement for causing the admission valves to work with variable cut-off is also applicable to other constructions of motor engines in which air or other elastic fluid under compression is caused to operate by expansion in one or more cylinders. The admission valves are so arranged as to be pressed to their seats by the air pressure, and each has a spring to ensure quick action and to keep the valve seated when there is no pressure. In order to reduce the risk of leakage past the inlet valves of the first cylinder, I make them with double seatings, the one seating over an intermediate chamber, and the other seating over the passage from this chamber to the cylinder; also, in order to prevent displacement of the valve by the rush of high pressure air, I surround it by a fence having through it passages so arranged that the impulse of the air on the valve is balanced.

Another part of my invention relates to means for imparting heat to the compressed air, so as to compensate for the decrease of temperature resulting from its expansion in the cylinders. For this purpose I provide a small steam boiler, which is connected with the passages leading into the working cylinder or cylinders by means of pipes having check valves so arranged that so long as the pressure of the air in the cylinder is above that of the steam in the boiler, the valves remain closed and prevent the entrance of steam, but when by the expansion of the air its pressure sinks below that of the steam, the latter opens the valves and mingles with the air, imparting heat to it. I also provide the cylinders with casings supplied with steam or circulating hot water from the boiler, so as to impart heat to the expanding air, the heat thus imparted being in many cases sufficient without having recourse to admixture of steam with the air, as described above. Instead of employing hot water for circulating through such casings, a liquid of higher boiling point, such as a saline solution, or oil, may be employed for that purpose.

The accompanying drawings represent a construction and arrangement of a locomotive according to my invention, worked by compressed air contained in a strong reservoir carried by the locomotive, and constituting a store of force available for propelling the locomotive over considerable distances. I will first describe the general arrangement of the locomotive, referring to figure 1, which is a longitudinal section, and figure 2 an end view.

Improvements in Motor Engines.

A framing, A, supported by springs on four wheels, B, carries the reservoir C containing the compressed air, and two complete engines worked by it. Each engine consists of two double-acting cylinders, one of them, E, a small cylinder which receives for each stroke a charge of compressed air from the reservoir C, and the other, F, a larger cylinder in which the air discharged from the smaller cylinder expands, performing work, and from which it is discharged as waste. The admission of air to the smaller cylinder E is regulated by an adjustable cut-off apparatus hereafter to be described, so that, notwithstanding considerable change of pressure in the reservoir, the engine power can be maintained uniform, or nearly so. Thus, when the reservoir at first starting contains air at very high pressure, the cut-off is adjusted, so that at each stroke the small cylinder receives a very small charge, which expands therein, propelling its piston, and afterwards expands further in the larger of the two cylinders; when, on the other hand, the pressure in the reservoir has become greatly reduced by expenditure of air, the cut-off is adjusted so as to admit a larger charge into the small cylinder, that is to say, to admit air throughout a greater portion of the stroke of its piston. When the pressure in the reservoir is so far reduced that the action on the smaller piston gives very little power, the supply passages to the smaller cylinder are, by means hereafter to be described, kept open, so that the air from the reservoir acts directly on the piston of the larger cylinder, the smaller piston in that case working idly. This arrangement can also be temporarily adopted when energetic action is required, as for starting the locomotive, the full pressure of the air in the reservoir being throughout one stroke or more permitted to act on the larger piston. The pistons of the two cylinders are connected in the usual way to cranks on the driving axle, those two cranks being set opposite to one another, so that when one of the two pistons is advancing the other is retreating. By this arrangement the air discharged from each end of the small cylinder passes directly into the corresponding end of the larger cylinder, this arrangement shortening the passages from the one cylinder to the other, and simplifying the valves which govern them. The other pair of cylinders arranged in a similar manner act on cranks on the same driving shaft, those cranks being likewise opposite to one another, but at right angles to the cranks of the former pair of cylinders.

The driving axle has on it two sets of eccentrics working link motions of ordinary construction, one for each pair of cylinders, these link motions being connected in the usual way to a hand lever for starting, stopping, or reversing.

As the air when it expands performing work in the cylinders would undergo considerable reduction of temperature and proportionate reduction of pressure, I provide means of sustaining its temperature during its expansion. For this purpose I mount in a convenient part of the locomotive, as at D, a small boiler for generating a small quantity of steam, which is led by a pipe to hollow casings enclosing the working cylinders. The steam partly condenses in these casings, keeping the cylinders warm, and the water of condensation returns by a pipe to the boiler, to be again vapourized and circulate through the casings. It is of advantage to lead the air discharged from the larger cylinders to the ashpit of the boiler, which is provided with an escape valve, so that the discharged air can when required be made, by closing more or less the escape valve, to act more or less as a blast for the boiler fire.

In order to avoid complicating the drawings, I have not shown in them the air or steam pipes connected with the boiler, as their arrangement may be readily understood.

The wheels B are coupled by external connecting rods in the usual way, so that they all act as driving wheels, and these connecting rods, as well as the wheels, are enclosed within casings.

Having thus described generally the construction and arrangement of a locomotive according to my invention, I will now explain the arrangement and action of the valves by which the air is admitted to and emitted from the working cylinders of each engine, referring to the following detail drawings:—Figure 3, a transverse section through a pair of the cylinders and their valves. Figure 4, a transverse section, and figure 5 a part longitudinal section of the cut-off apparatus for the small cylinder. Figure 6, a side view showing the levers for working the valves that govern the passages from the small to the large cylinder; and figure 7 a side view showing the levers which work the valves that govern the discharge from the larger cylinder. In these figures E is the small cylinder and F the large cylinder, e is the pipe leading from the reservoir C to each end of the small cylinder, the passage in each case being governed by a double valve, a lower valve, e^1 , pressed up against its seat by a spring, and an upper valve, e^2 , having a stem, e^3 , which passes through a stuffing-box and is pressed upwards by a spring, e^4 . It will be observed that the two valves e^1 and e^2 are not rigidly attached to one another, but that the lower one, e^1 , is merely opened by the pressure of the upper valve upon it, the lower valve having freedom to close tightly when the upper valve seats itself. Both valves are opened by the downward movement of the stem e^3 , and according as this movement is more or less prolonged, a greater or less charge of compressed air will be admitted to the small cylinder E, or, in other words, the movement of the stem e^3 determines the cut-off. This movement is effected and regulated in the following manner:—In the stem e^3 is jointed a lever, e^5 , which at one end carries a roller, e^6 , and at the other end is acted on by an arm of a lever, G, which is worked by a connecting rod, g , from a slide, g^1 , moved by the eccentric link g^2 . The piston rod of the smaller cylinder E, by means of a link, h (see figure 1), works a lever, H, and this lever, by means of a link, h^2 , works a sliding rod, h^3 . This rod is connected to the link h^2 by a swivel joint, so that it can be caused to revolve by gearing h^4 worked from a hand-wheel, h^5 . The rod h^3 is screwed over two parts of its length with right and left threads working respectively in female threads in blocks h^6 (see figures 4 and 5), which move in guides parallel to the axis of the cylinder. By turning the hand-wheel h^5 , and thereby causing the rod h^3 to revolve in either direction, the two blocks h^6 can be made to approach towards each other or to recede from one another, whilst they also continue to reciprocate to and fro along with the rod h^3 , which reciprocates in accord with the piston of the small cylinder E, but with a much smaller extent of stroke, as determined by the proportions of the lever H. The rollers e^6 bear against the under faces of the blocks h^6 , and therefore, if while either of them so bears, an arm of the lever G depresses one end of the lever e^5 , the middle of the lever e^5 is necessarily depressed, moving down the stem e^3 and opening the valves e^2 and e^1 , so as to admit a charge of air to the small cylinder E. The piston of that cylinder moving causes the rod h^3 and block h^6 also to move, and when the block h^6 has moved so far that the roller e^6 no longer bears against it, then the lever e^5 is left free and the valves e^1 e^2 close, cutting off the supply to the cylinder E. Thus, when the hand-wheel h^5 is turned in the one direction causing the blocks h^6 to approach towards each other, the cut-off takes place at an earlier period of each stroke of the small piston, and when

Improvements in Motor Engines.

when the hand-wheel is turned in the opposite direction the cut-off takes place at a later period. The one hand-wheel h^6 , by means of the gearing h^4 , serves to turn the rods h^3 of both engines simultaneously, and thus the attendant can vary the expansion in the small cylinders to suit the state of the pressure in the reservoir C.

Besides being enabled thus to vary the expansion, the attendant can at any time, by means of a handle, k , keep open the supply valves e^1 and e^2 , rendering the small pistons idle and admitting air at the full pressure of the reservoir to act on the larger pistons. For this purpose the handle k is connected to a lever on a rocking shaft, K, an arm on which is linked to levers k^1 that engage in the stems e^3 , so that when the handle k is pulled the four stems e^3 are simultaneously depressed, and consequently the four sets of valves e^1 e^2 are opened. Thus, when the pressure acting in the small cylinders is insufficient to start the locomotive, the attendant by pulling the handle k can admit the air to act in the larger cylinders at its full pressure, the small pistons being for the time *in equilibrio*.

The valves f , whereby the air passes from the small cylinder E to the large cylinder F, are kept closed by springs, f^1 , and are opened alternately by the levers f^2 acted on by the levers f^3 , which are worked from the eccentric link and lever G, as shown in figure 6; and in like manner, the valves f^4 , which govern the final discharge of air from the large cylinders F, are kept closed by springs f^5 , and opened alternately by the levers f^7 f^8 , which are worked also from the eccentric link, as shown in figure 7. It will be seen that by the different arrangement of the levers actuating the several admission valves of each compound engine, they are all enabled to be worked by one and the same shaft and lever, G.

The spaces d , shown in figure 3, constitute the casings supplied with steam, as above described, for the purpose of warming the cylinders E F and the air expanding in them. A small hole governed by a spring check valve, as indicated by the dotted lines d^1 in figure 3, may form a communication from the steam space d to the passage leading into the larger cylinder F, so that when the pressure of the air supplying that cylinder is considerably reduced by expansion, a small quantity of steam may mix with it as above described. Instead of or in addition to the passage d^1 , there may be an opening into the cylinder F governed by a spring check valve, f^6 , so that if the pressure in the cylinder F should be below that of the atmosphere, a little air can enter the cylinder from outside. Brakes of any suitable kind may be applied to the wheels, the brake levers being worked by treadles L, situated conveniently for the attendant or driver who commands the starting and stopping lever, and regulates the expansive action as described above.

Although I have shown in the drawings an arrangement of locomotive suitable for being connected to other vehicles such as tram cars, it may be readily understood that the construction and arrangement could be varied so as to accommodate the reservoir and engines in or under the body of the vehicle itself, the general principles of action and arrangement of the valves and their movements remaining such as I have described them. The air reservoir, which I have shown as a single strong vessel, may be subdivided into several smaller vessels. A convenient and strong form that has been employed is that of a number of closed tubes communicating with one another. I have mentioned steam as being employed for maintaining the temperature of the air cylinders. In cases where the boiler is at a sufficiently high level relatively to the cylinder casings, these might merely have hot water circulating through them, or instead of water there might be a saline solution, or oil, or other liquid having a boiling point higher than water. The pipe conveying the air from the reservoir to the cylinders may be heated by passing it through the hot casings so as to warm the air before it begins to perform work.

Although I have described my invention as being more particularly applicable to locomotive or traction engines, yet it will be evident that it is also applicable as a motor engine for propelling boats, or for working in mines or other localities where it is necessary to convey the fluid pressure from a distance through pipes. In the latter case, instead of having the reservoir for compressed air in immediate connection with the engine, it may be at a distance therefrom, at the locality where the air-compressing engine is situated, or the reservoir may be entirely dispensed with, and the air compressed by the compressing engine be conveyed directly therefrom through pipes to the motor engine.

Having thus described the nature of my invention and in what manner the same is to be performed, I hereby declare that I make no general claim to the use of compressed air or other elastic fluid under high pressure for working locomotive or other motor engines; but I claim, in respect of such engines when they are worked as compound engines by compressed fluid supplied from a reservoir to act in successive cylinders,—

First—Regulating the working power by means of expansion apparatus applied to the first cylinder, so as to suit the cut-off to the varying pressure in the reservoir, substantially as herein described.

Second—Combining with the supply valves of the first cylinder, hand gear, whereby these valves can be held open so that fluid at full pressure from the reservoir can be permitted to act in the second cylinder, substantially as and for the purposes herein set forth.

Third—The use, in the supply passage to the first cylinder, of double spring valves, the one being free to seat itself independently of the other, as herein described with reference to e^1 and e^2 in figure 3 of the accompanying drawings.

Fourth—The combination of the lever G worked by an eccentric link, the levers e^5 with their rollers e^6 , the screwed rod h^3 worked from the piston rod, and the sliding adjustable blocks h^6 constituting a variable cut-off apparatus for working the supply valves of the small cylinder, as herein described.

Fifth—In combination with the cut-off apparatus referred to in the preceding claim, the levers k^1 worked by hand for opening the supply valves of the small cylinder, as herein described.

Sixth—In combination with the compound cylinders and their passages, casings supplied with steam or hot fluid, as and for the purpose herein set forth.

In witness whereof, I, the said Frederick Edward Blackett Beaumont, have hereto set my hand and seal, this seventh day of October, A.D. 1880.

Witness—

OLIVER IMRAY, Patent Agent,
28, Southampton Buildings, London, W.C.

F. E. B. BEAUMONT.

This

Improvements in Motor Engines.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to Frederick Edward Blakett Beaumont, this twenty-sixth day of March, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

We do ourselves the honor to inform you that we see no objection to the issue of Letters of Registration in accordance with Mr. F. E. B. Beaumont's Petition, specification, drawings, and claim, for "Improvements in Motor Engines worked by compressed air or other elastic fluid under high pressure," transmitted for our report under your blank cover communication of 19th November, No. 80/9,322.

Sydney, 2 February, 1881.
We have, &c.,
JOHN WHITTON.
E. O. MORIARTY.

The Under Secretary of Justice.

[Drawings—three sheets.]

3 Sheets
Sheet I

FIG. 6.

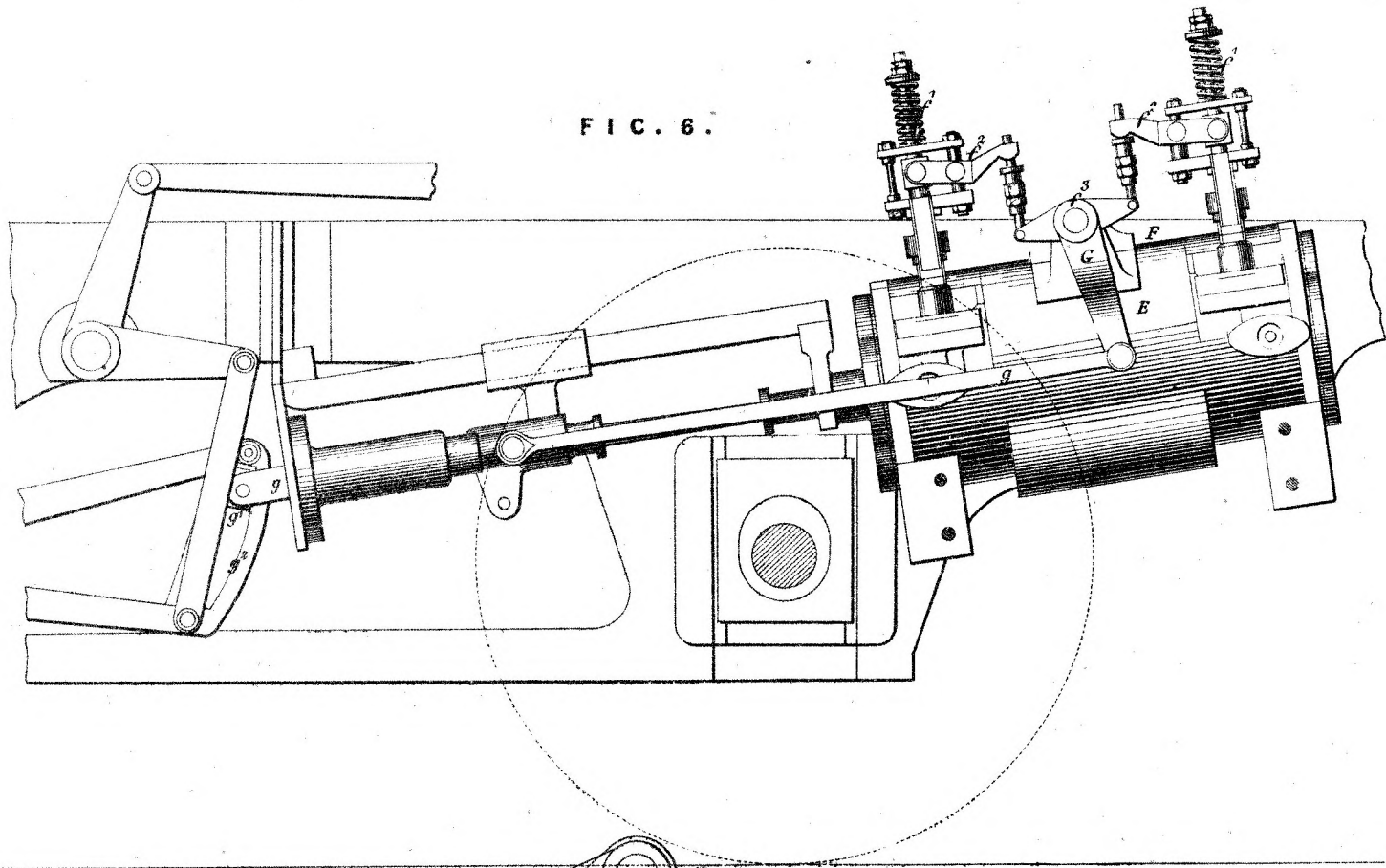


FIG. 5.

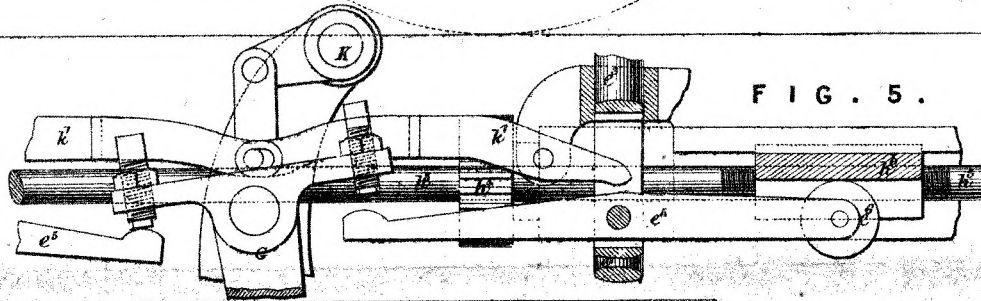


FIG. 1.

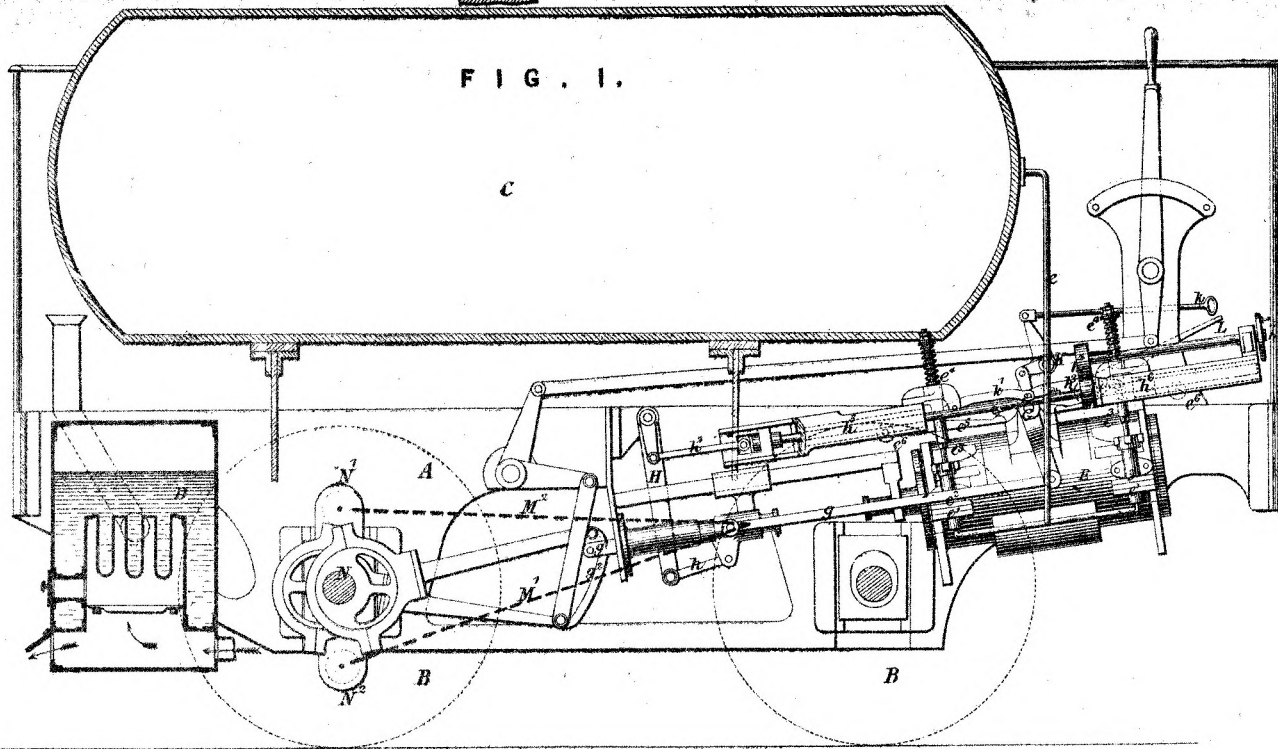


PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE,
SYDNEY, NEW SOUTH WALES.

*This is the Sheet of Drawings marked B referred to in the annexed
Letters of Registration granted to Frederick Edward Blackett Beaumont
this twenty-sixth day of March, A.D. 1881.*

Augustus Loftus.

(5634)

(3 Sheets)

Sheet II.

FIG. 2.

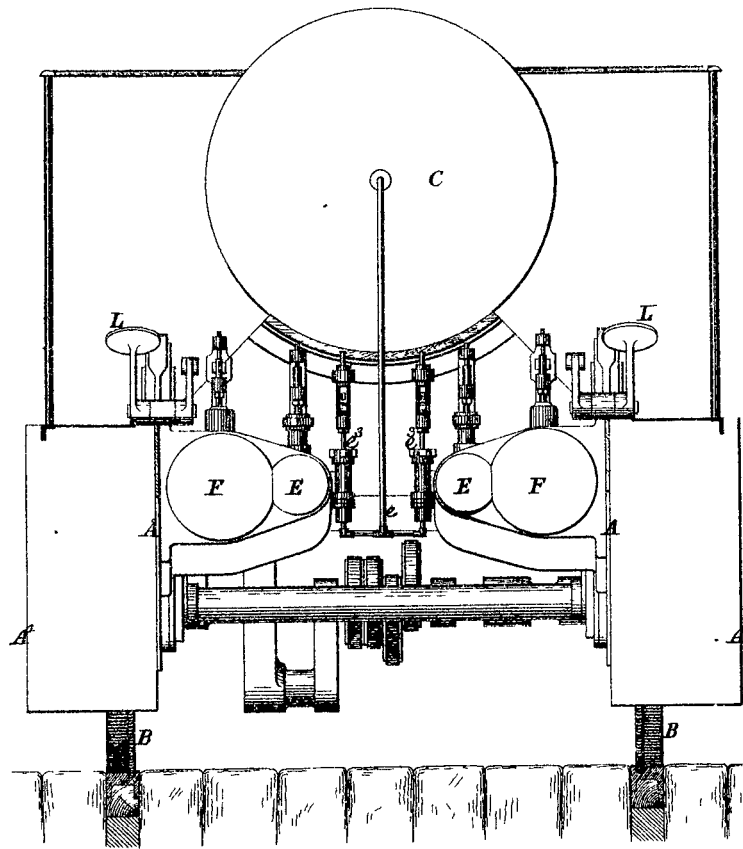


FIG. 7.

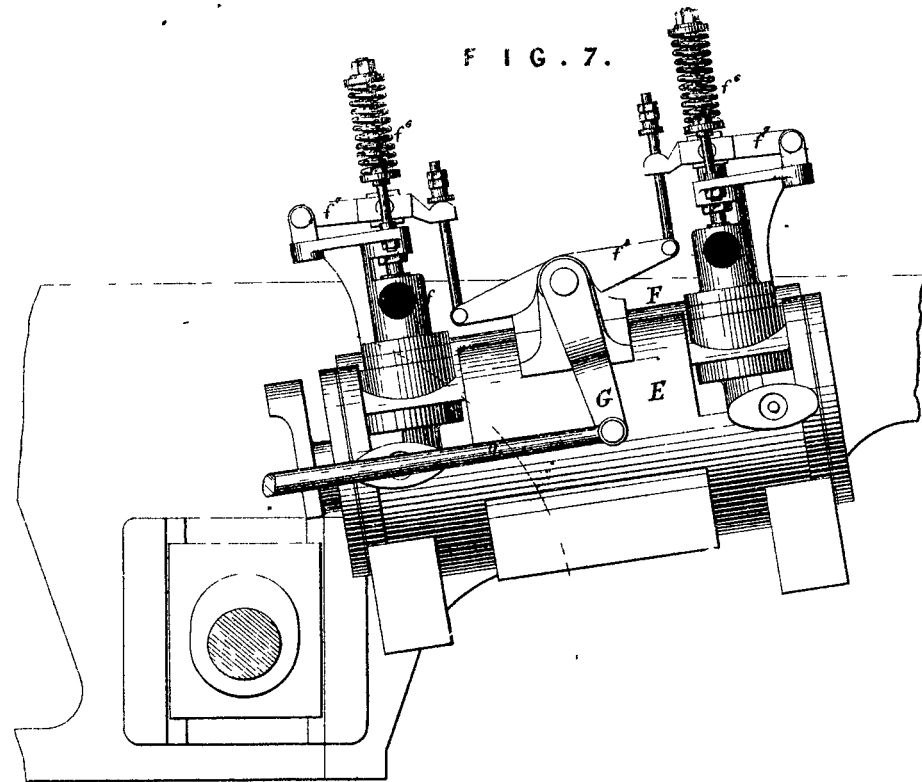


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*This is the Sheet of Drawings marked C referred to in the annexed
 Letters of Registration granted to Frederick Edward Blackett Beaumont
 this twenty sixth day of March, A.D. 1881.*

Sig. 34.

Augustus Loftus.

FIG. 3.

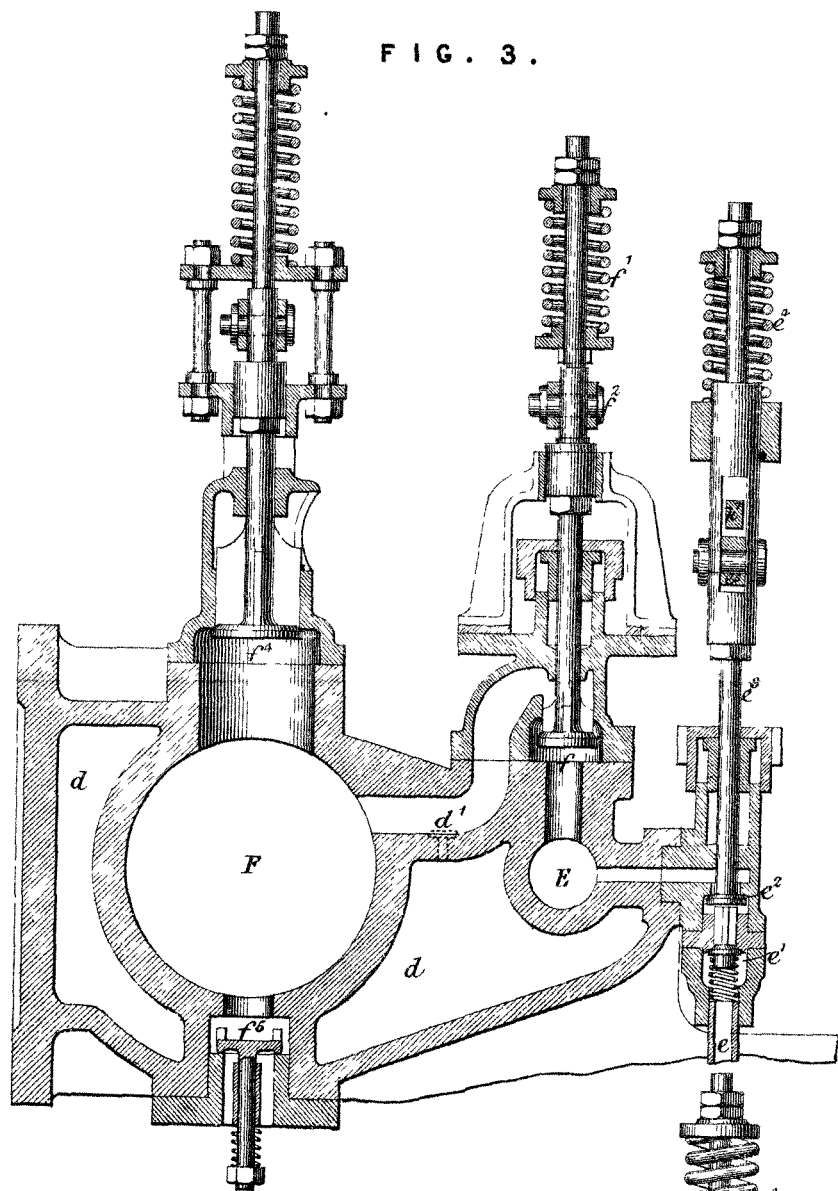
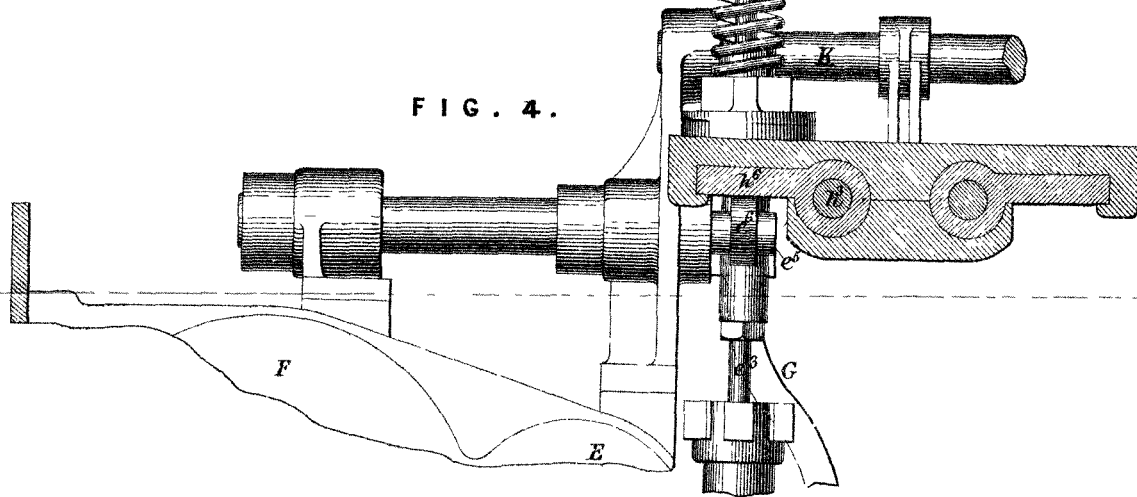


FIG. 4.



(Sig 34)

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*This is the Sheet of Drawings marked D referred to in the annexed
Letters of Registration, granted to Frederick Edward Blackett Beaumont
this twenty sixth day of March, A.D. 1881.*

Augustus Loftus.



A.D. 1881, 28th March. No. 919.

IMPROVEMENTS IN BELTS OR BANDS FOR DRIVING MACHINERY, &c.

LETTERS OF REGISTRATION to Maurice Gandy, for Improvements in and relating to Belts or Bands for driving Machinery, and an improved mechanical process of manufacturing the same, and machinery employed therefor.

[Registered on the 28th day of March, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCEE LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS MAURICE GANDY, of No. 5, Ansdell-street, Liverpool, in the county of Lancaster, in that part of the United Kingdom of Great Britain and Ireland called England, manufacturer of belting, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in and relating to Belts or Bands for driving Machinery, and an improved mechanical process of manufacturing the same, and machinery employed therefor," which is more particularly described in the specification, marked A, and the five sheets of drawings, marked B, C, D, E, and F, respectively, which are hereunto annexed; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Maurice Gandy, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof: to have, hold, and exercise unto the said Maurice Gandy, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said Maurice Gandy shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this twenty-eighth day of March, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Belts or Bands for driving Machinery, &c.

A.

SPECIFICATION.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, MAURICE GANDY, of Liverpool, in the county of Lancaster, in that part of the United Kingdom of Great Britain and Ireland called England, manufacturer of belting, send greeting :

WHEREAS I am desirous of obtaining Royal Letters of Registration, for securing unto me Her Majesty's special license that I, my executors, administrators, and assigns, or such others as I or they should at any time agree with, and no others, should and lawfully might, from time to time, and at all times during the term for which such Letters of Registration shall be granted, make, use, exercise, and vend within the Colony of New South Wales and its Dependencies, an invention for "Improvements in and relating to Belts or Bands for driving Machinery, and an improved mechanical process of manufacturing the same, and machinery employed therefor": Now know ye, that the nature of the said invention, and the manner in which the same is to be performed, is particularly described and ascertained in and by the following statement, that is to say:—

Reference being had to the accompanying sheets of drawings making a part of this specification, by which there is illustrated certain machinery used in the practice of my invention, and in which like letters and figures are used to denote the same or corresponding parts throughout the various views, and such letters and figures correspond with those used in the following explanation.

My invention consists—

First, of an improved cotton canvas or like belt.

Second, of an improved mechanical method or process of making a cotton canvas or like belt.

Third, of improved machinery to be employed in carrying out the mechanical process of making a cotton canvas or like belt.

My improved cotton canvas belt consists—

First, of cotton canvas or duck, composed of warp stouter than the weft—both warp and weft being hard spun, and the canvas hard and tight woven.

Second, of cotton canvas or duck, thus made and folded by hand or by a mechanical operation, while the cotton canvas or duck is being subjected to tension and stretched to kill the elasticity.

Third, of cotton canvas or duck, thus made and thus folded, and within which there is placed during the folding under tension and conjointly under tension, one, two, or more breadths of cotton canvas or duck made as described, so that a belt may be produced of two, three, four, six, eight, or any number of plies as desired.

Fourth, of cotton canvas or duck thus made, thus folded, and thus combined, united by longitudinal rows of stitching, of cotton or other twine, either plain or cable laid, and while the belt is under tension.

Fifth, of cotton canvas or duck, thus made, thus folded, thus combined, and thus stitched, saturated with linseed oil, or any compound thereof, being a drying oil.

Sixth, of cotton canvas or duck, thus made, thus folded, thus combined, thus stitched, and thus saturated with linseed oil, or any compound thereof, being a drying oil, pressed and stretched until it is hard, even, and rigid, preparatory to painting and finishing, and preparatory to its being used, by which the belt is rendered insensible to atmospheric changes, so that the elasticity of the woven and sewn cloth is nullified, or, so to speak, killed by a uniform stretching process, which is applied during the mechanical folding of the belt, during the stitching of the belt, during the oiling or saturation of the belt, and at the finishing of the belt, or wholly at the finishing of the belt.

I would here remark that, in the manufacture of belts or bands for driving machinery, where such belts have been composed of plies of woven fabric of any description, it has been the habit of the trade to fold the woven fabrics or cloth of which the belt is compounded by manual labour; and such woven fabric being necessarily of a more or less stiff nature, it has been impossible to produce a folded and compound belt in which the edges of the belt were fairly together and the belt of a uniform thickness, and all the plies of the belt so compounded as to take their share of the strain which would be applied to the belt when in use. Thus, although I have described this part of my invention as applied to belts of cotton canvas or duck, composed of warp stouter than the weft, both warp and weft being hard-spun, and the canvas hard and tight woven, I would have it understood that my improvements are applicable to all belts or bands composed of woven fabric other than hard woven cotton canvas or duck.

In my improved cotton canvas belt the hard woven canvas is a necessary part, so is the stitching under tension, and the after saturation and pressing under tension. The folding is not absolutely necessary, because the several plies of canvas can be woven to the desired width and mechanically laid together under tension, and discharged evenly to the sewing-machine, where they are stitched together under tension by cotton or other twine, either plain or cable laid. What I particularly mean by the mechanical folding under tension is the multiplying of the plies evenly under tension by mechanical means; the only object of folding is to increase the number of plies and the thickness and strength of the belt, and that can be done by cutting the interior plies in strips from wide canvas, leaving no selvage, but far preferably by hard weaving the canvas of the desired widths with a selvage on both sides, and then by mechanically laying the interior plies within an envelope composed of the outer ply by a mechanical folding process under tension.

My improved mechanical process of making a cotton canvas or like belt consists—

First, of mechanically folding the canvas or woven fabric while under tension in a machine, so as to form a four-ply belt.

Second, of mechanically folding the canvas or woven fabric while under tension in a machine, so as to form a belt of more than four plies, by combining with the first folded fabric one or more additional cloths so as to produce the additional plies.

Third,

Improvements in Belts or Bands for driving Machinery, &c.

Third, of stitching the canvas that has been folded under tension by a suitable machine upon a line with its warp, with as many rows of stitching of cotton or other twine, either plain or cable laid, as may be necessary to thoroughly unite the folds or plies of canvas, the stitching being done while the belt is under tension between a holder and a pair of feed rollers, so as to nullify or kill the elasticity of the woven and stitched cloth.

Fourth, of pressing the belt in a series of calender rollers until its surface is flat and even and the several folds or plies of canvas are forced hard upon each other, the pressing being performed before oiling, after oiling, and after painting, or after finishing only.

Fifth, of stretching the belt in the operation of pressing it until its tensile elasticity is practically exhausted, and the liability of the belt to stretch in use is removed.

Sixth, of stretching the belt after it has been finished, by passing it round rollers and applying screw power or like means to stretch the belt. This system is particularly applicable to broad belts, such as main drivers.

My improved mechanical contrivances or machinery to be used in carrying out the mechanical process of making a cotton canvas or like belt consist—

First, of a series of mechanical contrivances by which the bolt or bale of canvas or woven fabric is mechanically formed into a belt by folding, such folding being done while the fabric is under tension.

Second, in the arrangement of mechanism for stitching the belt under tension.

Third, in the arrangement of apparatus for pressing and stretching the belt.

REFERENCE TO THE DRAWINGS.

Figures 1 to 27 represent the mechanical contrivances for folding the cotton canvas or other fabric into a belt under tension. Figure 28 represents the combined apparatus for folding the cotton canvas or other fabric into a belt under tension. Figure 1 is a side sectional elevation of the first of the mechanical contrivances. Figure 2 is a plan of figure 1. Figure 3 is a side elevation of part of figure 1.

A is a loose roller, which carries the bale or bolt of canvas B. The canvas passes between the rolls A' and through the adjustable guide pieces A'', as shown. The canvas then passes through one (according to its width) of a nest of concentric rings, C, figure 4, which is an elevation, and figure 5, which is an end view, and thence through an oval former, D (see detail figure 6), which imparts to the canvas a tubular form, such as shown at figure 7. The canvas then passes through the appliance shown at figure 8, going first through the press plates E (see details, figures 9, 10, 11, 12, and 13), which form the belt into the section shown at figure 14 by the upper press plates E' and the internal gauge plate or tongue E''. After passing the press plates E, the belt passes between the press rolls F. From the appliance, figure 8, the belt passes through the appliance of which figure 15 is a side elevation and figure 16 an end elevation, passing first through the guiding appliance G, which forms the belt into an open gutter, as shown at figure 17, into which may be laid the number of cloths required to form the completed belt. These cloths are stored on the loose rollers G', G'', G''', and are delivered through the tension rolls G'''' into the gutter of the belt B, as shown at G'''''. From the appliance shown at figure 15 the belt passes to the appliance shown at figure 18, the press plates H of which (see details figure 19 and 20) form the belt as shown at figure 21, being either with or without interior plies as required. After passing through and being creased by the rollers H', the belt passes through the forming appliance, of which figure 22 is a side elevation and figure 23 an end elevation; by this the belt is formed, as shown at figure 24. The belt then passes to the final forming machine, illustrated in side elevation at figure 25, passing first through the press plates I (see detail figure 26), which forms the belt as shown at figure 27. After passing through the press plates I, the belt is finally passed between a nipping guide, I', and a pair of press rollers, I''. The relative positions of these various appliances will be understood upon reference to figure 28, and by the appliances a belt of any number of plies can be folded under tension and produced direct from the bale, and folded and creased so that the folded over-edges meet evenly in the centre, and after so folding it is ready for the sewing-machine.

Upon further reference to the drawings, figure 29 represents a side elevation of a sewing-machine, nippers, and feeding rollers, by which the belt is sewn while under tension. J are the driving pulleys of the sewing-machine (see also figure 30); K is a disc with a cam groove, which operates by means of the levers L (this cam may also be a simple cam on the shaft of the sewing-machine, actuating a lever that again actuates a ratchet that works the feed rolls), the pawl lever M, and thereby the feeding and pressing rollers N. The feeding and pressing rollers N intermittently pull the belt B through and from the nippers O, which hold the belt B, and during such movement the needle P of the sewing-machine Q stitches the belt while under tensile strain. The feeding rollers N are brought into operation by the machinist through the eccentrics and gear R (see also figure 31), or by a hand-wheel and screw. The nipper rolls O are operated by the eccentrics and gear O', and governed by a brake and gear, J''. The guides J''' control the correct passage of the belt B through the nipper rolls O, and are adjustable through the gear J''', to suit the passage of that part of the belt, being the then stitched line, through the sewing-machine. The guides J''' are also adjustable, to suit different widths of belts. The rolls N are geared by the toothed wheels a, and the nipper rolls O are geared by the toothed wheels b.

In the drawings, figure 33 represents a tank containing linseed oil set below the floor S, upon which the pressing and stretching machine (figure 34) is located.

By B is shown a belt after it has been folded and stitched.

By T is shown a disc, secured upon the lower end of the rod X, to which a tackle, T', is attached, by which the disc T is raised and lowered in the tank.

The object of the disc T is to carry a coil of the belt suspended in the oil in the tank, substantially in the manner shown at figure 33.

The belt B after being sufficiently soaked with the oil is led up between a pair of rollers, R/R', by which the free oil is stripped off from it. The belt is then led forward between a pair of friction rollers, S/S', and two pairs of nippers, B/B', passing on its way between the calender rollers UU and U', as illustrated. Each of the nippers B' is provided with an adjusting screw, V, by which the nippers are forced

Improvements in Belts or Bands for driving Machinery, &c.

forced upon the belt B, and the tension of the belt between the nippers B' and the rollers U U' is regulated. There are nippers, B', on each side of the rollers U U', but the nippers on the delivery side are left open when in operation, to allow the belt an unobstructed passage. These nippers may be formed of rollers retained by a brake band, and thus regulate the tension required. The pressure being regulated by pressure, they may also be distinct and separate from the frame carrying the press rolls.

The rollers are arranged to rotate alternately in opposite directions. Thus the belt B can be pressed and stretched first one way and then the other, until the oil is thoroughly soaked and forced into the fabric, and every thread in the structure is drawn and pressed to its bearing; the tendency of the belt to stretch being thus developed to its maximum, and its surface being brought to a hard and equal plane.

The two lower calender rollers U have their axis supported by stationary bearings in the frame W, but the roller U' is carried by an adjustable frame, *d*, which, through the agency of the jointed rod *e* and the lever *g*, is forced down by a weight, *e'*, upon the bottom rollers U, as shown in figure 34. The rolls are driven by the gear Z.

In the drawings, figure 38 represents a set of rollers by which I stretch my belts after they are finished. B is the belt which is passed round the rollers, and then made fast at one or both ends to the screw clamps or other stretching power as shown, so that the belt may have all the elasticity taken out of it.

I would remark, in conclusion, that although I have shown and illustrated in the drawings suitable machinery for carrying my invention into practice, I do not intend to confine the invention, of which this is the specification, to the special form of machines, apparatus, or mechanical appliances above described, my invention not being limited to the machinery illustrated, but consisting of the belt and of the mechanical process by which it is produced. I therefore claim as my invention—

Claim first:—A belt possessing the following composition and characteristics:—

First—A foundation consisting of cotton canvas, composed of warp stouter than the weft—both warp and weft hard spun, and the canvas hard or tight woven.

Second—A foundation composed of canvas thus made, folded upon the line of its warp, and the folds united by rows of longitudinal stitching of cotton or other twine, either plain or cable laid, and stretched to kill the elasticity.

Third—The interstices and fibre of a structure thus made, saturated with and pressed full of linseed oil, or any mixture of linseed oil, or other drying oil, or a compound of oil and resin, or tallow and resin.

Fourth—The structure thus saturated and pressed full of oil, or other compound, pressed and stretched rigid, hard, and even, and the elasticity nullified or killed.

Claim second:—The mechanical process of manufacturing canvas belts, the folding the belt while under tension, the sewing the belt while under tension, and the pressing and stretching of the belt after its treatment with oil between rollers in combination with stretching nippers, or between double sets of rollers running at differential speeds, for the purpose of forcing the oil into the interstices and fibre of the fabric; also, after finishing stretching the belts, especially main driving belts between rollers in a frame, for the purpose of stretching and pressing the belt hard, even, and rigid, and nullifying and killing the elasticity.

Claim third:—The mechanical appliances for folding the belt under tension, substantially as herein described, and illustrated at figures 1 to 28 inclusive of the accompanying drawings.

Claim fourth:—The mechanical appliances for sewing belts under tension, substantially as herein described, and illustrated at figures 29 to 32 of the accompanying drawings.

Claim fifth:—The mechanical appliances for oiling, stretching, and pressing belts, substantially as herein described, and illustrated at figures 33 to 38 of the accompanying drawings.

In witness whereof, I, the said Maurice Gandy, have hereunto set my hand and seal, this fourth day of December, in the year of our Lord one thousand eight hundred and eighty.

Witnesses—

FREDERICK JOHN CHEESBROUGH, }
JOHN HAMILTON REDMOND, } Both of 15, Water-street, Liverpool, England.

MAURICE GANDY.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to Maurice Gandy, this twenty-eighth day of March, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

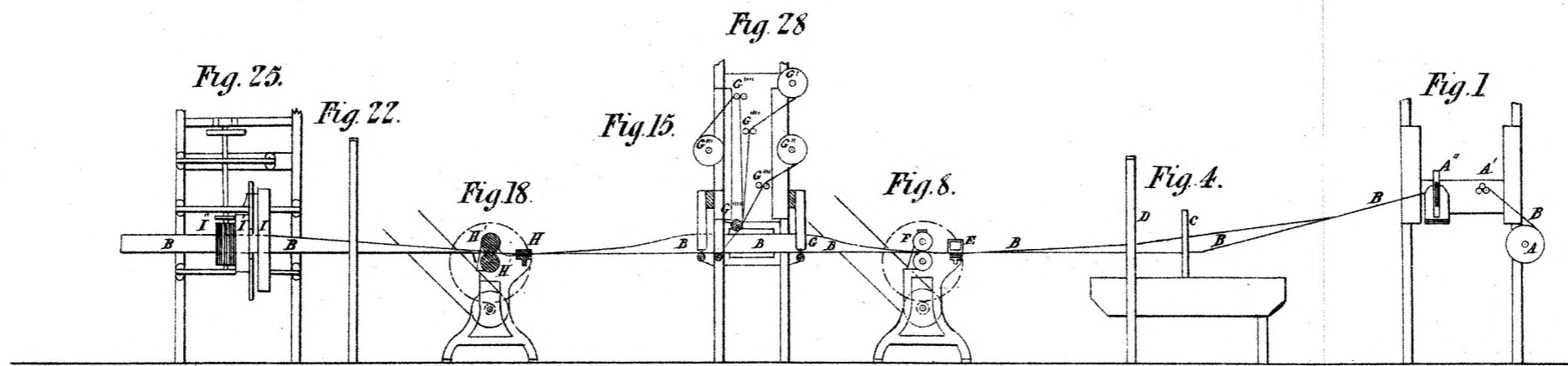
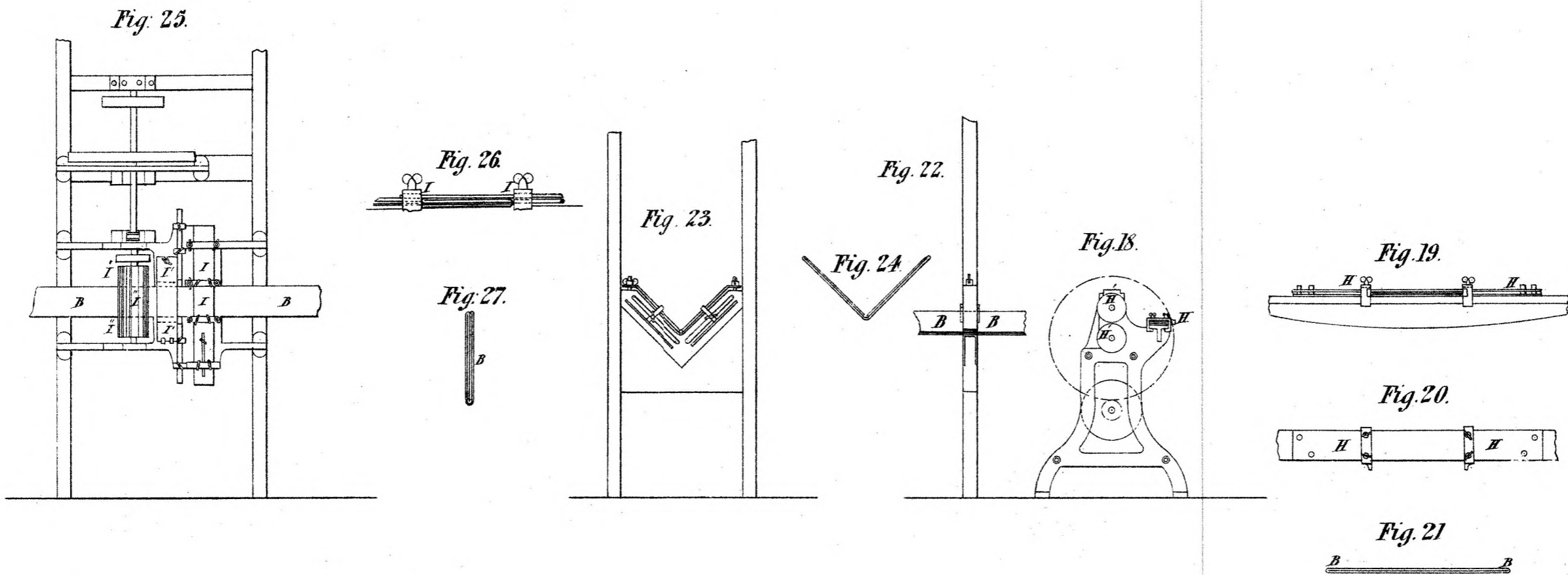
Sir,

We do ourselves the honor to return to you herewith the documents transmitted to us under your B.C. communication of the 1st instant, No. 81-1,232, which have reference to Mr. Edward Waters' application, on behalf of Mr. Maurice Gandy, for Letters of Registration for "Improvements in and relating to Belts or Bands for driving Machinery, and an improved mechanical process of manufacturing the same, and machinery employed therefor"; and we do ourselves the honor to state that we see no objection to the application being granted.

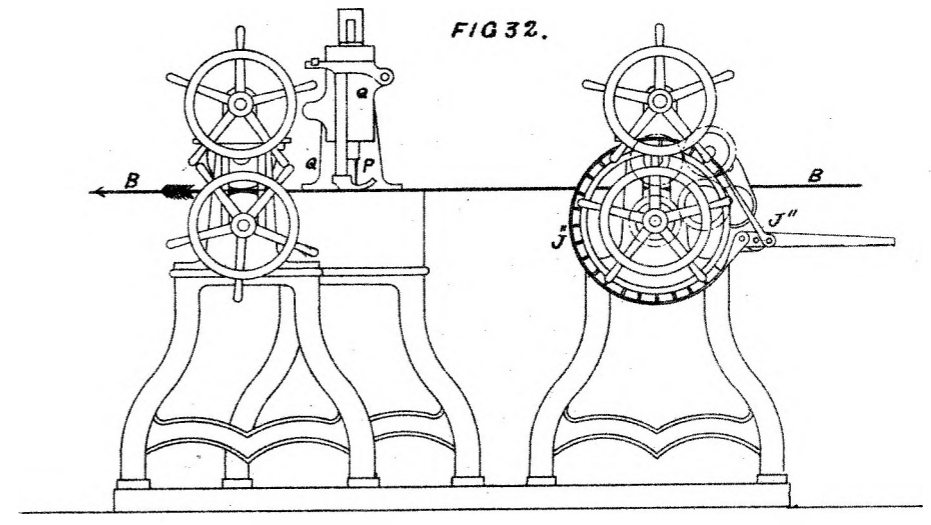
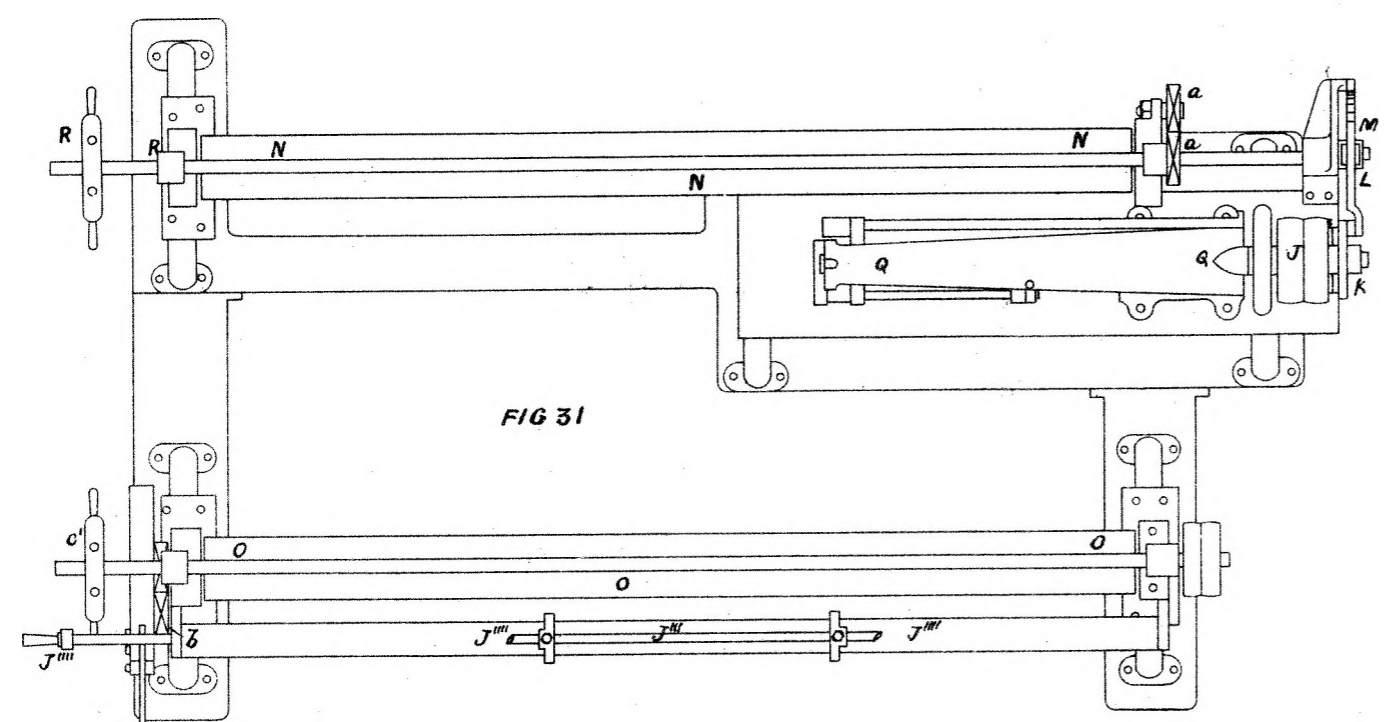
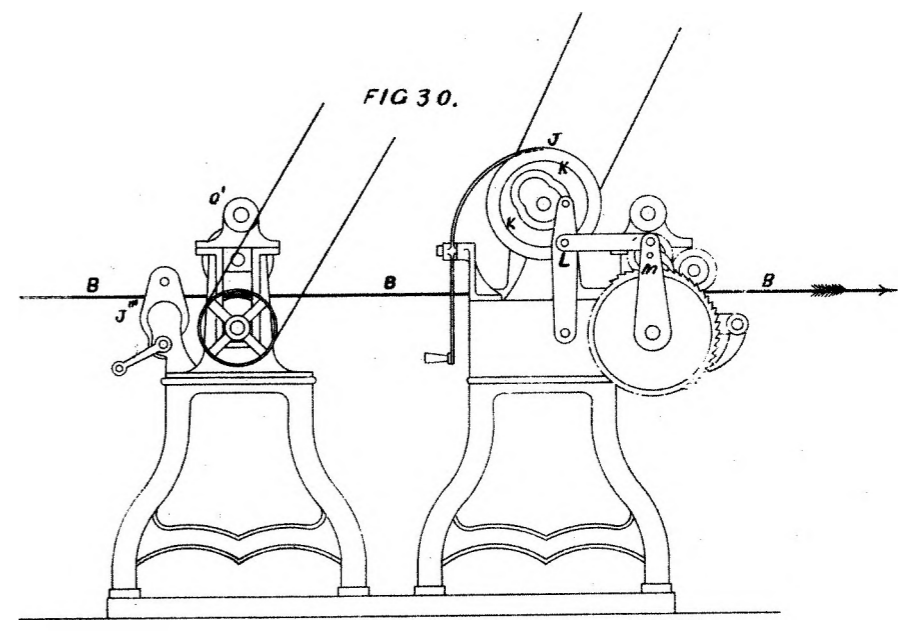
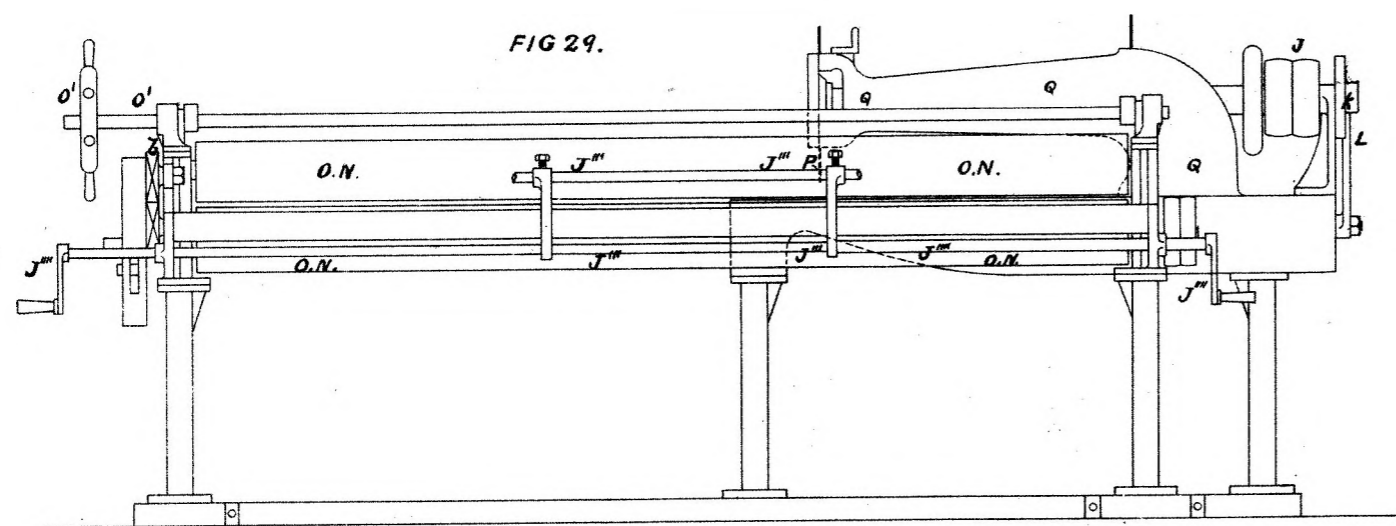
We have, &c.,

EDMUND FOSBERY.
GOTHER K. MANN.

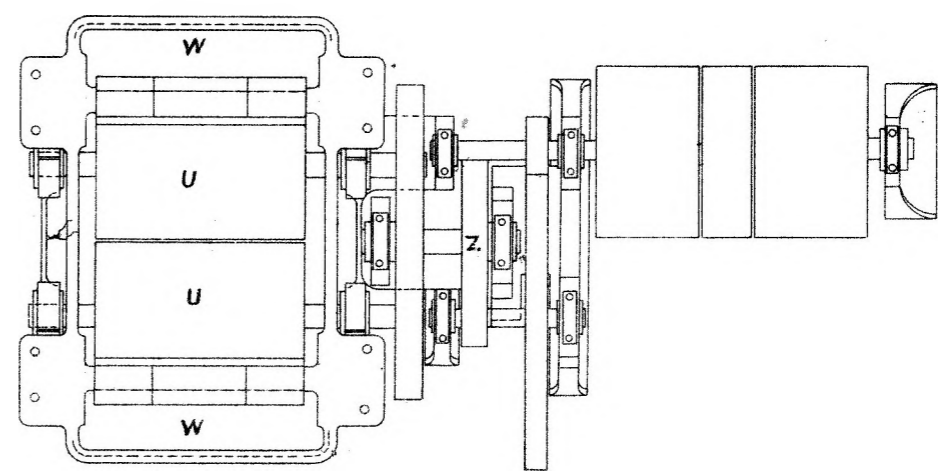
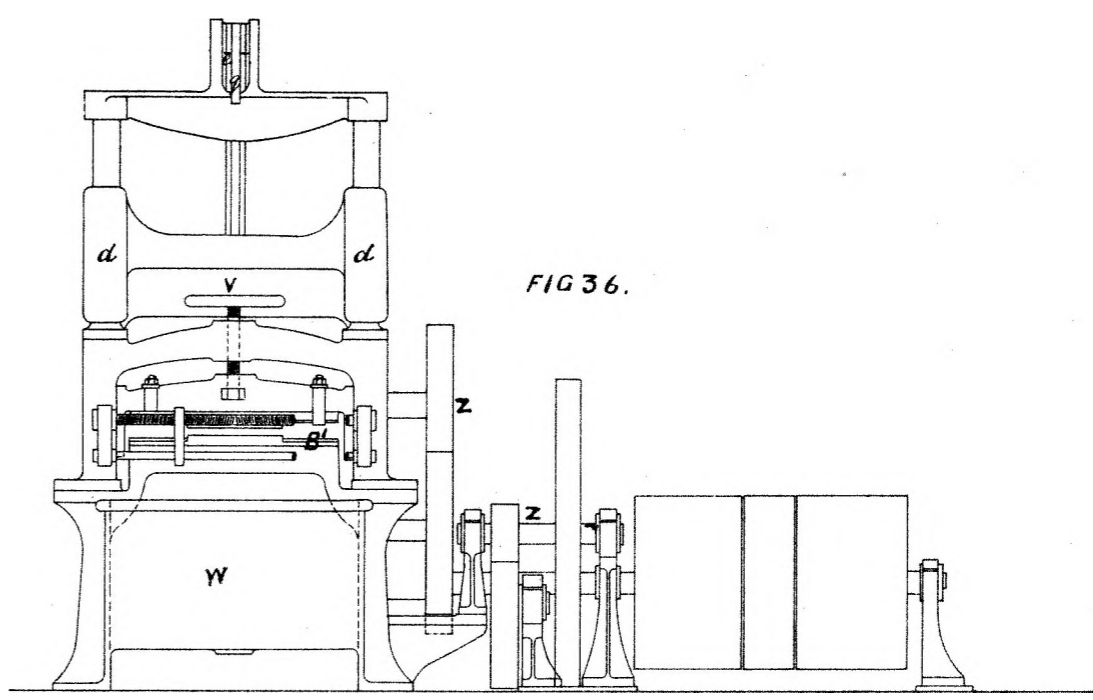
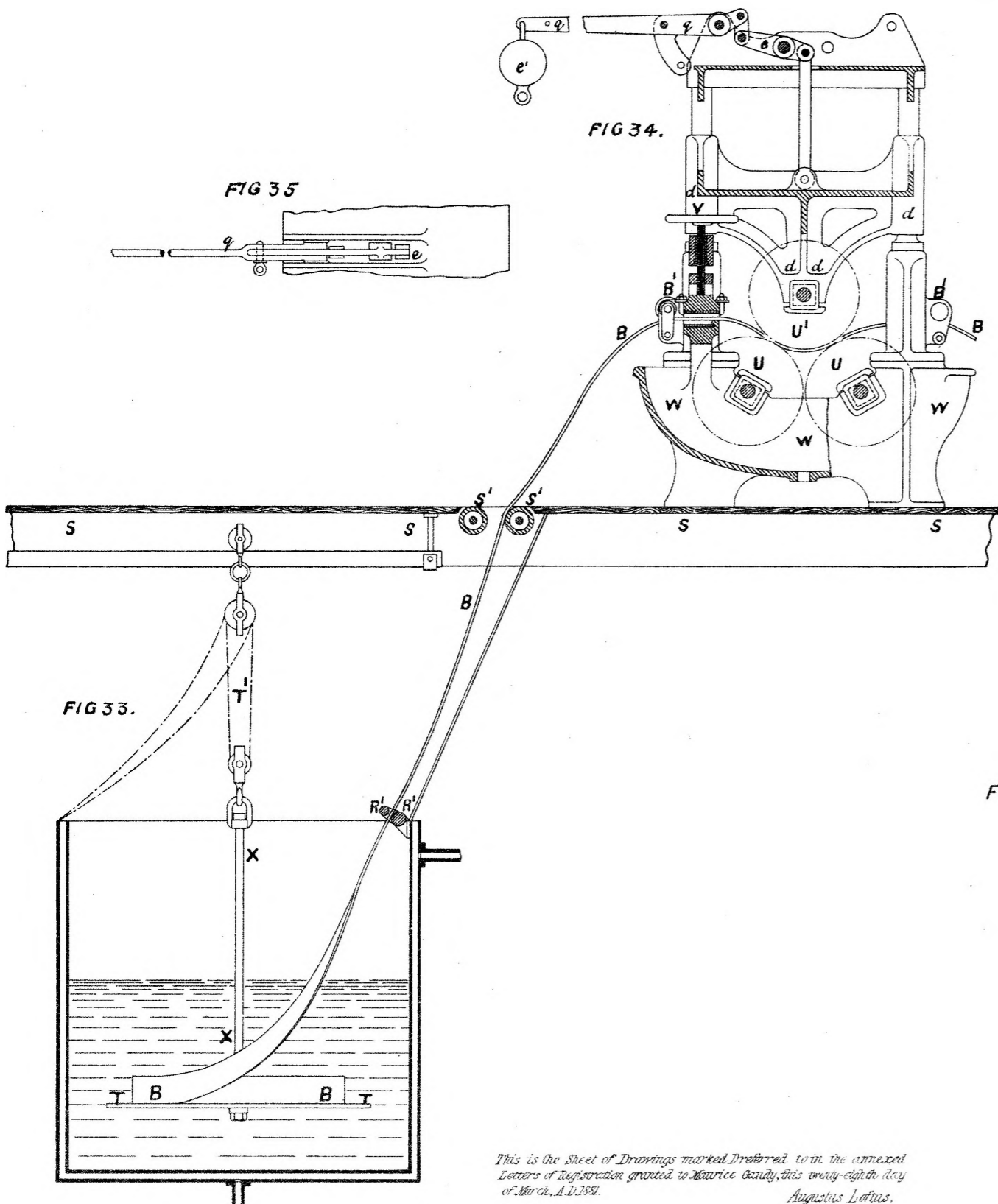
The Under Secretary of Justice.



*This is the Sheet of Drawings marked B referred to in the annexed
 Letters of Registration granted to Maurice Gandy, this twenty-
 eighth day of March, A.D. 1881.
 Augustus Loftus.*



*This is the Sheet of Drawings marked C entered to
 in the annexed Letters of Registration granted
 to Maurice Gaudy, this twenty-eighth day of March,
 A.D. 1882.
 Augustus Luffus.*



This is the Sheet of Drawings marked D referred to in the annexed Letters of Registration granted to Maurice Candy, this twenty-eighth day of March, A.D. 1981.
Augustus Loftus.

FIG 38.

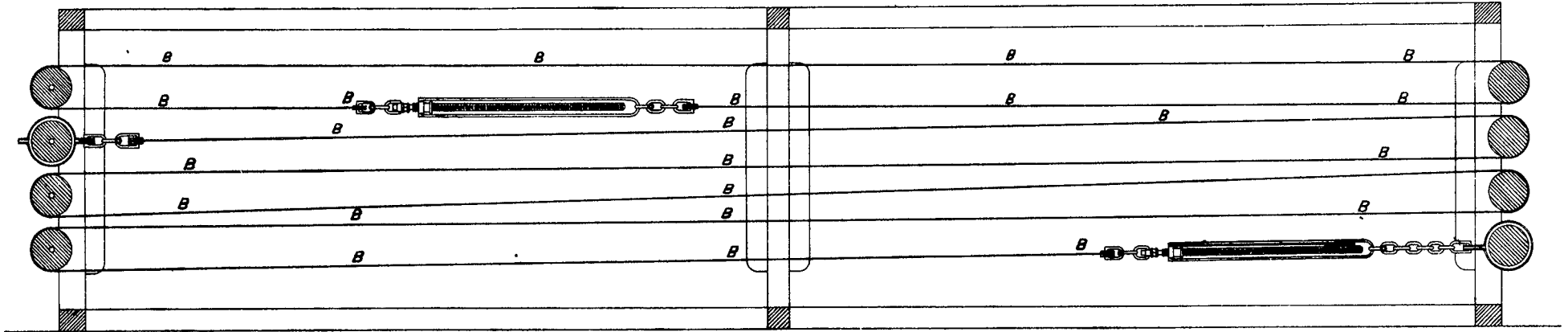


FIG 38.



This is the sheet of Drawings marked B referred to in the aforesaid
 Letters of Registration granted to Maurice Gaudy this twenty-eighth
 day of March, A D 1881. Augustus Loftus.

Fig 38.

PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE
 SYDNEY, NEW SOUTH WALES.

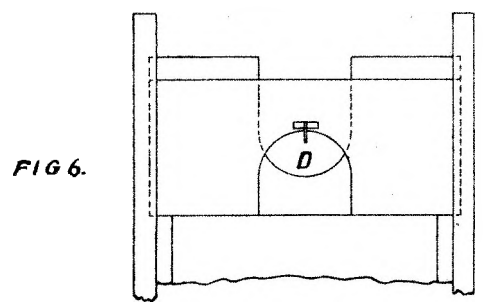


FIG 6.

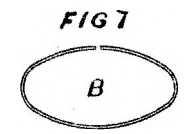


FIG 7

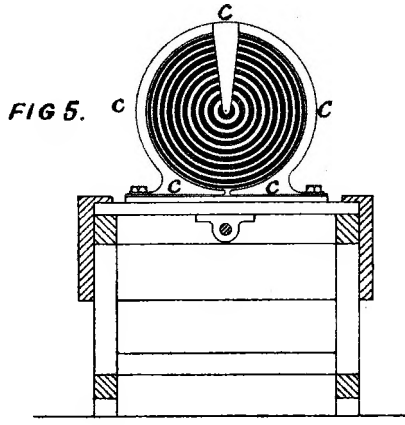


FIG 5.

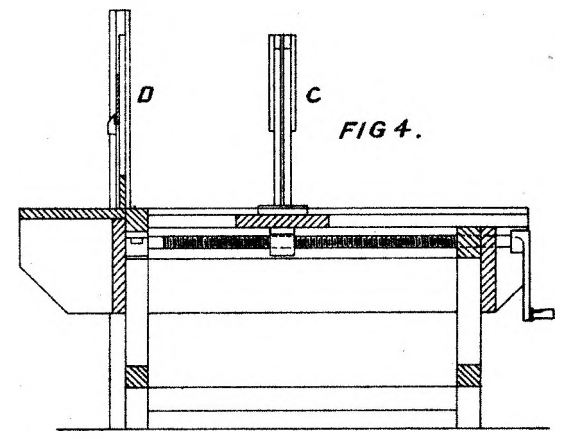


FIG 4.

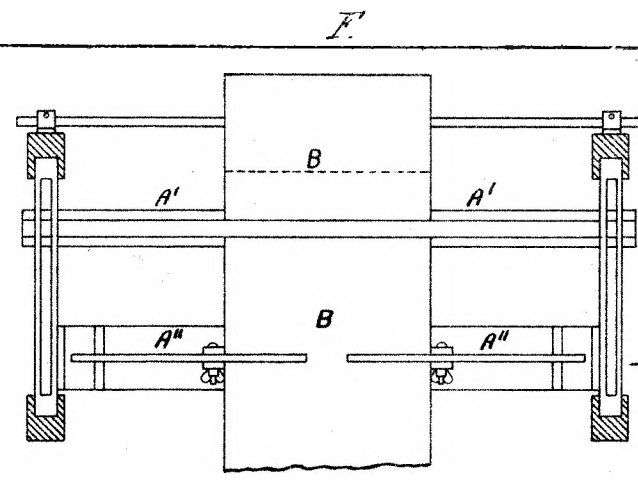


FIG 2.

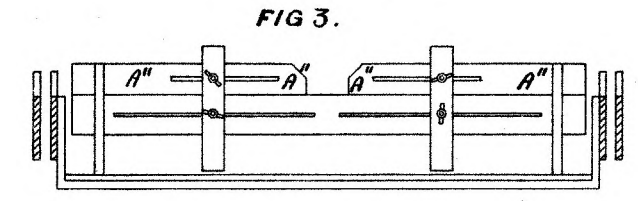


FIG 3.

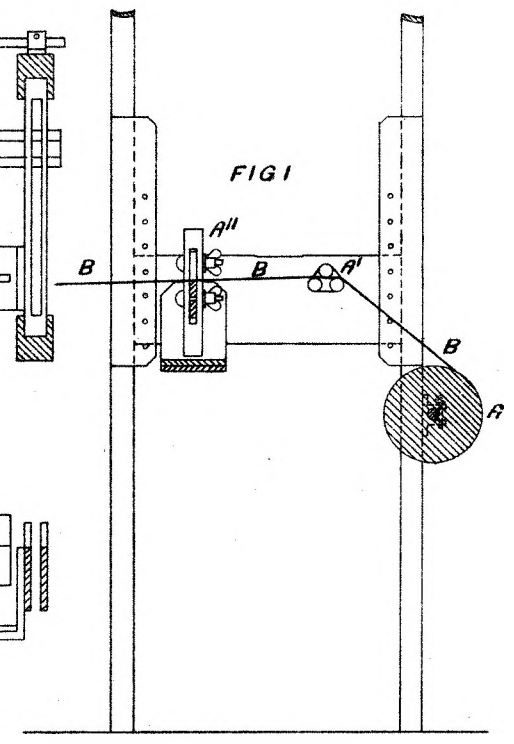


FIG 1

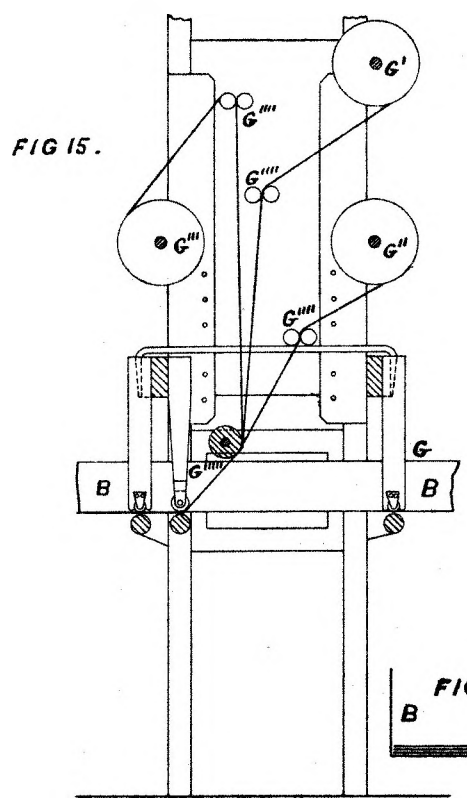


FIG 15.

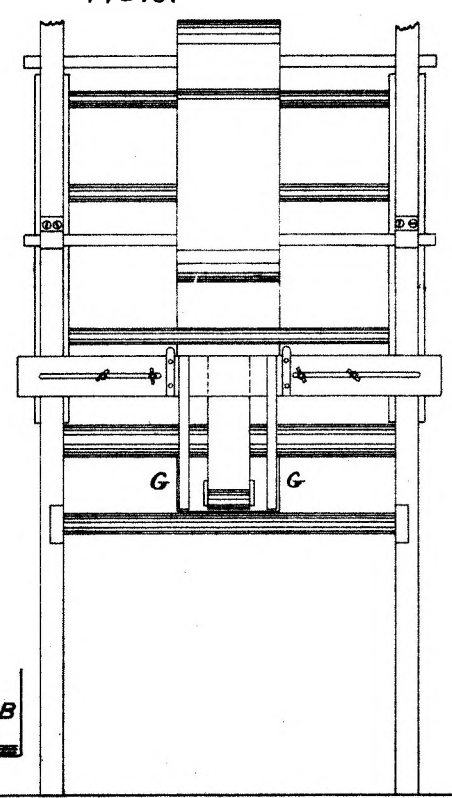


FIG 16.

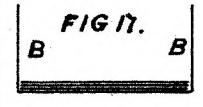


FIG 17.

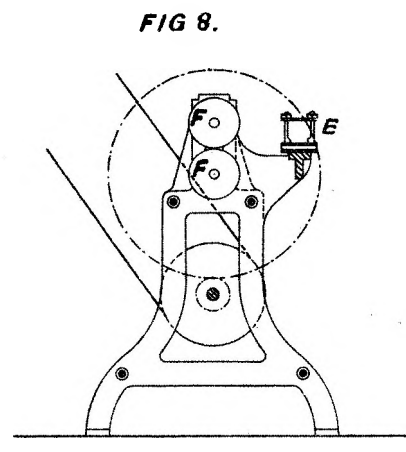


FIG 8.

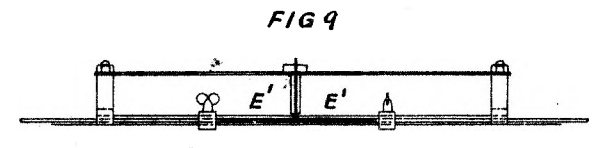


FIG 9

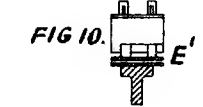


FIG 10.



FIG 11.

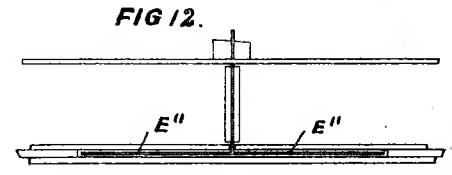


FIG 12.

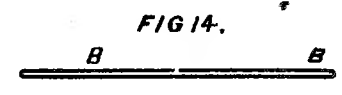


FIG 14.

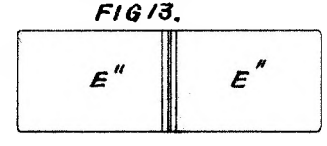


FIG 13.

This is the Sheet of Drawings marked F referred to in the annexed Letters of Registration granted to Maurice Gaudy this twenty-eighth day of March, A.D. 1917.
Augustus Loftus.



A.D. 1881, 28th March. No. 920.

IMPROVEMENTS IN PROCESSES AND APPARATUS FOR COOLING AND DRYING AIR.

LETTERS OF REGISTRATION to Leicester Allen, for Improvements in processes and apparatus for cooling and drying air.

[Registered on the 28th day of March, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting:

WHEREAS LEICESTER ALLEN, of the city of New York, county of New York, in the State of New York and the United States of America, journalist, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in processes and apparatus for cooling and drying air, applicable to all purposes which require air cool or dry, or both cool and dry air, but more particularly to the preservation in large refrigerators of animal and vegetable substances or products," which is more particularly described in the specification, marked A, and the four sheets of drawings marked B, C, D, and E respectively, which are hereunto annexed; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Leicester Allen, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said Leicester Allen, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said Leicester Allen shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this twenty-eighth day of March, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in processes and apparatus for cooling and drying air.

A.

SPECIFICATION of LEICESTER ALLEN, of the city of New York, county of New York, in the State of New York and the United States of America, journalist, for an invention entitled "Improvements in processes and apparatus for cooling and drying air, applicable to all purposes which require air cool or dry, or both cool and dry air, but more particularly to the preservation in large refrigerators of animal and vegetable substances or products."

THE invention relates to that class of cooling or refrigerating apparatus in which cold is produced by first compressing air, cooling it while so compressed or during the process of compression, or both during and after compression, and, lastly, expanding the same in the performance of work in an engine cylinder or other appliance, whereby the said expansion may be made to perform work.

The objects sought in the improved process and organization of the apparatus are the obtaining of large expansion and much work from the compressed air, and a correspondingly large effect in the cooling, either with or without great intensity of cold; a method and means whereby the heat even at low temperatures in the refrigerating enclosure may be made to perform work during its transfer from the interior of said enclosure to the exterior of the same; the attainment of a very high degree of compression without making the steam cylinder or other prime motor do more than a comparatively small amount of the work of such compression, while, at the same time, it works independently, having no direct or positive connection with the air expanding engine or engines or apparatus, or (if it be connected with the shaft to which one of the expanding engines is also connected) to provide means whereby the portion of the apparatus with which the steam-engine is directly connected may be worked independently of all other parts of the apparatus; means whereby to effect the utilization of all the cold produced by the expansion in the refrigeration enclosure or room to be cooled or substance to be cooled; a method and means of drying the air while cooling the same, if necessary to be dried; and a method and means for preventing the formation of fog or visible vapour in the refrigerating enclosure, through the sudden contact and commingling of very cold air with warm and moist air at the point where the final exhaust of expanded air enters such enclosure.

The invention partly consists in a mode of accumulating pressure in a reservoir air space or pipe of an air-cooling apparatus, carried out by inducting to a compressor which supplies such reservoir, air space, or pipe, cooled air already compressed by another independently working compressor, substantially as herein described.

The invention further consists in the heating of compressed air cooled by partial expansion, prior to its further expansion, by heat abstracted from the enclosure to be cooled, or substance to be cooled, substantially as herein described.

The invention further consists in a mode of obtaining artificially compressed air having a lower temperature than that of the compartment or substance to be cooled, which is accomplished by first obtaining a high degree of compression in the moderately cooled air by successive and consecutive compressions in separate compressors without intermediate expansions and with intermediate cooling, and then expanding the air so compressed by successive and consecutive expansions without intermediate compressions, whereby, after the first of the series of expansions the still compressed air is brought to a temperature at which it may abstract heat from said compartment or substance to be cooled before further expansion, substantially as herein described.

The invention further consists in a mode of adding to the expansive force of the compressed air, and obtaining therefrom a maximum amount of work and refrigerating effect, which is done by heating the still compressed air, after partial expansion, abstracting the heat for this purpose from the refrigerating compartment or substances to be cooled, and subsequently expanding the air in the performance of work, substantially as herein described.

As part of a process of dynamic cooling in which a series of successive and consecutive compressions of air taken from a refrigerating compartment is performed in a series of independent compressors delivering air one to another, to compress the air from atmospheric pressure to a maximum pressure before any expansion of such compressed air is permitted, and in which the air is cooled between the several stages of compression, and in which the so compressed air is expanded down to atmospheric pressure in an air engine or engines, and then exhausted again into said refrigerating compartment, the invention further consists partly in the method of removing vapour resistance to compression by trapping out the water precipitated from the cooled and compressed air after the first stage of compression and before attaining the maximum pressure, whereby a large percentage of the vapour resistance is removed.

The invention further consists in the combination of a refrigerating enclosure, an air compressor or compressors, a cooler or coolers for cooling compressed air, a primary compressed air-engine, driven by air discharged from the compressor for partly expanding said air, a supplementary air engine or engines for further expanding the air, and a heater or heaters placed in and abstracting heat from said enclosure for heating the partly expanded air during its passage to said supplementary air engine or engines, whereby the air during said passage gains in expansive force prior to further expansion.

The invention further consists in the combination with a refrigerating enclosure of an air compressor or compressors placed outside of said enclosure, a cooler or coolers for cooling the compressed air discharged from said compressor or compressors, and a compressed air-engine or air-engines placed within said enclosure, driven by compressed air delivered from said compressor or compressors, and applying its or their work outside of said enclosure, whereby all the cold produced in and by the expansion is utilized in the room to be cooled, substantially as herein described.

The invention further consists in the combination with a series of air-compressors and coolers for compressed air, of one or more by-passes, whereby air compressed by one or more of the compressors may be passed without cooling into another compressor, and thence into the cooler or coolers of another compressor, by which means the temperature of the compressed air may be made so high as to render water of a considerably elevated temperature effective as a cooling medium, substantially as herein described.

The invention further consists in the combination with a series of compressed air-engines delivering air into a refrigerating enclosure, and a heater or heaters abstracting heat from said enclosure for heating said

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said air on its way from one of said engines to another, of a by-pass or by-passes through which air may be delivered at will from one engine to another without being heated in its passage, and by which means a very low temperature may be acquired in the expanded air, when extremely low temperatures are desired, substantially as herein described.

The invention further consists in an air-cooling apparatus composed of a refrigerating enclosure, a series of air-compressors supplied with air from said enclosure, air-coolers, a series of compressed air-engines delivering air into said enclosure and driving all the compressors but one, a steam-engine or other prime motor for driving or assisting in driving one of the compressors, a heater or heaters for abstracting heat from the enclosure and imparting it to the air on its way from one engine to another, pipes for conveying the air, and cocks or valves for directing the flow of air through the different parts of the apparatus combined, substantially as herein described.

As part of a process for dynamic cooling wherein air is compressed, cooled, expanded to perform work, and exhausted into a refrigerating compartment, the invention further consists in heating the final exhaust of the expanded air previous to its intermingling with the air of such refrigerating compartment; the heater for this purpose being placed within the refrigerating compartment, and operating by heat abstracted from said compartment to raise the exhausted air passing through it to a temperature above that of the dew-point, whereby the production of fog or vapour by the sudden commingling of cold air with warm moist air is prevented, substantially as herein described.

The invention further consists in the combination of two or more air-expanding engines, one or more of which are driven by air partly expanded and exhausted from the other or others, and an intermediate reservoir or reservoirs for the reception and storage of the partly expanded air previous to its induction to the engine or engines in which it is to be further expanded, whereby the pressure of the air in its intermediate passage from one engine to another is rendered more uniform, substantially as herein described.

The invention further consists in the combination of a refrigerating enclosure, a series of compressors successively imparting increments of compression to air, a cooler or coolers for cooling the compressed air, and a series of engines, one of which is driven by steam or other independent motive power to operate one compressor or aid in operating said compressor, and the remainder by pressure and successive expansion of the cold and compressed air to apply the power of the expanding air to compressing other air.

The invention also consists in a cooler, composed of a shell for retaining air and superimposed series of water-pipes, each series being placed across another series at right-angles, and each of the series having its pipes placed over or under the spaces between the pipes of the next series above or below it, whose pipes lie in the same direction, said pipes being inserted in said shell, substantially as herein described.

The invention also consists in the combination with the air-retaining shell of a cooler and water-pipes inserted into said shell, of detachable connectors, clamping bars, and clamping screws, which hold the connectors to seats in the ends of the pipes, whereby the pipes are connected into one or more continuous passages for the conveyance of water, substantially as herein described.

It will be sufficient to illustrate the invention by the description of an apparatus designed to maintain a temperature of 1.1° C. in an enclosure of a proper size, and constructed with walls so impervious to heat that the total influx of heat into said enclosure shall not exceed the cooling power of the apparatus.

The cooling power of the water used for cooling the compressed air between the several compressions and after the final compression is assumed to be with a cooler of ample size, equal to reducing the temperature of the so compressed air to 21.1° C.

The increments of expansion in the expansion engines are as follows:—Commencing with the maximum pressure of 11.4 atmospheres at the sea-level: the air at the maximum pressure of 11.4 atmospheres is expanded first down to five atmospheres, thence down to 2.25 atmospheres, thence down to one atmosphere.

The increments of compression will be as follows:—The first compressor, which takes its air from the refrigerating enclosure at a temperature of 1.1° C., and at a pressure of one atmosphere, compresses the volume inducted to a pressure of 1.8827 atmospheres. The air being then discharged from the first compressor is cooled by passing it through a cooler or condenser, and is then inducted to the second compressor of the series at the same pressure under which it was delivered from the first, namely, 1.8827 atmospheres, and is then compressed to 3.4188 atmospheres. It is then discharged, cooled under constant pressure to a temperature of 21.1° C., and then inducted to a third compressor, in which it is compressed to 11.4 atmospheres. This is for a cycle of three compressions and three expansions.

The application of the invention is, however, not limited to any number of compressions nor to any number of expansions greater than two. There must be at least two expansions; neither is it requisite to compress to the pressures named or expand in accordance with the numbers given. The increments of compression and degrees of expansion may be varied to any extent without affecting the principle of the operation.

Figure 1 in the accompanying drawing is a front elevation of an apparatus designed to carry out this improved process; figure 2 is a plan view of the same; figure 3 is a sectional side view of the apparatus; figure 4 is an end view of a cooler, which forms part of the invention; figure 5 is a side view, and figure 6 a sectional top view of said cooler, illustrating the details of its construction; figure 7 illustrates a connector employed in said cooler; figures 8 and 9 are diagrams illustrating the construction and operation of the entire apparatus.

A, figures 8 and 9, represents the refrigerating enclosure; B, figures 1, 2, 3, 8, and 9, a steam-engine; C^1, C^2, C^3 , figures 1, 2, 3, 8, and 9, air-compressors; E^1, E^2, E^3 , figures 1, 2, 3, 8, and 9, air-expanding engines; R^1, R^2, R^3 , figures 8 and 9, cooling reservoirs for compressed air; c^1, c^2, c^3 , &c., figures 8 and 9, sundry cocks or valves for regulating the flow of air, as hereinafter explained; p^1, p^2, p^3 , &c., figures 8 and 9, pipes through which the air flows; and h^1 and h^2 , figures 8 and 9, reservoirs for receiving and retaining partly expanded air.

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In the example herewith given of the application of the invention, the steam-engine B, compressor C³, and air-expanding engine E¹, are coupled to a common shaft, S¹. The air-expanding engine E² and air-compressor C² are connected to a common shaft, S². The compressor C¹ and air-expanding engine E³ are connected to a common shaft, S³. The compression and discharge in the compressor C¹ are effected by the induction to and expansion of air in the air-expanding engine E³, assisted by the induction of air at atmospheric pressure to said compressor.

The compression of air in and discharge from the compressor C² are effected by the induction of air to and expansion in the air-expanding engine E², assisted by the induction of air to said compressor at the maximum pressure attained in compressor C¹. The compression of air in and discharge from the compressor C³ are effected by the joint action of steam in the steam cylinder B, and the induction of air to and expansion of air in the expansion engine E¹, assisted by the induction of air to said compressor at the maximum pressure attained in compressor C². The cycle of compressions and expansions, with their corresponding temperatures, volumes, and pressures is therefore in this instance as follows:—

The compressor C¹ takes its air from the refrigerating compartment at the temperature 1.1° C., and pressure of one atmosphere, and compresses its unit of volume so inducted to a volume of 0.6385, a pressure of 1.8827 atmospheres, and a temperature of 56.5° C. It is then discharged into the cooling reservoir R¹, figure 8, where its temperature is reduced to 21.1° C., and its volume is reduced under constant pressure to 0.5698 of its original volume. It is then inducted to the compressor C² with the volume as last named, a pressure of 1.8827 and temperature 21.1° C., and is compressed in this compressor to a volume of 0.3732, a pressure of 3.4188 atmospheres, and a temperature of 76.8° C., and is then discharged into the cooling reservoir R², figure 8, where it is cooled down again to the temperature 21.1° C., its volume being reduced by this cooling to 0.3137 of its original volume. This last volume is then inducted to the compressor C³, at the temperature 21.1° C., and pressure 83.4188 atmospheres. In this compressor it is compressed to a volume of 0.1335, a pressure of 11.4 atmospheres, and reaches a temperature of 144.1° C.

It is then discharged into the cooling reservoir R³, where it is cooled under constant pressure down to 21.1° C., its volume being reduced by this cooling to 0.0941 of its original volume. This volume is then inducted to the expanding engine E¹, under a pressure of 11.4 atmospheres and temperature of 21.1° C. In this engine the air expands down to five atmospheres, thereby increasing its volume to 0.168806 of its original volume, and it acquires by this expansion a temperature of 41.6° C. It is then passed through the heater H¹ h¹, figures 8 and 9, placed within the compartment or substance to be cooled. It is estimated that in passing through this heater, if sufficient surface be supplied, the air will be heated from the temperature at which it is discharged from the air-expanding engine to a point within 5.5° C. of the temperature of said compartment, or to the temperature of -4.4, and by this transfer of heat the temperature of the refrigerating room will be equivalently reduced. The volume which is discharged from this expanding engine is 0.168806 of the original volume inducted to the first compressor is, by this acquisition of heat, so abstracted from the compartment to be cooled or substance to be cooled, increased to 0.19583 of the original volume.

From the reservoir h¹, which forms part of the heater H¹ h¹, the last-named volume of air is inducted to the expanding engine E², with a temperature of -4.4 and a pressure of five atmospheres, and is in this engine expanded down to 2.25 atmospheres and volume of 0.3449 of the original volume inducted to the first compressor, and it acquires by this expansion a temperature of -60.1° C. It is then discharged into the heater H² h², where it is raised to the temperature of -4.4, and its volume is increased to 0.4352 of the original volume inducted to the first compressor. This volume is then inducted to the air-expanding engine E³, where it is expanded down to one atmosphere, acquiring by this expansion a volume of 0.776, the original volume, and a temperature of -60.1° C. In this condition it is discharged through the exhaust heater H³ into the compartment to be cooled. In the exhaust heater H³ the temperature of the air exhausted is raised above the dew-point. However, this heater may be connected with a reservoir like the other heaters, and directly connected with the compressor C¹, thus making a completely closed circuit if desired. The compressor cylinders are constructed to receive the volumes named for each, and the sizes of the expansion cylinders correspond to the volumes discharged therefrom. The work developed by each of the expansion cylinders E¹ and E², in conjunction with the power of the air inducted to each of the compressor cylinders C¹ and C², is sufficient to approximately produce the degree of compression in said cylinders, as described. The power developed in the air-expanding engine E¹ is, in conjunction with the power supplied by the steam-engine and the power of the air inducted to the compressor cylinder C³, sufficient to produce the degree of compression named for that cylinder.

But it is not intended to confine the apparatus to these degrees of compression and expansion. Any other cycle of expansion and compression may be employed, so long as the degrees of expansion and compression are acquired in the general manner herein specified. The steam-engine, instead of being connected with the air-expanding engine E¹ and the compressor C³ through the medium of the shaft B¹, may be connected with any other expansion engine in the series, the function of the steam-engine being merely to supply the difference of power required for the compressions and that developed by the expansions, and also to supply power sufficient to overcome the passive resistances of the entire system; and it will be plain that the steam-engine may also, if desired, supply the entire power for working a single compressor, provided the entire power of the compressed air be expended in driving the other compressors.

In the example herein described and illustrated in the drawings the sizes of the respective cylinders are as follows:—

C¹ has a stroke of 0.305 mètres and diameter 0.616 mètres. It inducts a volume of 6.25 cubic décimètres.

C² has a stroke of 0.305 mètres and diameter 0.462 mètres.

C³ has a stroke of 0.305 mètres and diameter 0.344 mètres.

E¹ has a stroke of 0.305 mètres and diameter 0.254 mètres.

E² has a stroke of 0.305 mètres and diameter 0.336 mètres.

E³ has a stroke of 0.305 mètres and diameter 0.542 mètres.

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B has a stroke of 0.254 mètres and a diameter of 0.203 mètres. It is intended to take steam at an absolute pressure of five atmospheres when starting the apparatus, and afterwards to throttle down the pressure to that required.

It is not necessary to describe the particular construction of the compressors and air-expanding engines, as the invention is not confined to the use of any particular kind of compressors or engines. The kind of compressors shown in the drawing are those known in America as the "Clayton Air-compressors"; the kind of expansion engines shown in the drawing are those known as the "Buckeye Automatic Engines"; but any other engines or compressors may be substituted for the ones shown, provided that the expanding engines have cut-offs adjusted to cut off the induction of air at such a point as shall permit the inducted volume to expand down to the pressures at which the next expanding engine in the series inducts its air.

The compressors are constructed to work with as little clearance and friction as possible, and they are supplied with water-jackets.

The point of cut-off for each expanding engine in the example herewith given is practically at 0.55 of its stroke.

The air-expanding engines are all placed in the refrigerating room, as shown in figures 8 and 9, while all the compressors and coolers and the steam-engine are placed outside. In the example of the apparatus shown in the drawing the room is constructed with an overhang or projecting box, O, figures 8 and 9, which encloses the engines E¹, E², E³. By this means loss by radiation is prevented, and all the cooling effect is utilized in the room to be cooled.

The coolers employed for extracting the heat from the compressed air may be of any approved kind; it is preferred, however, to use a cooler of the construction shown in figures 4, 5, and 6, which cooler forms part of this invention, and is constructed as follows:—

A shell, 1, is employed to receive the compressed air from which the heat is to be extracted. In this shell are inserted a number of series of tubes, 2 and 3, the tubes 2 being arranged in series one above the other in such manner that each tube of each series lies below a space between two adjacent tubes in the next series above or below it, lying in the same direction. The tubes 3 are placed at right-angles with the tubes 2, and are also in series arranged in such manner that each tube of each series lies beneath a space between two adjacent tubes in the next series above or below it, lying in the same direction. Water enters the lower series of the tubes 2 through a branch pipe, 4, and passes alternately back and forward through the tubes of the lower series until it reaches the last one of the series, these tubes being connected by connectors hereinafter described. Upon reaching the last tube of the lower series of tubes 2, it rises through one of these connectors 5 to one of the tubes in the next series above it; thence it passes forward and backward through the tubes of this series till it reaches the last of the tubes in that series; thence it passes through another connector, 5¹, into the series above it; and so on, until it is passed through all of the series of tubes 2, and finally emerges at a branch discharge pipe, 6.

Water enters one of the tubes of the lower series of tubes 3 through the branch pipe 4, and passes in a similar manner through all the tubes of each of the series of tubes 3 till it reaches the branch discharge pipe 6, whence it flows out.

These tubes 2 and 3 are inserted and expanded into the shell of the cooler in the same manner as locomotive boiler tubes are expanded into tube plates. After being expanded in they are reamed out, slightly tapering at the end, as shown in figure 7.

The connector, figure 7, is a U-shaped tube, the extremities of which are made tapering, to enter slightly into the reamed ends of the tubes 2 and 3. At the middle of the bend of each of these U-shaped tubes is formed a flat-bearing surface, 8. Bars 9 are attached to the flanges 10 of the shell, and in these bars are fitted screws 11, which bear against the flat surfaces 8 of the U-shaped tubes, and press them home to their seats in the ends of the tubes 2 and 3. This affords a ready means, through the removal of the detachable connectors, for cleaning out the tubes 2 and 3, in case they should become foul with foreign substances deposited from water used for cooling; but it is not designed to confine the invention to the cooler described, as any cooler of ample surface to extract the heat from the compressed air may be employed.

Three of these coolers are required for the particular machine herein described, and they are shown respectively at R¹, R², and R³, in figures 8 and 9. They are preferably arranged under the framework which supports working parts of the machine.

The cooling surface required in each of these coolers is respectively as follows:—R¹, 74.31 square mètres; R², 45 square mètres; R³, 39 square mètres.

The heaters for heating the partially expanded air exhausted from the expanding engines are simply the pipes H¹, H², and the reservoirs h¹, h², with which said pipes are connected. The pipes H¹, H², are extended around near the top of the compartment to be cooled. They must be of ample diameter to permit the free exhaust of the partly expanded air, and of a length to supply sufficient heating surface to approximate as closely as possible the temperature of the partly expanded air to that of the room to be cooled or substance to be cooled.

With the temperature of a room held at 1.1° C., to acquire a temperature in the confined air of -4.4° C., the dimensions of the two heaters, which must be exposed to the air in the room to be cooled, will be respectively as follows:—

Diameter of H¹ and H², 0.95 décimètres; length of H¹, 167.63 mètres; length of H², 228.6 mètres.

In describing the operation of the apparatus, reference will be made to the diagrams, figures 8 and 9.

Figure 8 is a sectional top view of the refrigerating room and the apparatus, the section being made on the line *x x* in figure 9.

Figure 9 is a sectional front view of the refrigerating room and the apparatus, the section being made on the line *y y* in figure 8.

To set the apparatus in full operation, it is first necessary to charge the cooling and other reservoirs with air at the stated pressures, which may, if desired, be indicated by ordinary pressure gauges. The

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The cocks c^3 , c^6 , and c^7 , figure 9, being adjusted to admit air from A through the pipe p^{15} to the compressor C^3 , and confine the compressed air in the cooling reservoir R^3 , the steam-engine is started and accumulates compressed air in said reservoir, which air may then be used to impel the engine E^1 , which is then also started, taking its air from R^3 through the pipes p^7 , and exhausting into $H^1 h^1$, in which pressure gradually accumulates. Then the cocks c^2 and c^5 , figure 9, being adjusted to admit air to the compressor C^2 through the pipe p^{14} , and confine the air discharged from C^2 in R^2 , the engine E^2 is, by opening the cock c^9 , set to driving the compressor C^2 , the exhaust from E^2 accumulating pressure in $H^2 h^2$, from which the engine E^3 is to take its air. The compressor C^3 , which has hitherto taken its air from A through the pipe p^{15} , is now made to induct its air from R^2 by adjusting the cocks c^6 and c^3 , figure 9, whereupon taking air from R^2 at higher pressure, it immediately accumulates a higher pressure in R^3 . Consequently a greater weight of air is inducted to E^1 , which now develops greater power and exhausts at higher pressure into $H^1 h^1$, increasing the pressure in h^1 and developing greater power in E^2 , the exhaust from which accumulates higher pressure in h^2 . The pressure in h^2 having become sufficient to drive the engine E^3 , the cock c^2 , figure 9, in the pipe p^{14} , which permits the induction through p^{14} to C^2 , is closed, and it is made to take its air from R^1 by proper adjustment of the cock c^{15} . At the same time the engine E^3 is started by opening the cock c^{16} , and set at work driving the compressor C^1 , which inducts its air direct from the cooling compartment through the pipe p^1 .

All the engines being now at work, the pressure in each of the reservoirs will rise to the point required to maintain the discharge and induction at a constant weight, because each engine, inducting only stated volumes depending upon its point of cut-off, will take less from each reservoir R^3 , $H^1 h^1$, $H^2 h^2$, than is delivered into said reservoir until such time as the sum of the volumes passed in and passed out become equal.

By-passes, p^{10} , p^{11} , each provided with a cock c^{10} , c^{11} , enable the air to be passed from one compressor to another without cooling, whereby a higher temperature may be acquired when the cooling water has so high a temperature as to require this operation, as may sometimes be the case in mines.

By-passes, p^{12} , p^{13} , provided with cocks c^{12} , c^{13} , are also provided, which permit the air to be passed from one engine to another when very low temperatures are required. When any of the by-passes are used, it will be necessary to cause the engine B to perform more work by opening its throttle-valve wider.

The diameter of the exhaust heater H^3 is the same as that of H^1 and H^2 , and its length is 182.9 metres.

The water for cooling may be drawn from pipes in which the head is sufficient to give the required supply, or a special pump may be employed to circulate it through the coolers. Its temperature is assumed to be 15.6 C.

A cock is inserted in the lower part of each cooler, to take out the water of condensation, as shown in figures 4 and 5.

The water is condensed and trapped out after the first compression and before the final compression is reached, and in this way a large percentage of vapour resistance, which would else have to be overcome by the engines in gaining the maximum pressure, is removed.

The general advantages secured by this invention are as follows:—

1. The attainment of a high pressure, and consequently great expansion and quantity of cooling, without undue strain on any of the working parts, with a great reduction of the power required to perform the compression when high pressures are attained and great gain in the work, which may be obtained from the expanding air, and consequently increased cooling capacity.
2. The losses from piston leakage in working high pressures, hitherto only prevented by working some water in compressor cylinders, are in this process avoided, while working purely dry air, by virtue of the system; that is to say, the expanding of the air by stages in independent air-engines, and its compression in independent compressors. In the system of dynamic refrigeration herein described the method of integral expansion in separate cylinders is abandoned, and fractional or stage expansion substituted therefor. The strains upon the journals and the piston leakages depend upon the differences in the pressures upon opposite sides of the pistons, and it is obvious that this is very much less both in compression and expansion than when the air is compressed from the minimum to the maximum pressure in one cylinder, and then expanded from the maximum to the minimum pressure in one cylinder.
3. The entire independence of the action of each air-engine or compressor, so that if one gives out other parts of the apparatus may be correlatively run independently of the broken part, and the cooling process go on uninterrupted, though with less efficiency, the by-passes being used to pass the air around the middle engine and compressor, if either of these be in fault. This is a most important consideration in an apparatus designed for use on ship-board for transportation of perishable cargoes. In nearly all apparatus of this kind hitherto used, the engines and compressors are all coupled to one shaft and work synchronously. Therefore, if one part gives out the whole apparatus is crippled.
4. Facility of changing the operation of the apparatus when not only a moderately low temperature is required but an extremely low temperature is desirable, as above described, by the use of the by-passes.
5. The utilization of all the cooling effect in the compartment to be cooled or substance to be cooled. Heretofore there has always been a waste or expenditure of cold outside of the compartment to be cooled.
6. The prevention of fog or visible vapour in the refrigerating compartment caused by the sudden intermingling of cold air with moist air at the point where the cold air is finally discharged into such compartment. All dripping, except what results from the condensation of water on the exterior of the heaters, is thus prevented, and the absence of vapour removes an obstruction to radiation which would otherwise retard the cooling process. The dripping from the heaters $H^1 h^1$, $H^2 h^2$, and H^3 may easily be conducted away by properly arranged conductors or troughs.

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7. The working parts of the apparatus may be made much lighter than when the maximum pressure is attained by a single compression, the strains being distributed to several shafts instead of being concentrated upon a single shaft. Thus less wear and tear from friction, and greater durability of the apparatus as a whole, is secured.

Having thus fully described the invention, what is claimed as new and desired to be protected by Letters Patent is as follows:—

1. The mode of accumulating pressure in a reservoir, air-space, or pipe of an air-cooling apparatus, which consists in inducting to a compressor which supplies such reservoir, air-space, or pipe, cooled air already compressed by another independently working compressor, substantially as herein described, and as shown in figures 1, 2, 3, 8, and 9.
2. The method of heating compressed air cooled by partial expansion, prior to its further expansion, by heat abstracted from the enclosure to be cooled or substance to be cooled, substantially as and for the purposes herein described, and with reference to figures 8 and 9.
3. The mode of obtaining artificially compressed air having a lower temperature than that of the compartment or substances to be cooled, which consists in attaining a high degree of compression in moderately cooled air by successive and consecutive compressions in separate compressors without intermediate expansions and with intermediate cooling, and then expanding the air so compressed by successive and consecutive expansions without intermediate compressions, whereby, after the first of the series of expansions, the still compressed air is brought to a temperature at which it may abstract heat from said compartment or substance to be cooled before further expansion, substantially as herein described, and with reference to figures 1, 2, 3, 8, and 9.
4. The mode of adding to the expansive force of the compressed air and obtaining a maximum refrigerating effect, which consists in heating the still compressed air after partial expansion, abstracting the heat for this purpose from the refrigerating compartment or substance to be cooled, and subsequently expanding the air in the performance of work, substantially as herein described, and with reference to figures 1, 2, 3, 8, and 9.
5. As part of a process of dynamic cooling in which a series of successive and consecutive compressions of air taken from a refrigerating compartment is performed in a series of independent compressors delivering air from one to another to compress the air from atmospheric pressure to a maximum pressure before any expansion of such compressed air is permitted, and in which the air is cooled between the several stages of compression, and in which the so compressed air is expanded down to atmospheric pressure in an air-engine or engines, and then exhausted again into said refrigerating compartment, I claim the method of removing vapour resistance to compression, which consists in trapping out the water precipitated from the cooled and compressed air after the first stage of compression and before attaining the maximum pressure, whereby a large percentage of the vapour resistance is removed, substantially as herein described, and with reference to figures 4, 5, 8, and 9.
6. The combination of a refrigerating enclosure, an air-compressor or compressors, a cooler or coolers for cooling compressed air, a primary compressed air-engine driven by air discharged from the compressor for partly expanding said air, a supplementary air-engine or air-engines for further expanding the air, and a heater or heaters placed in and abstracting heat from said enclosure for heating the partly expanded air during its passage to said supplementary air engine or engines, whereby the air during said passage gains in expansive force prior to further expansion, substantially as herein specified, and with reference to figures 1, 2, 3, 8, and 9.
7. The combination with a refrigerating enclosure of an air compressor or compressors placed outside said enclosure, a cooler or coolers for cooling the compressed air discharged from said compressor or compressors, and a compressed air-engine or air-engines placed within said enclosure, driven by compressed air delivered from said compressor or compressors, and applying its or their work outside of said enclosure, whereby all the cold produced in and by the expansion is utilized in said enclosure, substantially as herein described, and with reference to figures 8 and 9.
8. The combination with a series of air-compressors and coolers for compressed air of one or more by-passes, whereby air compressed by one or more of the compressors may be passed without cooling into another compressor or other compressors, by which means the temperature of the compressed air may be made so high as to render water of a considerably elevated temperature effective as a cooling medium, substantially as herein specified, and with reference to figures 8 and 9.
9. The combination with a series of compressed air-engines delivering air into a refrigerating enclosure, and a heater abstracting heat from said enclosure for heating said air on its way from one of said engines to another, of a by-pass or by-passes through which air may be delivered at will from one engine to another without being heated in its passage, and by which means a very low temperature may be acquired in the expanded air when extremely low temperatures are desired, substantially as herein described, and with reference to figures 8 and 9.
10. An air-cooling apparatus composed of a refrigerating enclosure, a series of air-compressors supplied with air from said enclosure, air-coolers, a series of compressed air-engines delivering air into said enclosure and driving all the compressors but one, a steam-engine or other prime motor for driving or assisting in driving one of the compressors, a heater or heaters for abstracting heat from the enclosure and imparting it to the air on its way from one engine to another, pipes for conveying the air, and cocks or valves for directing the flow of air through the different parts of the apparatus combined, substantially as herein described, and as shown in figures 1, 2, 3, 8, and 9.

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11. As part of a process for dynamic cooling wherein air is compressed, cooled, expanded to perform work, and exhausted into a refrigerating compartment, the heating of the final exhaust of the expanded air previous to its intermingling with the air of such refrigerating compartment, the heater for this purpose being placed within the refrigerating compartment, and operating by the heat abstracted from said compartment to raise the exhausted air passing through it to a temperature above that of the dew-point, whereby the production of fog or vapour by the sudden commingling of cold air with warm moist air is prevented, substantially as herein described, and with reference to figures 8 and 9.
12. The combination of two or more air-expanding engines, one or more of which are driven by air partly expanded or exhausted from the other or others, and an intermediate reservoir or reservoirs for the reception and storage of the partly expanded air previous to its induction to the engine or engines in which it is to be further expanded, whereby the pressure of the air in its intermediate passage from one engine to another is rendered more uniform, substantially as herein described, and with reference to figures 8 and 9.
13. The combination of a refrigerating enclosure, a series of compressors successively imparting increments of compression to air, a cooler or coolers for cooling the compressed air, and a series of engines, one of which is driven by steam or other independent motive power to operate one compressor, or aid in operating said compressor, and the remainder by pressure and expansion of the cooled and compressed air to apply the power of the expanding air to compressing other air, substantially as herein described, and with reference to figures 1, 2, and 3.
14. A cooler composed of a shell for retaining air and superimposed series of water-pipes, each series being placed across another series at right-angles, and each of the series having its pipes placed over or under the spaces between the pipes of the next series above or below it, whose pipes lie in the same direction, said pipes being inserted in said shell, substantially as herein described, and with reference to figures 4, 5, 6, and 7.
15. The combination with the air-retaining shell of a cooler and water-pipes inserted in said shell, of detachable connectors, clamping bars, and clamping screws, which hold the connectors to seats in the ends of the pipes, whereby the pipes are connected into one or more continuous passages for the conveyance of water, substantially as herein described and for the purposes specified, and with reference to figures 4, 5, 6, and 7.

In witness whereof, I, the said Leicester Allen, have hereunto set my hand and seal, this first day of November, 1880.

LEICESTER ALLEN.

Witness—

EDWARD H. WALES,
10, Spruce-street, New York,
Patent Attorney.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to Leicester Allen, this twenty-eighth day of March, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

The application of Mr. Leicester Allen for Letters of Registration for "Improvements in processes and apparatus for cooling and drying air" having been referred to us, we have examined the specification and drawings accompanying the same, and have now the honor to report that we see no objection to the issue of Letters of Registration as prayed for.

Sydney, 12 February, 1881.

We have, &c.,
J. SMITH.
CHAS. WATT.

The Under Secretary of Justice.

[Drawings—four sheets.]

No. 921.

[Memorial of offer of sale of No. 918. See page 55.]

Fig. 1.

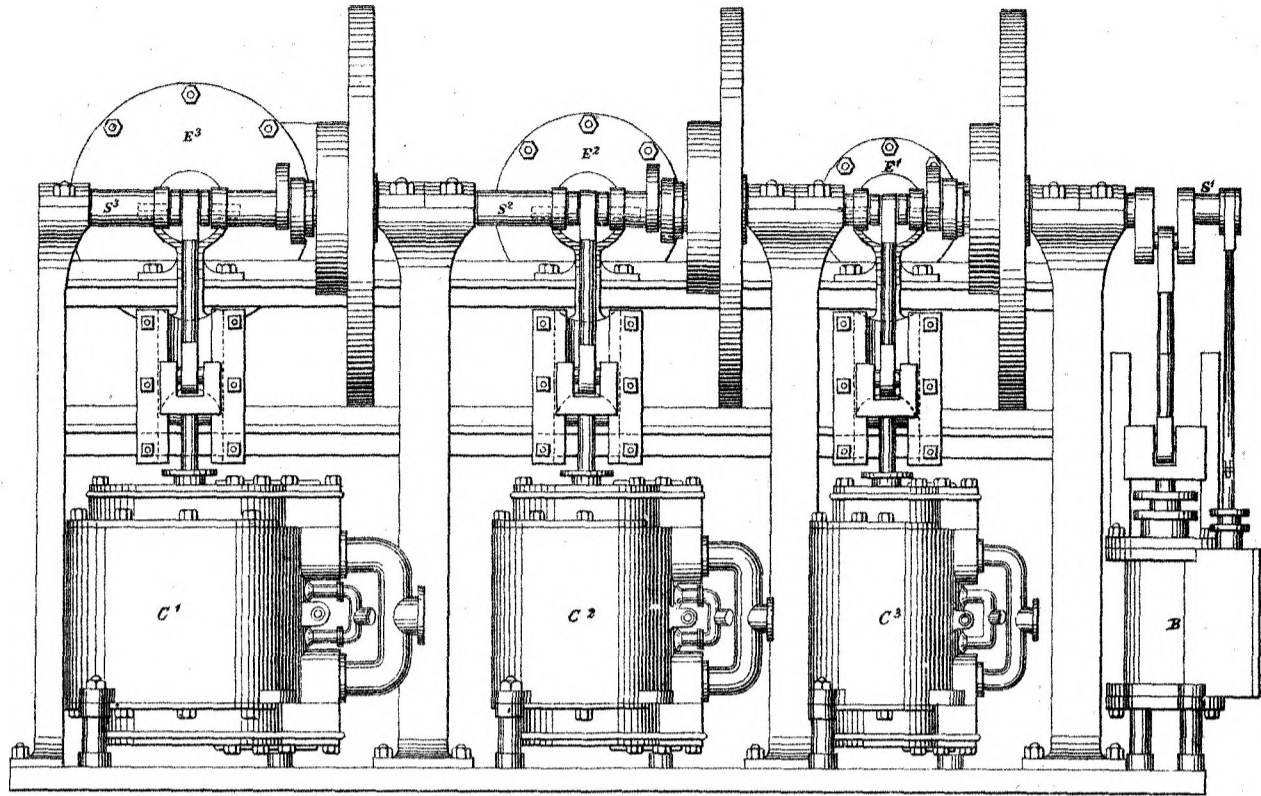
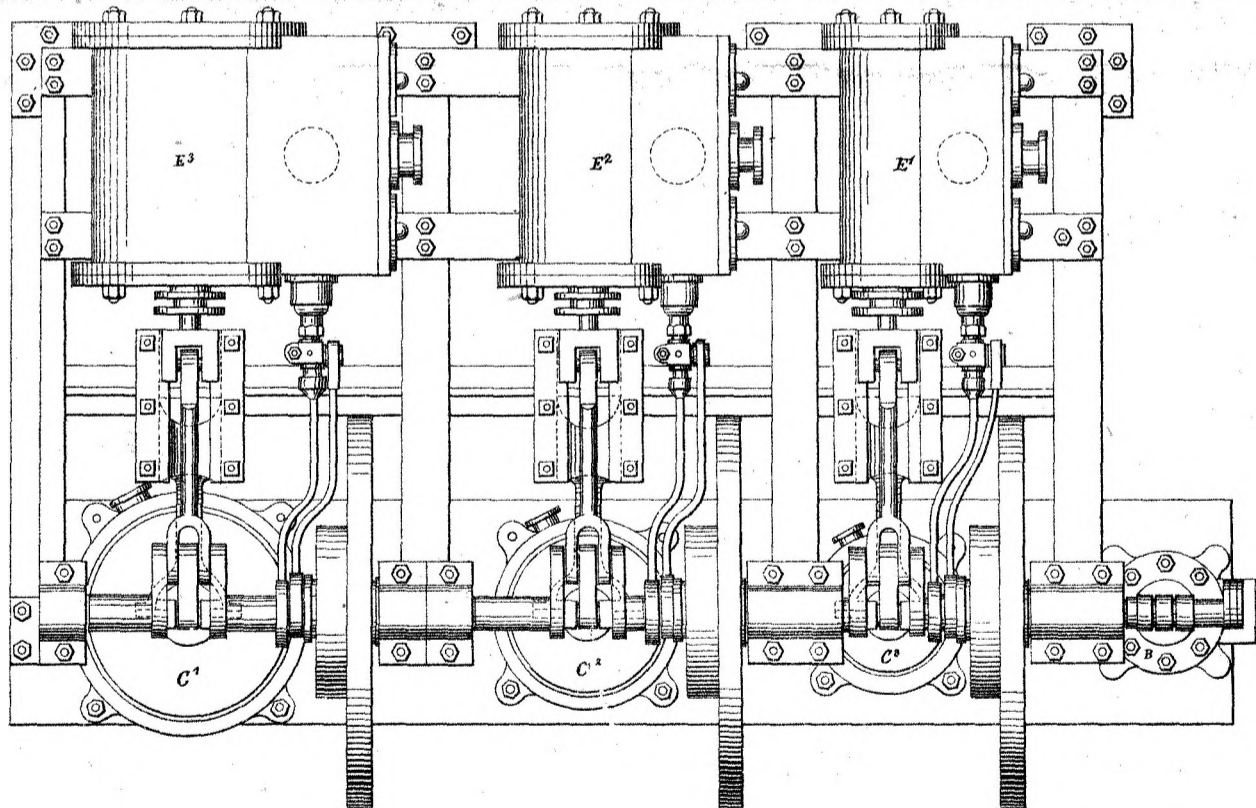


Fig. 2.



1 Metre.

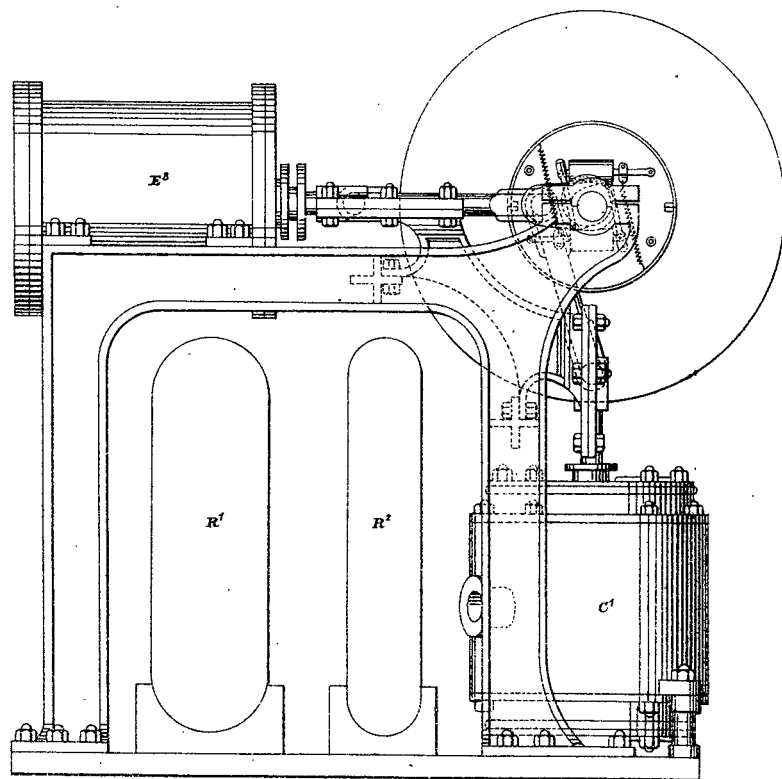
PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE.
SYDNEY, NEW SOUTH WALES.

(34-)

*This is the Sheet of Drawings marked B referred to in the annexed
Letters of Registration, granted to Leicester Allen this twenty eighth
day of March, A.D. 1881.*

Augustus Loftus.

Fig 3.



1 Metre.

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SYDNEY, NEW SOUTH WALES.

*This is the Sheet of Drawings marked C referred to in the annexed
Letters of Registration, granted to Leicester Allen this twenty-eighth
day of March, A.D. 1881.*

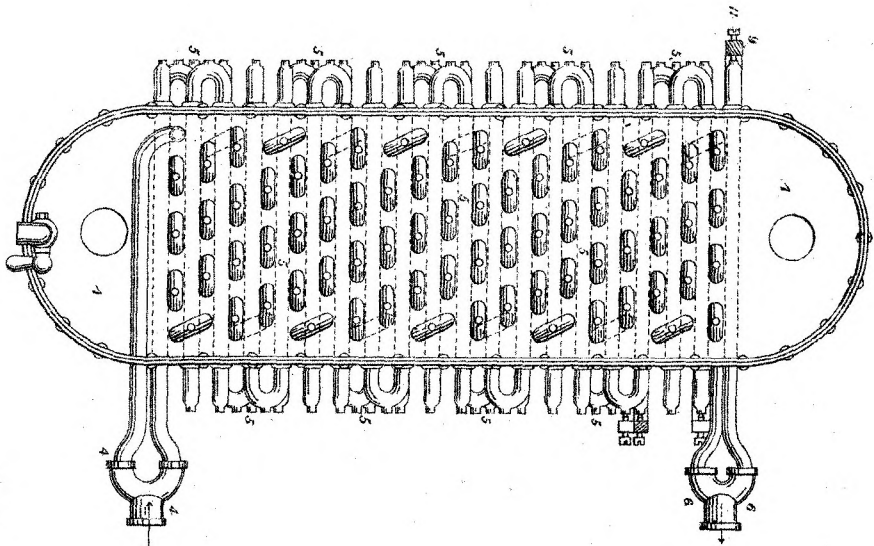


Fig. 4.

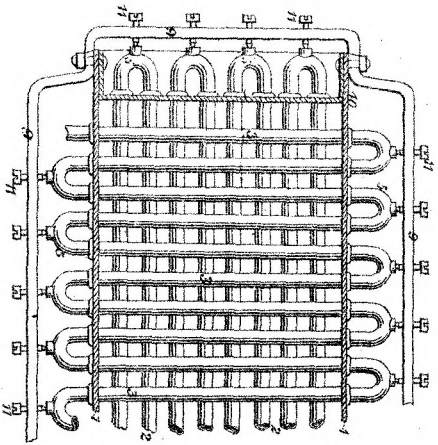


Fig. 6.

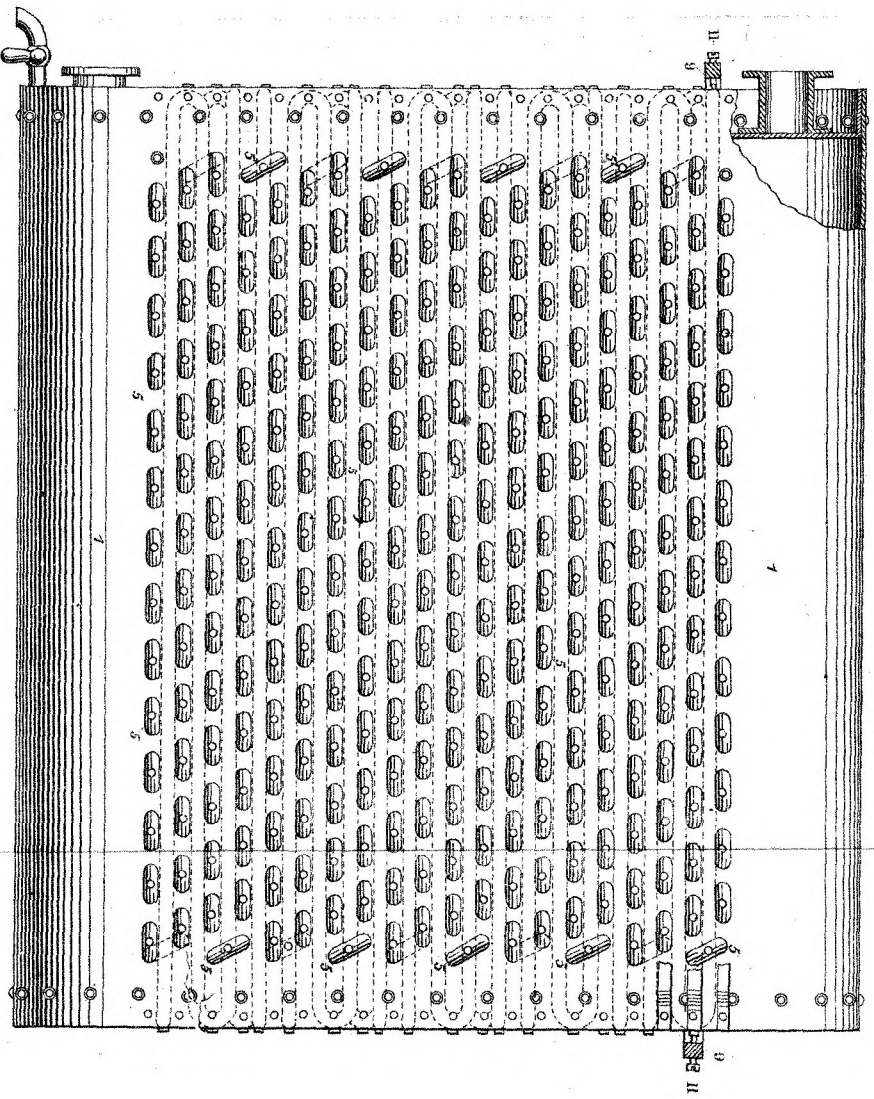


Fig. 5.

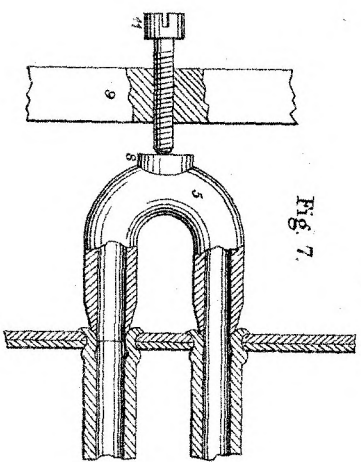


Fig. 7.

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Augustus Loftus.

E

1920

Fig 8.

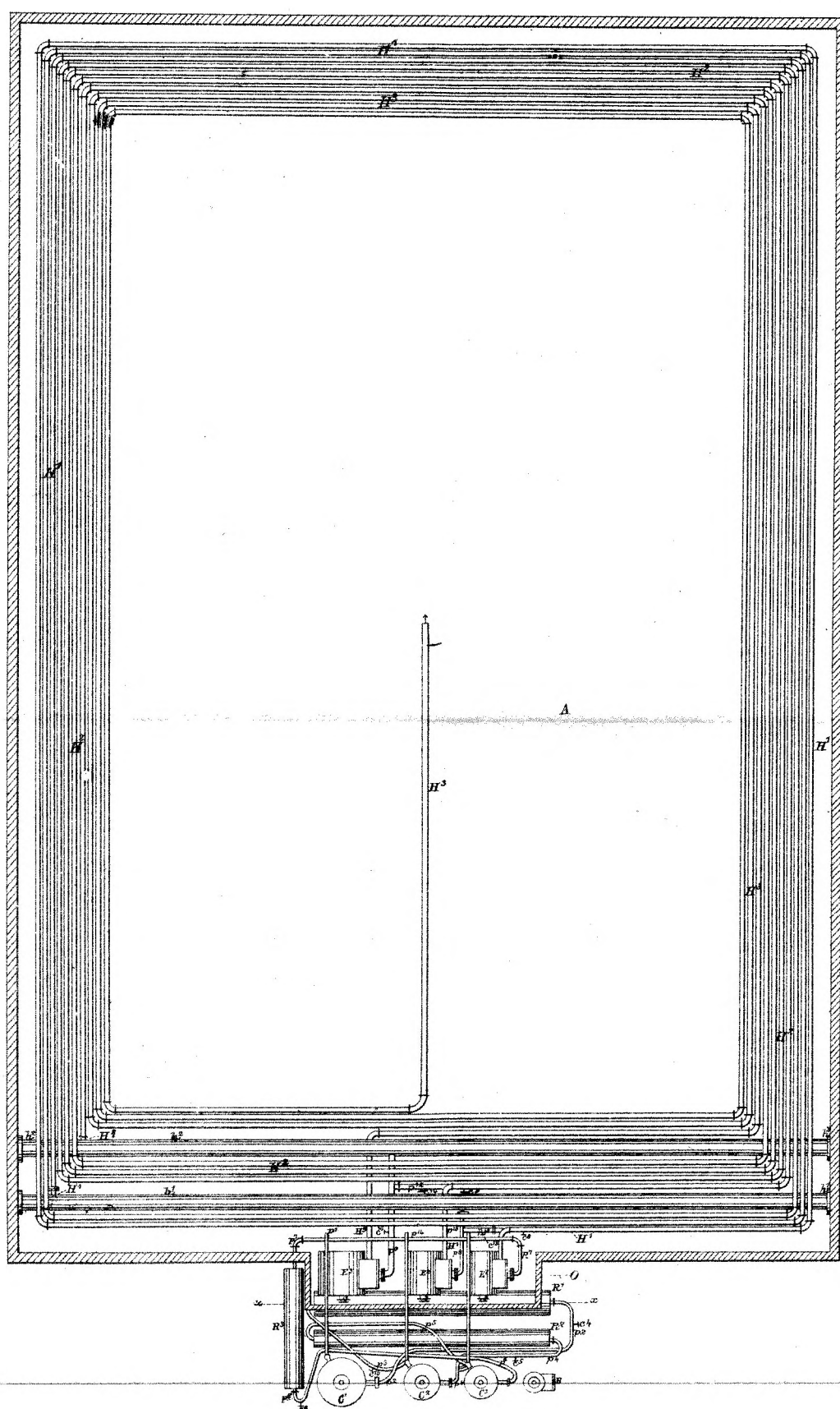
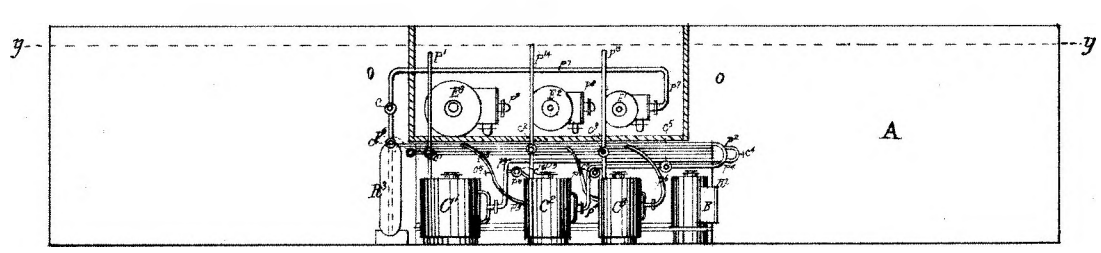


Fig 9.



Metres

This is the Sheet of Drawings marked E referred to in the annexed Letters of Registration granted to Leicester Allen, this twenty eighth day of March, A.D. 1881.

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Augustus Loftus.



A.D. 1881, 2nd April. No. 922.

IMPROVEMENTS IN ELECTRIC LAMPS, &c.

LETTERS OF REGISTRATION to Thomas Alva Edison, for Improvements in Electric Lamps and in Carbons or Incandescing Conductors therefor, and in means for and methods of manufacturing the same.

[Registered on the 4th day of April, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS THOMAS ALVA EDISON, of Menlo Park, in the State of New Jersey, United States of America, electrician, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in Electric Lamps and in Carbons or Incandescing Conductors therefor, and in means for and methods of manufacturing the same," which is more particularly described in the specification, marked A, and the two sheets of drawings, marked B and C respectively, which are hereunto annexed ; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four ; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years : And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein, and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Thomas Alva Edison, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof ; to have, hold, and exercise unto the said Thomas Alva Edison, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended : Provided always, that if the said Thomas Alva Edison shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this second day of April, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS

Improvements in Electric Lamps, &c.

A.

TO ALL WHOM IT MAY CONCERN: BE it known that I, THOMAS ALVA EDISON, of Menlo Park, in the State of New Jersey, United States of America, electrician, have invented certain new and useful Improvements in Electric Lamps and in Carbons or Incandescing Conductors therefor, and in means for and methods of manufacturing the same.

As is now generally known, I prefer to use in my system of electric lighting an electric lamp consisting essentially of an incandescing conductor sealed hermetically in a glass-enclosing globe.

In manufacturing carbons for such and for all classes of electric lamps the practice, so far as I know, has been to make them of as low resistance as possible, a porous carbon having been used, which was dipped or soaked in some carbonizable liquid until its pores were filled and then subjected to recarbonization, which process was repeated until the pores of the original carbon were filled with carbon. By this process the resistance of the carbon is lessened, while its liability to disintegration under high heat is increased. Such carbons are unfit for use in electric lamps giving light by incandescence. For such lamps I have discovered that the incandescing material should have the highest possible resistance in a very small bulk, and be capable of resisting the disintegrating effects of very high heats and the absence of atmospheric pressure; and further, that carbons which are purely structural in character alone possess these qualities. By purely structural is meant a carbon wherein the natural structure, cellular or otherwise, of the original material is preserved unaltered, that is, not modified by any treatment which tends to fill up the cells or pores with unstructural carbon, or to increase its density or to alter its resistance.

One object of this invention therefore is to provide such carbons and means and methods for their manufacture.

In practice the incandescing conductor of a lamp should be of about 100 ohms resistance. While this may be varied within certain limits, the resistance stated is a preferable one, and is a very high resistance compared to the carbons referred to as previously used.

It is essential that this high resistance should be had without increase of radiating surface, that is, only the radiating surface necessary to give a certain standard amount of light at the proper degree of incandescence should be used. I have discovered that incandescing conductors possessing the qualities enumerated may be made of such natural fibres or fibrous bodies as are capable of carbonization, especially such as are large, filamentary, and cellular in character.

Of such there are several varieties, of some of which a single fibre or several fibres aggregated together artificially are used; of some a piece composed of numerous elementary fibres are used.

I have found that the preferable single fibres are those of which jute, bast, Manilla hemp, &c., are good types, the more preferable one being a fibrous grass from South America, called "monkey bast" fibre, each blade of which is generally round and composed of a great number of elementary fibres held together by a natural cement or resin, which carbonizing locks all the elementary fibres together into a homogeneous filament. The treatment next herein described applies, however, to all the fibres of this class.

These blades vary somewhat in size, and are also slightly tapering. It being necessary that the conductors should be of a uniform size, I reduce them, and also any other fibres varying in size, to uniformity by passing them through a cutting die, which shaves off the extraneous matter, or a revolving cutter may be passed along the fibre, or they may be reduced in any other practical way.

When desired I may take several fibres of the abovenamed grass, or several of any other natural fibres, and after bunching them together dip them into a solution of sugar or other carbonizable liquid and then carbonize as one fibre, the carbonized cementing liquid binding them firmly together into a large filament of higher resistance but of no greater radiating surface than the carbonized paper incandescing conductor heretofore described by me.

So far as capable of illustration, this part of the invention is shown in figs. 1, 2, and 3. Upon the ends of the fibre A, whether simple or compound, are fixed prior to carbonization the clamps B, made of any suitable carbonizable material, lignum vitæ, box-wood, &c., being well adapted therefor.

They may be made flattened or square, but preferably are cylinders. A small hole is bored through the centre and the fibre inserted therein, as shown in fig. 2.

It is advantageous to moisten the inserted ends of the fibre with a solution of sugar, or with other carbonizable liquid. Pieces of platinum wire, *c c*, are inserted into the clamps, as shown in fig. 1.

Upon carbonization the material of clamps B B shrinks around and upon the wires and fibre, binding them tightly together, which result is aided by the carbonization of the liquid, applied, as before suggested, to the inserted ends of the fibre.

Of those materials wherein the piece necessary to form a conductor is composed of a large number of fibres, I have discovered that excellent results pertain to the use of the plants of the family *Arundinæ*, or gigantic grasses, commonly known as bamboo or cane, or cane-bamboo.

In such the primary fibres making up the mass of the material extend from end to end, parallel to each other, increasing the strength and obviating danger of breakage from cross or oblique grain.

Of the bamboo-cane the hard glossy exterior is the best to use, and the softer or pithy part should be rejected.

To produce the best results in giving light, it is essential that the carbon should be of uniform size throughout the portion that is to be rendered incandescent, in order that the radiating surface and resistance be regular and uniform, ensuring even heating and incandescence.

To accomplish this the cane bamboo or other material used is treated as follows, and by the following means:—

The cane is split into pieces somewhat wider than necessary and the inner or pith portion removed.

The material chosen (either the cane or bast, or other if desired), cut into strips, is passed through a shaving device in which a cutting or shaving knife is fixed, the material being forced against the knife by a movable block provided with an adjustable stop screw, by which the distance of the block from the knife can be regulated, regulating in turn the thickness to be given to the slip.

In this device the slip or filament is shaved on both sides until the proper thickness is attained.

It

Improvements in Electric Lamps, &c.

It is then placed in a clamp composed of two halves, of a length equal to the desired length of the slip. In one half a shoulder or off-set is formed at a distance from the edge greater than the desired width, upon which one edge of the fibre rests, which is then clamped between the two halves and the protruding portion carefully shaved off, which may be done by hand or by a cutting-blade moved by machinery.

On the opposite side of the clamps is an off-set in one half, at a distance from the edge exactly equal to the width to be given the slip.

As it is desirable to form the extended bearing upon which take the clamps securing the carbon to metallic conductors homogeneous and in one piece with the body, provision is made therefor. Upon the side last referred to of the clamps and at the ends are made projections of the exact shape and size to be given the broadened ends of the carbons. The slip shaved upon both sides and one edge is transferred to the opening in the clamps and the extra material shaved or cut off. The slip is now of uniform size throughout its body, and with enlarged ends formed upon it. The enlarged ends are entirely upon one edge, instead of the enlargement being equally distributed upon both edges. This construction enables the slips when placed on edge—the straight edge—in the carbonizing flask to move therein as they are contracted in the process of carbonization.

This part of the invention is illustrated in figs. 4, 5, 6, 7, and 8, in which fig. 4 is a top view and fig. 5 is a side view of the device used for shaving the sides. Fig. 6 is an end view and fig. 7 a side view of the clamps used in shaving the edges. Fig. 8 is a view of a complete filament.

In these figures A is a suitable base, having upon it supports, $a a'$, for the working devices, these supports leaving an open space between them in which such working devices are mainly located.

In front of a' is fixed a block, B, fashioned at one end to receive and support at the proper angle the knife or plane b . In front of a is a block, C, attached to screw D, sliding in a , and caused to rotate so as to move C by disk E, working in a slot in a , D being prevented from rotating by screw d taking into a feather cut in its side.

Upon the side of C is lug G, through which passes the screw g , which is set to strike against B, and consequently limit the movement of C, keeping it at any desired distance from B, which distance is the thickness intended to be given the slip.

The slip S is placed between B and C and drawn through between them, being forced by C against the edge of the knife until one side is smoothed. It is then taken out and replaced, with the shaved side next to C, and the operation repeated. By these operations and means the slip is reduced to a uniform thickness.

The clamp for reducing to a uniform width is made of two parts, H I, of a length equal to the length to be given to the slip, and held together by pieces x (one at each end), having a slot, o , in one end so as to permit of a limited movement of the parts H I from each other.

The part I is formed with shoulders or off-sets, $v w$, along its entire length, taking into a corresponding recess in H, forming when the two parts are in position slots along the entire length of the clamp, the off-sets $v w$ forming the bottom of the slots.

Upon one side at each end of each part are formed the lugs or projections $h h$, the size and shape of the enlarged ends of the finished carbons.

In $h h$ are the small recesses $i i$, for the purposes hereinafter set forth.

The slip S, of a greater width than the widest portion of the finished slip, is placed in the clamp in the slot whose bottom is the off-set v , the clamps tightened and the protruding portion removed down to the surface of the clamps.

The edge thus prepared forms a straight edge or gauge for the finishing, the slip being placed in the clamp in the slot whose bottom is the off-set w , and the extra materials removed, on the line formed by the surface of the clamp and the projections $h h$. This being done, a saw or knife is run through the recesses $i i$. The result is the slip shown in fig. 8, having a uniform body, with the enlarged clamps for securing the carbon in the clamps, and provided with the recesses i , which are of use in securing the slip in the carbonizing flask, and afterwards for permitting the clamping screws to pass through.

Sometimes it is desirable to form the ends thicker in both directions. In such cases the preliminary cutting in the first machine simply reduces the slip to dimensions equal to the desired width and thickness of the ends, and it is then finished off in the clamps, one set of clamps being made with shallow grooves so that the slip may be laid flatwise therein.

Good natural and purely structural carbons may be made of wood, as the wood is an example of the class of materials alluded to in which the mass of material is composed of a number of elementary fibres naturally bound together.

In all instances the wood is first to be formed into the shape of what is generally known in my system as the loop or "horse-shoe," and then carbonized, and not to be subjected to any further processes which will tend to fill up its pores and alter its density or resistance.

The wood may be prepared by several methods; for instance, it can be shaped by cutting or stamping by a die. A thin veneer of wood, properly smoothed and brought to the desired thickness, is taken and laid upon a mould or bed-plate; a cutting die is then forced down upon it, cutting out a piece in the desired shape for the incandescing material and with thickened ends for attachment to the clamps; or a number of veneers may be taken and secured together and then cut into proper shape by a band, jig, or circular saw.

This is illustrated in fig. 9, which is a section of the cutting-die and mould, with a veneer in position; and in fig. 10, which shows the resultant piece ready for carbonization. In these figures A is a cutting or stamping die, provided with the cutting or stamping edge a projecting from the face of A, and of the same size and contour as the wooden horse-shoe E. B is the mould or bed-plate, having a groove or recess, D, whose upper edge is of a size and shape just sufficient to receive a , but increasing in size towards the base to permit the ready escape of anything which may be forced in at the top. C is a piece of veneer in position for the operation of the stamp or die A. Upon force being applied to A, shoe E is cut from the wood with the broadened ends e for attachment to the clamps homogeneous and unitary therewith. This is then taken and placed in a suitable carbonizing flask, fully illustrated herein. The result is a porous structural carbon of high resistance, excellently fitted for use in lamps intended to give light

Improvements in Electric Lamps, &c.

light by incandescence, and not needing any further treatment which might alter or modify its purely natural structure. Another method is as follows:—A block of wood is taken and cut or formed so that its centre shall be a web bounded at the sides by thicker portions. The grain of the wood is from side to side, and the thickness of the web is about the desired breadth of the carbon. From the block so fashioned pieces whose width approximate the desired thickness of the carbon are split, shaved, or cut off. These pieces are then sufficiently softened by moisture and heat so as to be bent into a circular or horse-shoe or oval form, and they are retained in such shape in a proper carbonizing flask and carbonized.

This method is illustrated in figs. 11, 12, and 13, in which fig. 11 represents a block formed as before described; fig. 12 a piece split, cut, or shaved therefrom; and fig. 13 the same after carbonization, in which A is the web of the block, the centre of the block being reduced in thickness, while the ends *a a* are left broad or thickened for fastening to the clamps. This block is split, cut, or shaved into pieces like fig. 12, which are then bent into the shape shown in fig. 13, or into any other desirable shape, and then carbonized while in such form. The result is a carbon with broadened ends for clamping unitary with itself, and which is porous, structurally unaltered, of high resistance, and with a minimum tendency to disintegration under high heat. It is evident that the block shown in fig. 11 could be made of disintegrated fibre, paper-pulp, papier-mâché, &c., by powerful pressure, and the individual carbons then cut off from such block, but in practice I so far prefer to make the block and resultant carbons of wood.

Another method is as follows:—A block of wood is taken and cut in a milling machine or lathe for turning irregular forms until its shape is that of an elongated oval, of which about one-third, including an end, is cut upon somewhat larger axes than the remainder, in order to provide for the clamps. The interior is then reamed out in a suitable machine, so that the block then resembles a series of carbon horse-shoes with closed ends piled upon each other. The length of the oval is with the grain of the wood. The block is then split or sawed into very thin layers or slips, each forming ultimately one horse-shoe carbon. The slips are then carbonized, preferably in a nickel flask of a description shown herein; after carbonization the greater portion of the broader end of the slip is cut off, leaving the horse-shoe in shape for use. This broader end, which connects what are afterwards the ends of the horse-shoe, may, if desired, be cut off prior to carbonization; but as this broader connecting end tends to support and keep in shape the portions afterwards forming the horse-shoe it is better to leave it on until after carbonization.

Either before or after carbonization, preferably before, and before the slips are sawed or split from the block, small holes are made in the broad end, through which pass the clamp screws.

* This is illustrated in figs. 14, 15, and 16, of which fig. 14 is a perspective view of the block partially turned in proper shape; fig. 15 is a front view of a carbon after carbonization; fig. 16 is a side view of a carbon properly secured in clamps.

In these figures A is a block of wood, which in a proper machine is turned so that its exterior shape is that of an oval composed of two ovals, B C, of different axes, thereby forming a broader portion for the clamps, the interior being reamed out to present a uniform smooth surface, E. This block so shaped is then split or sawed into very thin layers or slips of a thickness sufficient for one carbon horse-shoe, as seen in figs. 15 and 16.

These slips are then carbonized and a portion of C broken or cut off at *c c*, as shown in dotted lines in fig. 15. At some stages in the process, preferably while in the shape shown in fig. 14, holes *d d* are drilled for the reception of the screws *e*, which fasten the clamps D to the carbon.

It is desirable, in manufacturing carbon slips or filaments of the style generally known as the horse-shoe carbons for use as the incandescing conductors in electric lights, that they should be carbonized evenly and uniformly, and that their shape should be preserved, that the carbonization should be effected without warping or twisting the body of the carbon.

As however the material contracts largely in the process of carbonization, means are required which, while holding the material in position to avoid twisting or warping, shall at the same time guarantee even and thorough carbonization and permit the material to move, so that the inevitable contraction during the process may proceed without danger of rupturing or otherwise damaging the carbons. For this purpose means and methods as follows are used:—For fibres of the class where a single fibre is used, and clamps or enlarged portions for clamps are secured thereto, a carbonizing flask is used, in the bottom of which is cut a groove approximating in form the shape desired for the finished carbon, but somewhat longer, in which groove is laid the fibre with its attached clamps. A heavy metallic cover is then laid thereon, confining the fibre in place, so that it preserves its shape during carbonization, while at the same time it is free to contract. The cover may in turn be grooved and receive another fibre, and a series be used, so that many may be carbonized at once in one flask. This flask and all its parts should be made of nickel, which is best adapted to stand the high heats necessary to thorough carbonization.

This flask is illustrated in fig. 17, in which D is a flask or box of metal capable of withstanding a high degree of heat, having a groove, E, of the desired shape cut in its bottom, as shown in fig. 17. As fibrous material contracts or shrinks in the process of carbonization, it is necessary to provide for the movement attendant thereon, care being taken at the same time to prevent any movement which would allow of warping or distortion. This is effected by the groove E, which allows a longitudinal movement, but prevents any other. In this groove the fibre with its attached end is placed, a cover, F, being then laid over it. A corresponding groove may be cut in the upper surface of the cover F and another fibre laid therein, and a number of such covers, limited by the capacity of the flask or box D, may be used, so that many may be carbonized at one operation. When the flask or box E is full, the lid F' is fastened tightly thereon, and the whole placed in any suitable furnace for carbonization. The result is what is now known as the horse-shoe carbon, made as a single fibre, with carbon clamps and proper conductors securely attached thereto by the process of carbonization.

As these carbon clamps, from their much larger size relatively, contain a large quantity of deleterious gases, which come out very slowly when under the action of the vacuum pumps, it is preferable that clamps be used which have first been carbonized and subjected *in vacuo* to heat sufficient to produce a high degree of incandescence.

When such are used, a very small amount of sugar applied to the ends of the fibres serves by its carbonization to bind them securely together.

Improvements in Electric Lamps, &c.

The carbons made of the other materials set forth have enlarged ends made upon them for affording a large and certain connection with the clamps as set forth. For their carbonization a flask constructed in either of the following methods is used. These several forms are unitary in principle, in that they confine and support the material during its carbonization, preventing any distortion, while at the same time provision is made for contraction, and they differ only slightly in the details by which these results are attained.

In one form a plate is provided with a groove or recess of the shape and size desired for the carbon. At one end of the groove is a recess just large enough to receive one of the enlarged ends of the strip, a pin being used to secure that end therein. At the other end of the groove is an elongated recess, whose excess of length is equal to the contraction of the material during carbonization in which rests the other end of the filament, to which may be attached or on which may be placed a small weight to keep it straight. During carbonization this end is drawn up in its elongated recess, the other end remaining fixed. In another form a groove or recess is made of the elliptical form desired, with recesses at the ends just sufficient to admit of the enlarged ends of the filament placed sideways therein. The top or apex of the groove is enlarged in this case, one boundary edge being upon a curve equal to the length of the uncarbonized material, while the other is of the length and shape desired for the filament after carbonization. In another form a recess is cut in a plate of the form desired for the carbon, but of a size that will accommodate the uncarbonized material. In the recess fits and slides a plate slightly smaller than the recess, so that when the plate is laid in the recess a groove is left sufficient in size to just receive the filament. Upon the outer edge of the recess, and at the proper points, are made side recesses, just large enough to receive the enlarged ends of the filament. The filament is laid in the groove formed between the recess and its plate, the enlarged ends laying in the recesses provided therefor, weight being laid on the latter to confine them therein. During carbonization, as these ends are fixed, contraction draws down the bow portion, which carries the plate with it, the upper portion of the plate preserving the shape of the material.

These plans may be better understood by reference to figs. 18, 19, 20, 21, 22, 23, 24, 25, and 26, in which figs. 18, 21, 24, and 25 are plan views of carbonizing plates, unitary in principle, but differing slightly in detail. Figs. 20 and 23 are an edge and side view respectively of a slip or filament ready for carbonization. Figs. 19, 22, 26, and 27 are details more fully hereinafter referred to. A is the nickel plate in which is cut the groove *a* of the shape desired for the finished carbon, and of a depth sufficient to receive the slip or filament S. The co-efficient of contraction of the fibre is determined by experiment, and the length of the groove is made equal to the length desired for the finished carbon, plus the contraction of the material during the process of carbonization. In fig. 18 this extra length is at one end of the groove, enlarged at one end into a small chamber just sufficient to receive one of the enlarged ends *c* of the filament, which is secured therein by a pin, *e*. A small wedge, *f*, may also be placed in the chamber to assist in keeping the enlarged end in shape, the pin *e* passing through *c* and *f*. The other end of the groove *a* is made into a long chamber, *b*, whose length is equal to or greater than the amount of contraction in length of the filament in carbonization. Upon the free end of the slip or filament S the clamp *d* is secured.

The plate A, with the slip or filament secured in position as described, is covered by a smooth plate, or a series may be used piled one upon another, the smooth under surface of one forming the cover to the one underneath. They are then placed in a suitable nickel case, and on being subjected to the first low heat, carbonization and contraction proceed evenly and equally throughout each slip or filament, the contraction drawing up the loose end in the chamber *b* until, at the conclusion of the process, the end *d* is exactly opposite *c*. The cases and plates used are made of nickel, as no other metal stands the high heat necessary in the final stage of carbonization.

In fig. 21 the groove *a* is shown formed into a chamber, *a'*, at the bow of the horse-shoe. In this case the slip S is laid flatways in the groove, the ends *c c* fitting into chambers at the end of the groove, upon which weights *o* are laid. By this means the ends are held in position during carbonization, while the contraction is from *x* to *x'* during the process. Fig. 24 shows the same construction and method of operation as in fig. 18, except that while in fig. 18 the slip is placed edgewise in the groove, in fig. 24 it is placed flat or sideways in the groove.

In fig. 25 the plate A is formed with a chamber, in which slides a plate, *c*, smaller than the chamber by the size of the filament or strip, so that when the plate C is placed in the chamber a groove shall be left in which is placed the filament or strip, its ends *c c* resting in chambers fitted for them, and held in place therein by weights *g g* laid thereon in chambers made therefor. As the filament is thus fastened at the ends, as carbonization proceeds the ensuing contraction pulls the bow towards the ends, forcing the plate C towards the end B of A. In all these plans, however, the filament is kept under strain during carbonization with one or more points, fixed against moving, and the contraction proceeds against the strain, which constantly keeps the filament against or in contact with a former, preserving its shape and obviating any risk of warping or twisting. In all provision is made for keeping flat and in their proper relative position the enlarged ends of the carbon.

It is also essential that they should be carbonized evenly and equally throughout their entire mass.

This may be accomplished by a furnace of the following description:—Preferably a nickel flask is used, composed of two parts—a base-plate provided with numerous legs so as to support the same and permit the heat to reach the bottom, and a case or box which sets thereon. A series of plates, constructed as before described, is laid upon the bottom so as to form a pile, and the box or case placed thereon, its edges resting upon the bottom. The flask is then placed in an oven of a size sufficient to leave a space on every side of the flask. The oven is provided with a top, in which is a peep-hole having a removable cover for inspection of the interior. A pipe connected to a source of supply of any gaseous combustible passes around the oven in several branches, inlet pipes therefrom carrying the gas in as many places as necessary to the interior of the oven for consumption there.

A pipe connected to a suitable air-blast passes around the oven in the same manner, from which lead branch-pipes, one passing into each inlet pipe of the gas supply, so that air under suitable pressure is mingled with the gas at the point of combustion, furnishing the proper blast for ensuring the necessary high

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high degree of heat. The gas and air pipes are furnished with proper valves, so that the relative supply of each may be regulated. By this means the supply may be so regulated that at first the flask is subjected to a comparatively moderate heat only, which is then gradually brought up to the highest degree necessary.

The carrying into effect of this part of the invention may be more clearly understood by reference to figs. 28, 29, and 30; of which fig. 28 is a view of a carbonizing plate grooved to receive a filament; fig. 29 is a perspective view of a series of the plates in the carbonizing flask; fig. 30 is a perspective view of the carbonizing oven.

In these figures A is a carbonizing plate grooved to receive a filament and to have it secured therein.

The carbonizing flask is composed of two portions, B and C. B is a base, provided with numerous legs, *b b b*, in order to raise it above the bottom of the oven to permit the free passage of heat therearound. Upon B is arranged a series of the plates A, each containing a filament, and over the series is placed a cover, C, securing them all upon the base and within the flask. The flask so filled is placed within the oven D, provided with the cover E, an exit, *e*, for the escape of the products of combustion being provided. A peep-hole may be provided, which is closed by cover F, through which the condition of the flask may be observed. A pipe, G, connected to a source of supply of any gaseous fluid passes around the oven in several branches, inlet branches *g g* therefrom conveying the gas in as many places as necessary to the interior of the oven for consumption. H is an air-tube, connected with a suitable blast, and passing around the oven in the same manner as G, from which lead branch-pipes *h h h*, one passing into each branch inlet *g*, so that air under pressure is mingled with the gas at the point of combustion, furnishing a supply of air for proper combustion and ensuring the necessary high degree of heat. Both G and H are provided with ordinary stop-cocks or valves, by which the supply of either air or gas absolutely or relatively to each other may be regulated. The oven D is of such a size that when the flask is placed in position therein there is a space on every side between the flask and the oven. The flask, filled with plates and filaments, is placed in the oven and the fire kindled by lighting the gas. By means of the valve before mentioned the supply of fuel may be so regulated that at first the flask is subjected to a moderate heat, which may be gradually brought up to the required point.

The blast ensures a high degree of heat, directed immediately upon the flask and evenly distributed thereon. When heated for a sufficient time the gas is turned off, and the flask may be allowed to cool down in the oven. During the process of carbonization there is sometimes danger that the material under treatment may be oxidized to such an extent as to interfere with proper carbonization. This oxidation is due to oxygen in the air present in the flask and to the oxygen eliminated from the wood itself at the commencement of the process. If desired to prevent this an auxiliary tube may be used, passing into the flask, through which is introduced therein prior to firing and during the burning an atmosphere of hydrogen, or of some hydro-carbon, or of some other element which will take up the oxygen and prevent its action upon the filaments.

In a system of electric lighting such as proposed by me, in which separate electric lamps devoid of regulating devices are used at the places of consumption, the entire regulation for all the lamps being performed at the central station, as with water or gas supply, it is essential that a constant electro-motive force or pressure be maintained; and as in such a system the lamps are arranged upon the multiple arc or derived circuit system, it is essential that there should be a certain standard resistance in each derived circuit. This has been attained by placing one lamp of such standard resistance in each derived circuit. It is desirable that all lamps used should be of equal lighting value, each giving a certain standard amount of light. This has been attained by giving each a certain definite or standard amount of radiating surface.

Ordinarily this radiating surface has been that with which the standard pressure or electro-motive force and the standard resistance should give a light equal to sixteen candles. Sometimes, however, it is desirable in some parts of the system to use lamps which each give a much less amount of light; for instance, in chandeliers, where it is desirable to divide the total amount of light produced among a larger number of lamps than ordinary, that is, that the light of one, say standard sixteen-candle lamp, be divided between two, three, or four lamps, each of eight, five and one-third, or four candle power respectively. This result may be attained in the following way:—In a derived circuit are placed two lamps, each being carefully provided with an incandescing conductor of one-half the resistance and one-half the radiating surface of the incandescing conductor of the standard lamp of the system. A single circuit-breaker is provided for both lamps, in order that both shall be turned off or on simultaneously. When desirable the two lamps may be arranged in one holder, which may form a bracket or may form a section of a group of lamps or of a chandelier.

This part of the invention is shown in figs. 31, 32, and 33; wherein fig. 31 is a diagram showing one standard lamp and two half-lamps in derived circuits from the same main conductors, fig. 32 is a view of two half-lamps arranged in one holder, and fig. 33 is a diagram showing the connections in such holder.

In these figs. C C' are the main conductors leading to and from any suitable source of electric energy at the central station. In the multiple arc 1 thereto is a lamp, A, of standard resistance and radiating surface. In the multiple arc 2 are the two lamps B B, each of which has just one-half the radiating surface and one-half the resistance of A. One circuit-breaker, *b*, is provided, controlling the circuit through both lamps. As a consequence, with a uniform standard electro-motive force or pressure, each of these lamps will each give one-half the light which A would give. If it is desired to increase the number, the same proportion between the number used and the standard resistance and radiating surface should exist. For two, three, or more lamps, a suitable holder, F, of insulating material is made, sockets S being made therein for each lamp. To each socket metallic conducting plates are placed on opposite sides, as at *c c' d d'*, for forming contact with metal slips or pieces on the necks of the lamps.

The socket may be provided with a plain or screw threaded aperture, E, by which it may be attached to the wall as a bracket or to a framing, so that it may constitute a portion of a group of lamps or of a chandelier. Upon the socket is a circuit-breaker, consisting of a metallic screw, D, secured in a seat, *h*, and which may be turned to impinge upon or be cleared from contact with a metal block, *e*.

The conductor C passes through *c c'* to *e*, and the conductor C' through *d d'* to the metal seat *h* of the screw D.

Instead]

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Instead of two lamps, as instanced, any number may be used, care being taken that the resistance of each be a fractional part of the standard resistance of one ordinary lamp, the denominator of the fraction being the number of smaller lamps in the one derived circuit.

If more than two are used, the block *e* and screw *D* are placed somewhere in the circuit leading through all the lamps, in order that all may be turned on or off simultaneously, all the divided lamps being used as one standard lamp.

In the lamps generally used in my system, and referred to hereinbefore, the light is produced by the incandescence of a conductor in an hermetically sealed vessel, the incandescing conductor being the small carbon now generally designated as the "horse-shoe carbon." Such, however, are designed for small lamps, usually fifteen to eighteen-candle power, and the conductor required therefor being small is hermetically sealed in glass. When it is desired to produce on the same principle a much greater light, say one-hundred-candle power, the conductor thereto must also be much larger. While I have succeeded satisfactorily in sealing somewhat larger conductors hermetically in the glass, it is generally not so effective or desirable a method of passing large conductors into the bulb as where small conductors are used. Wherefore there seems to be a necessity for some other method, which in the case of larger conductors shall pass the conductor into the bulb of the lamp without contact with the glass thereof, and at the same time furnish an effective and lasting hermetical seal.

This I have succeeded in doing by the employment in the lamp of two columns of mercury, sustained in tubes attached to the lamp bulb at ordinary barometric height by the pressure of the atmosphere, and serving both as seals to preserve the vacuum in the lamp bulb and as parts of the circuit through the incandescent conductors.

A glass globe or bulb is blown of proper size, having an annular opening in its base of a size to admit of the passage into the globe of an insulating base supporting the carbon. After this base is put in the globe the annular opening is closed, and two tubes connecting with the interior of the globe are connected hermetically thereto, of a length somewhat greater than the barometric column of mercury. From the clamps of the carbons conductors pass, one from each clamp, into the proper tube. The lower ends of the tubes are placed in proper mercury reservoirs insulated from each other—one reservoir being connected to one pole of the source of electricity, the other to the other pole.

The air being exhausted from the globe the mercury rises in the columns or tubes, forming a seal for the vacuum, and also forming a circuit to the conductors attached to the clamps. The lamp is supported upon or by a frame, whose standards are provided with adjusting screws, so that its height may be regulated or the levelling of the stand secured.

This part of the invention is shown in detail in fig. 34, which is a view of a lamp embodying this part of the invention, shortened somewhat in proportion to its height, as indicated in the dotted line.

A glass globe or bulb, *A*, is blown having an annular opening in its base of a size to admit of the base *a a* passing therethrough. The line of this opening is indicated at *i i*. Upon the top of the bulb is formed a tube, the continuation of the projection *N*, by which the lamp is attached to the air-pump. Upon a suitable base, *a a*, of insulating material are fastened by proper devices the clamps *b b*, holding and supporting the horse-shoe *B*, the clamps being connected to metallic conductors, *e e'*, passing a little distance, say several inches, below the base *a a*. Two glass tubes, *c c'*, each of a diameter several times greater than that of *e* or *e'*, and several inches longer than a column of mercury supported *in vacuo* by atmospheric pressure, are united near their top, as at *m*, and their united tops formed into a circle the diameter of or slightly larger than the diameter *i i* of the opening in *A*. The base *a a* supporting the carbon and with its attached conductors is introduced into *A*, and the tubes *c c'* are then secured by sealing at *i i* to *A*, the conductor *e* projecting downwardly into *c'* and *e'* into *c'*.

For supporting the lamp thus formed a stand is employed consisting of an insulating top, *E*, and base, *E'*, united by metallic standards, *F F'*, which are connected to the base *E'* by adjustable screw connections *g g'*, so that as circumstances require the top may be raised, lowered, or inclined. Upon the metal standards *F F'* are binding screws, whereby conductors 1 4, to and from the source of electricity, are attached. The top *E* is provided with a central aperture, or it may be annular, permitting the tubes *c c'* to pass through and below it while supporting the globe.

Upon the base *E* is located a vessel made of insulating material not affected by mercury, divided into compartments *D D'*, or two separate distinct vessels may be used. The tube *c* passes into one, *D*, to near its bottom, while *c'* passes into *D'*. A wire, 2, connects *D* and *F*, and a wire, 3, connects *D'* and *F'*.

The parts being placed in position as shown in the figure, the vessels *D D'* are filled with mercury and the tube continuation of *N*, before mentioned, fastened to the pumps.

As the air is exhausted from the bulb the mercury rises in *C* and *C'*. During this operation care must be taken that the compartments *D D'* are kept supplied with mercury, and that upon the completion they are still full. Upon the proper degree of vacuum being attained, the bulb is sealed at *N* and the tube removed. At this stage the mercury has risen to and remains at *x x*, the height at which atmospheric pressure sustains a column of mercury *in vacuo*, the mercury contacting with *e e'* and passing a little distance above their ends.

The columns *C C'* should be of such a diameter as to give no greater resistance to the current than does either of the conductors *e e'*, 2, or 3.

For high candle-power incandescent lamps this arrangement makes a very reliable and durable seal, obviating any danger there may be of seal breakage arising from difference of expansion coefficient likely to exist where a large metallic conductor is sealed directly to or in glass. For such reason, in large lamps this method may prove preferable to that of sealing direct.

Hitherto in manufacturing the lamp, the carbon having been prepared from paper, wood, or other suitable fibre, was placed in the lamp, whose parts are then sealed; the lamp was then exhausted of air, a current being applied during the process of exhaustion, heating the carbon. Prior to sealing in the lamp and the process of exhausting the completed lamp the carbons were not heated, and prior to heating any defects therein could not be discovered. It is practically impossible to produce all the loops or slips of absolute uniformity or homogeneity, or to carbonize all of them absolutely uniform throughout their entire mass. When heated to redness generally throughout their length some show spots either less red or of a brighter red than the average of the carbons, indicating for the first time faults in the carbons.

Where

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Where there is a bad fault in the carbon a white incandescence appears, determining the life of the lamp, and also affecting its resistance. Such lamps are unfit for use, and the entire cost of their manufacture has proved a loss.

I now propose to furnish a simple and easy method and means of testing the carbons before they are put in the lamp proper, and so prevent defective or unsuitable carbons from being embodied in completed lamps, to be only thrown away upon discovery of the faults, increasing in fact the net cost of the faultless ones. This is accomplished by a preliminary heating of the carbons *in vacuo*, which by the following means can be cheaply, rapidly, and effectually done. What may be called a temporary lamp is formed of a globe or chamber of proper size, with an aperture at its top of a size sufficient to admit of the passage of a carbon and its supporting base. The neck of the supporting base passes tightly through a soft rubber cork, which fits into the aperture in top of the globe. The cork is so sized that its upper side is a little distance below the top edge of the aperture, so that when the cork is in position a chamber is formed on top. On one side of the wall of the aperture is an opening having a tube upon its exterior, the opening being into the chamber referred to as formed above the cork. A mercury reservoir is connected to the opening by a flexible tube. When the cork is put into place the reservoir is elevated, and the mercury flows thence, forming a seal over the cork; *per contra*, the reservoir being depressed the mercury flows back into the reservoir, baring the cork. The globe is connected to a proper exhaust tube, several spring-drops being simultaneously used. By this means a carbon may be placed in the globe, it sealed and exhausted quickly, and the current applied testing the carbon, which standing the test may be placed in a permanent lamp.

Suitable mechanism for carrying this part of the invention into effect is shown in fig. 35, which is a sectional view of the preliminary proving or testing lamp, in which fig. Q is the usual glass carbon support, which is sealed to the glass globe in the completed lamp at *r*; *a* is the carbon to be proved, secured thereto in the usual way. C is the temporary proving lamp, having at its upper end an aperture sufficiently large to admit the carbon and its support, and provided with a soft rubber cork, B, through which the neck of the carbon support Q passes. The cork B fits tightly in the aperture, the sealing being further rendered secure by a mercury seal, E, a mercury reservoir, *d*, being elevated when necessary, so that the mercury therefrom flows down through a tube, *c*, over the top of the cork. From the bottom of the proving lamp C proceeds two tubes, one, *n*, connecting with a McLeod gauge; the other tube, *b*, leads to and connects with the vacuum apparatus. In operation the carbon to be tested is placed in the proving chamber or lamp C and the mouth hermetically sealed. The stop-cock *x* in tube *b* is then opened, giving free communication between the chamber C and the vacuum apparatus. When the proper degree of exhaustion is attained circuit is closed through carbon *a* heating it to incandescence, causing defects, if any, to be visible.

If the carbon proves defective it is discarded, the only loss being the labour and material, which are small, involved in the manufacture of the carbon, and not, as hitherto, the labour and materials, which were many times greater, necessary to a completed lamp.

It is evident that several carbons may be tested at once in the proving chamber or temporary lamp.

One of the objects in giving a very high resistance to the incandescing conductors used in my system of lighting is to attain economy of material in the conductors therefor. The resistance usually given them is sufficient for any desired economy in ordinary thickly-settled localities; for use, however, in sparsely settled neighbourhoods, as (say) the outskirts or suburbs of a town or city, it may be desirable to have a lamp by the use of which still greater economy of conductor is attained. In such localities, in order to lessen the number of lights needed in streets, it may also be desirable to have a lamp in which the volume of light is increased, in order that economy in the erection of lamp-posts, &c., may be subserved, and it may also be desirable to use lamps in which the volume of light may be increased in other localities.

As there is eventually a limit to the effective life of the carbon used, it seems desirable to so arrange a lamp that the operative life of the lamp may be prolonged beyond the average life of a carbon, to the end that the cost of the labour expended in embodying a carbon in a lamp may be reduced.

Both or either of these results are attained in the following way:—An enclosing globe is used, made and put together in the usual manner in my lamps. To the inner end of one of the conductors leading into the lamp is fastened a double clamp, that is, one that is Y-shaped, a carbon being fastened to each limb of the Y clamp. At the other end each carbon is fixed in an individual clamp, each clamp having its own conductor leading outside of the lamp. The wires leading out of the lamp and the wires leading from a suitable source of electricity are united at a circuit-controlling device, constructed so that it may close the circuit through either carbon, the circuit through the other remaining open, or it may close the circuit through both; as carbons in a series, or it may close a circuit through each, the circuit through them being derived or multiple arc circuits.

This part of the invention is more clearly shown in fig. 36, in which A is a glass globe and B the supporting neck united at *a b*. Through the neck B passes the conductors 6, 7, 8, which are sealed therein. Upon the inner terminal of 6 is the Y-shaped clamp D, in each leg of which is fixed a carbon, *e* or *g*. The other ends of these carbons are in separate clamps, *e* being fastened in the clamp *d* of conductor 8 and *g* in clamp *d'* of conductor 7. The conductors 6, 7, and 8, and the circuit conductors 5, 9, are connected to a key, E, composed of metal contact points 1, 2, 3, 4, and anvils *x*, *s*, *z*, as follows:—Circuit conductor 5 is connected to point 1, contacting with *x* and to anvil *s*, on which 2 contacts; while 9 is connected to anvil *z*, with which both 3 and 4 may make contact. Conductor 6 is connected to anvil *x*; 7 to point 4, which contacts with *z*, and 8 to 2, which contacts with *s*, and to 3, which contacts with *z*. If points 1 and 3 be put in contact with their anvils *x z* a circuit is formed, 5, *via* 1, *x*, 6, D, *e*, *d*, 8, 3, *z*, to 9, the circuit through *g* being open. If 1 and 4 be closed on *x* and *z* the circuit is formed, 5, *via* 6, D, *g*, *d'*, 7, 4, *z*, to 9, the circuit through *e* being open, and *g* alone in circuit and use. If 2 and 4 be closed on *s* and *z* the circuit is from 5, *via* 8, 2, 8, *e*, D, *g*, 7, 4, *z*, to 9, and both *e* and *g* are in one circuit, that is, in series. If 1, 3, and 4 be closed on *x*, *s*, and *z*, the circuit is from 5, *via* 1, *x*, 6, to D, where two paths are formed, the current consequently dividing, one circuit being D, *e*, 8, 3, *z*, to 9, the other D, *g*, 7, 4, *z*, to 9, both carbons being in circuit, but each having its own circuit, which is a derived one so far as the main circuit is concerned.

When

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When both are used in multiple arc it is evident that the net resistance of the circuit is one-half the resistance of one, and a certain sized conductor is required. If both are used in series the resistance is double that of one and four times that of the multiple arc, in which case the conductor may be diminished three-fourths. As the volume of light is that of two ordinary lamps, it is evident that a much less number may be used with the same light-giving result. Thus economy in laying main conductors and in the erection of lamps is secured. It is evident that as one carbon only may be used at a time, that by so using one only at a time the life of a manufactured lamp is practically doubled, for where one carbon has reached its effective limit the circuit therethrough is transferred to the other, thus saving the expense involved in sealing one carbon and its globe, the cost of a globe, and of its exhaustion. It is evident that while only two carbons are shown that more may be sealed in one globe, D being provided with the same number of clamps and each carbon provided with a separate return wire, for which proper connections are made by enlarging key E on the principle shown. It is also evident that E may be provided with lever contacts, instead of the screw contacts used to explain the principle of my invention.

In electric lamps formed by sealing an incandescing conductor hermetically in a glass-enclosing globe, there may be danger sometimes that the glass and wire will separate at the point where the conducting wires pass through and are sealed into the glass globe. This is due to the fact that the conducting wires near the incandescing material become very hot by conduction and that the coefficient of expansion of the glass and wire are so different. In the lamp made on my plan, owing to the high resistance of the incandescing material, such small conductors are used that the danger referred to has been of minor or the very least importance. It may be desirable, however, to provide means which reduce the danger to a minimum, while affording at the same time the necessary support for the very small and delicate conductors and incandescing material. One part of this invention has for its object the provision of such means, which is done as follows:—A small glass bulb is blown of a little larger diameter than the distance apart of the ends of the carbon. Through this globe are passed and sealed therein the conductors leading to the carbon, each conductor being sealed therefore in two places—one contiguous to the clamps for receiving and supporting the carbon, the other seal being almost diametrically opposite. The carbon and clamps being placed in position, this small globe is placed in an aperture left for the purpose in the larger enclosing globe, and sealed thereto at about the meridian line of the smaller bulb. The larger bulb is provided with a tube, by which it is attached to the air-exhausting apparatus, and where it is sealed after the vacuum is produced. Connected to this tube is a branch tube leading from the smaller bulb, so that both are simultaneously exhausted. This is shown in detail in fig. 37, in which A is the glass-enclosing globe, formed with the tube *a* for attachment to the exhausting apparatus. A small bulb, B, is made attached to the supporting neck C, and formed with a tube, *b*. Through the bulb B the conductors 1 2 are passed and sealed therein, 1 being sealed at *c c'* and 2 at *e e'*. The bulb B is then sealed into A at the lines *z z*, and the tube *b* connected to the tube *a*, the bulb B practically forming the seal to A. The tube *a* is then connected to the exhaust apparatus. It is evident that a vacuum is created in both A and B. When a proper degree of exhaustion is reached the tube *b* is sealed off at *y*, after which the tube *a* is sealed off at *x x*. The vacuum in globe A is thus protected by two sealings of each wire, *c e* and *e' e'*, to only one set of which is there any danger, *e' e'*, the other set, *c e*, from its distance from the heated portion of the lamp, never heating sufficiently to be affected.

As very small conductors are used, it is necessary for stability that they be supported near the carbon, which is done at the sealings *e' e'*; but if either of these, from their proximity to the light, is ever so heated as to crack, it will still subserve its functions as a support, while the vacuum *m* is preserved by the seals *c e*, more distant from the clamps.

Sometimes it may be desirable to make a lamp in which a less permanent seal is used, involving a less expensive method of sealing, and which may be taken apart readily for the substitution of a carbon, or for other purposes. This may be done as follows:—Upon a tube closed at one end is supported the carbon, the conductors therefrom passing through the tube and being sealed hermetically in the top thereof. The enclosing globe is made with a neck somewhat larger than the tube, so that the carbon may be passed therethrough. A rubber packing is interposed between the outer walls of the tube and inner walls of the neck, securing the two together, the ends of the tube projecting beyond the end of the neck. This projecting portion of the tube passes through the base of a rubber-cup, the base of the neck resting upon the bottom of the interior of the cup. At the top of the cup a rubber packing fills the space between the exterior of the neck and the interior of the cup. The space in the cup is filled with mercury, which is retained in place in the cup by the packing last referred to, forming with the rubber a good seal for any temporary uses. Fig. 38 shows a lamp embodying this portion of the invention: A is the enclosing globe, made with a long neck, A', through which may be passed the carbon B, attached to clamps *b b*, connected to conductors 1 2, which are sealed in the top of a tube, C, at *c c*, the tube C being somewhat smaller than the neck A'. Around the base of C is a soft rubber-plug, D, which fits into the lower part of the neck A', forming a tight joint between the two, supporting C and the carbon in position in A' and A. F is a socket or cup, through the bottom of which by a tight joint passes the end of C, the end of D resting in the cup. At the top of the cup a washer, E, of soft rubber fills tightly the space between A' and the inner wall of the cup F, the space in the cup being filled with mercury, H, or other suitable liquid. The lamp so put together is exhausted and then sealed at *a* in the usual manner, the combination of the cup F, plugs or washers D and E, and the mercury H, forming a reliable seal.

Having thus described my invention, what I claim is hereby declared to be as follows:—

- First—An incandescing conductor formed of one or more carbonized natural fibres, substantially as set forth.
- Second—A carbon clamp, for uniting the incandescing and the metallic conductors, formed of a carbonizable material, substantially as set forth.
- Third—The method of uniting the incandescing and the metallic conductors, which consists in inserting both in clamps made of carbonizable material and then carbonizing the whole together, substantially as set forth.
- Fourth—The slip for carbonization having enlarged ends formed in one piece and homogeneous therewith upon one edge, or one side and one edge, the remaining edge and side being straight, substantially as set forth.

Fifth—

Improvements in Electric Lamps, &c.

- Fifth—The method of forming a slip or filament for carbonization, consisting in securing a blank in clamps or holders having the configuration desired for the carbon, and shaving or cutting away the superfluous material, substantially as set forth.
- Sixth—A slip or filament for forming on carbonization the incandescing conductor of an electric light, made of bast or fibre, like cane and bamboo, substantially as set forth.
- Seventh—A slip or filament for forming by carbonization the incandescing conductor of an electric light, made of a material composed of fibres laying parallel through the length of the slip or filament, substantially as set forth.
- Eighth—A slip or filament for carbonization, provided with slots or holes in its enlarged ends for holding it in the carbonizer, and for passage of the clamping screws when placed in a lamp, substantially as set forth.
- Ninth—The combination of the shaving knife, the block C, and means for moving it, and the adjustable limiting screw, substantially as set forth.
- Tenth—The clamp formed of two portions, one being provided with off-sets or shoulders forming the bottom of slots acting as straight edges or gauges to the slip under treatment, substantially as set forth.
- Eleventh—The clamp provided with slotted projections at the ends, for forming the broadened or thickened ends of the slip and the slots therein, substantially as set forth.
- Twelfth—The method of forming carbons for electric lamps, which consists in forming the wood into the shape desired for the carbon and then carbonizing the same, substantially as described.
- Thirteenth—The method of forming carbons for electric lamps which consists in cutting or stamping from veneer a piece of wood with thickened or broadened ends and of the shape desired and then carbonizing the same, substantially as described.
- Fourteenth—The horse-shoe, with thickened or broadened ends, for attachment to the clamps, formed or cut from one piece of wood, substantially as set forth.
- Fifteenth—The method of forming carbons for electric lamps, which consists in shaping a block of wood as described, then cutting, splitting, or shaving into straight pieces adapted for single carbons, then bending such pieces into the desired form and carbonizing in such form, substantially as described.
- Sixteenth—The block for the manufacture of carbons for electric lamps, consisting of the central web and thickened or broadened ends, substantially as set forth.
- Seventeenth—The method of forming carbons for the incandescing conductors of electric lights, consisting in first cutting or turning a block of wood into the shape of an oval having a broadened portion, then carbonizing, and then removing a portion of the broadened part, substantially as described.
- Eighteenth—A carbon horse-shoe, composed of a filamentary body with broadened ends, turned from one piece of wood and then carbonized, substantially as described.
- Nineteenth—The method of manufacturing carbons for incandescent electric lamps, uniform and regular in shape and carbonization, consisting in carbonizing filaments while one or both ends are secured in a certain definite position, relatively to the amount of contraction, so that when carbonized and contracted the ends shall be in proper position to each other, substantially as set forth.
- Twentieth—The method of manufacturing carbons for incandescent electric lamps, consisting in maintaining the slips or filaments under constant strain and with one or both ends fixed while in process of carbonization, substantially as set forth.
- Twenty-first—The method of manufacturing carbons for incandescent electric lamps consisting in carbonizing the slips or filaments while in grooves, which maintain the shape and provide for contraction during carbonization, substantially as set forth.
- Twenty-second—The carbonizing plate provided with a groove for shaping the material and a chamber or chambers permitting contraction during carbonization, substantially as set forth.
- Twenty-third—A carbonizing flask and the plates thereof, made of nickel, substantially as set forth.
- Twenty-fourth—The carbonizing flask or box provided with grooves for the reception of the fibre, substantially as set forth.
- Twenty-fifth—The carbonizing oven, consisting of a case and a system of gas and air supply pipes combined, substantially as described, and for the purposes set forth.
- Twenty-sixth—The combination of a case or cover therefor, provided with an inspection aperture and cover, means for supplying gaseous fuel to the interior of the case, and means for mingling air under pressure with the fuel, substantially as set forth.
- Twenty-seventh—The combination with one derived circuit of a multiple arc system of two or more lamps, each of a fractional resistance and radiating surface of the resistance and radiating surface of the standard lamp of the system, the fraction being the number used, substantially as set forth.
- Twenty-eighth—The combination with one socket or holder and one derived circuit of one circuit controller and two or more lamps, each of a fractional resistance and radiating surface of a standard lamp, substantially as set forth.
- Twenty-ninth—The combination with the incandescing conductor of an electric lamp of two fluid columns sustained by atmospheric pressure and forming both a part of the circuit and an hermetical seal to the lamp, substantially as set forth.
- Thirtieth—The combination with the incandescing conductor and the fluid columns of reservoirs connected to the source of electricity, and into which the columns dip for the maintenance of the columns and the completion of the circuit therethrough, substantially as set forth.
- Thirty-first—The combination with an electric lamp of the stand or support therefor, consisting of an insulating base and top connected by adjustable standards, substantially as set forth.
- Thirty-second—

Improvements in Electric Lamps, &c.

- Thirty-second—The combination with a globe or chamber of a much larger chamber or reservoir connected to air-exhausting apparatus, which maintains therein a high degree of exhaustion, substantially as set forth.
- Thirty-third—The combination of a proving chamber or globe, a mercury reservoir for sealing the same, and exhaust reservoir or chamber and means for exhausting the same, substantially as set forth.
- Thirty-fourth—The combination of a globe or chamber, a second and much larger globe, chamber, or reservoir, a valved tube connecting them, means for maintaining a high degree of exhaustion in the larger reservoir or chamber and connected thereto, and a gauge for determining the degree of exhaustion, substantially as set forth.
- Thirty-fifth—The combination with the globe or chamber of a proving lamp, of a mercury reservoir connected to the globe or chamber, so that the stopper thereof may at will be covered or not covered by mercury, substantially as set forth.
- Thirty-sixth—The method of testing carbons, consisting in subjecting them to the action of a current in a temporarily exhausted globe or receiver prior to their embodiment in completed lamps, substantially as set forth.
- Thirty-seventh—The combination in one electric lamp of two or more incandescing conductors and means for connecting them in the electric circuit, either in series or multiple arc, substantially as set forth.
- Thirty-eighth—The combination in one electric lamp of two or more incandescing conductors and means for making or breaking an electric circuit through either one, as may be desired, substantially as set forth.
- Thirty-ninth—The combination in one electric lamp of two or more incandescing conductors and means for completing the circuit through either or through both, substantially as set forth.
- Fortieth—The combination of contact points 1, 2, 3, 4, anvils *x*, *s*, *z*, and circuit connections, substantially as set forth.
- Forty-first—In an electric lamp the combination with the enclosing globe or chamber of a second chamber, through and into which the conducting wires pass and are sealed, both chambers being hermetically sealed together and exhausted, substantially as set forth.
- Forty-second—The method of sealing the enclosing globe or chamber of an electric lamp, by sealing an auxiliary or secondary globe or chamber in the opening of the first or enclosing globe, substantially as set forth.
- Forty-third—The method of preserving the vacuum in the enclosing globe of an electric lamp, consisting in sealing the conducting wires at two points in a vacuum globe hermetically sealed to the enclosing globe, substantially as set forth.
- Forty-fourth—The combination with the neck of the enclosing globe and the carbon supporting tube of a cup containing a liquid receiving the end of the neck of the enclosing globe and through which passes the carbon supporting tube, and washers or plugs filling the space between the neck and cup and the neck and tube, substantially as set forth.

Signed by me, this eighth day of October, A.D. 1880,—

THOMAS ALVA EDISON.

Witnesses—

CHAS. H. SMITH.
GEO. T. PINCKNEY.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to Thomas Alva Edison, this second day of April, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

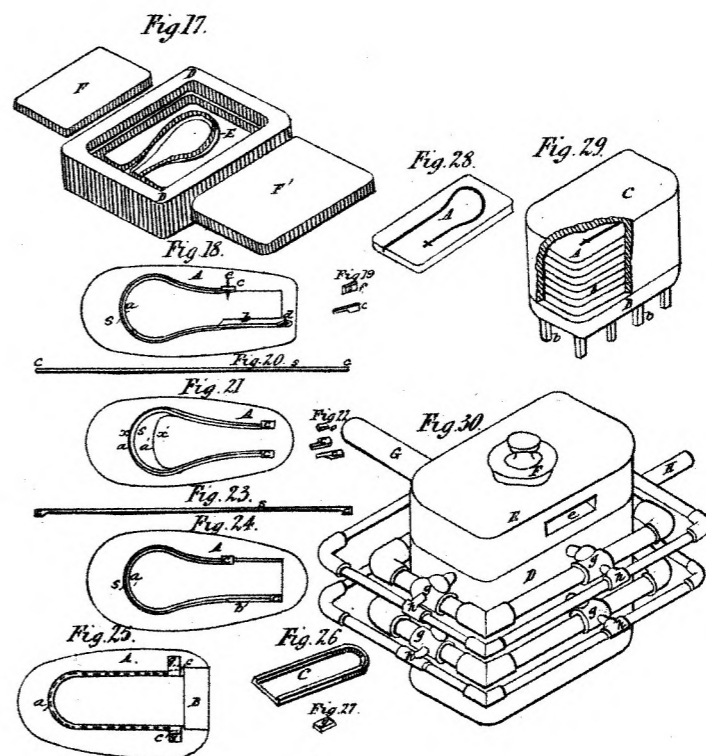
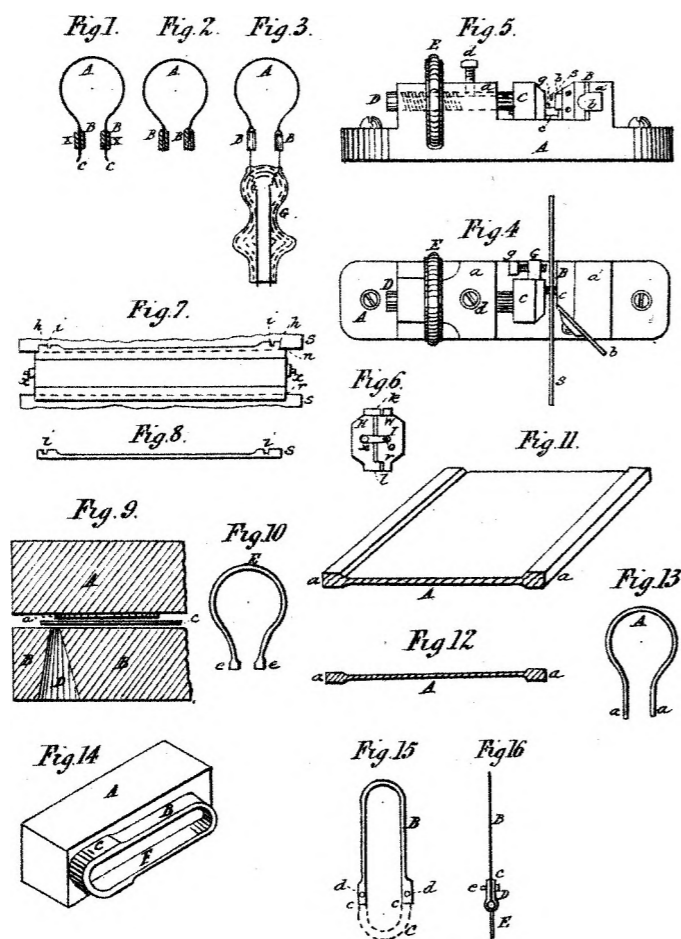
We do ourselves the honor to state that we are of opinion that Letters of Registration may be granted in favour of Mr. Thomas Alva Edison, for an invention of "Improvements in Electric Lamps and in Carbons or Incandescing Conductors therefor, and in means for and methods of manufacturing the same," in accordance with his specification, drawings, and claim, transmitted for our report under your blank cover communication of the 20th December last, No. 80-10,319, and subsequent communication.

We have, &c.,

E. C. CRACKNELL.
GOTHER K. MANN.

The Under Secretary of Justice.

[Drawings—two sheets.]



Witness
 Chas. Smith
 J. S. Dunkley

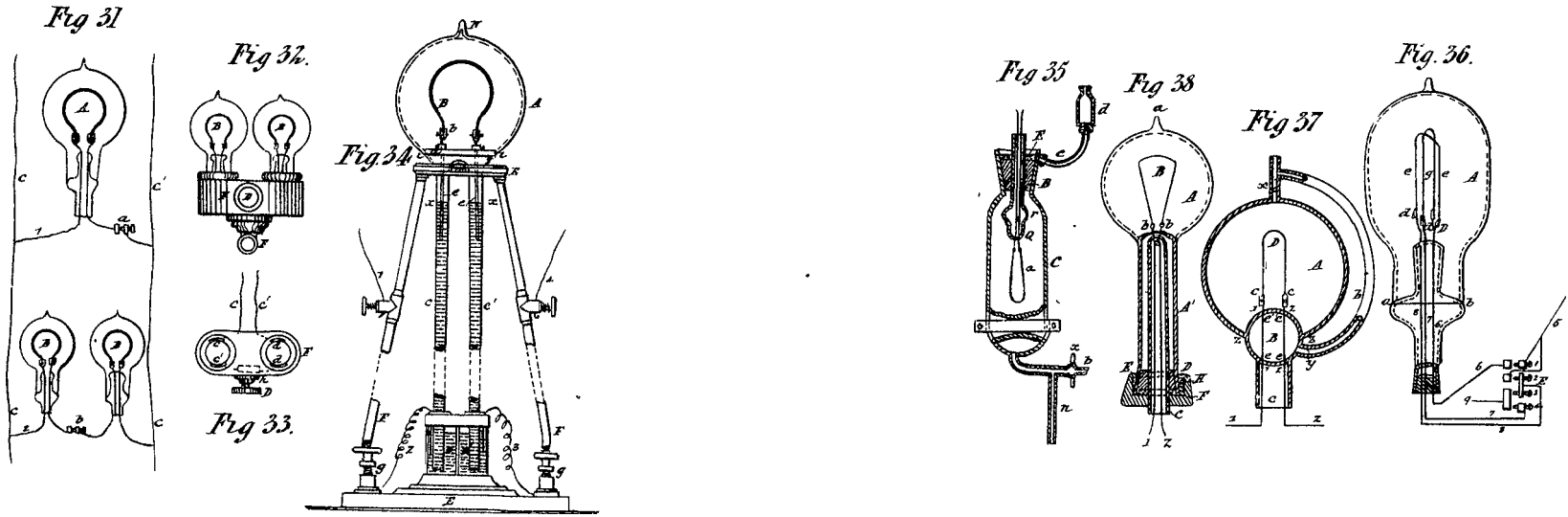
Inventor
 Thomas Alva Edison

This is the Sheet of Drawings marked B. referred to in the annexed Letters of Registration granted to Thomas Alva Edison, this second day of April A.D. 1881.

Augustus Loftus

PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE, SYDNEY, NEW SOUTH WALES.

C.



Wm. H. H. Smith.
 Chas. H. Smith.
 Geo. W. Prickney.

Inventor
 Thomas Alva Edison.

This is the Sheet of Drawings marked C. referred to in the annexed Letters of Registration granted to Thomas Alva Edison, this second day of April A.D. 1882.

Sig. 34

Augustus Loftus.



A.D. 1881, 7th April. No. 923.

IMPROVEMENTS IN FIRE-GRATES.

LETTERS OF REGISTRATION to Adam Cyrus Engert, for Improvements in Fire-grates.

[Registered on the 8th day of April, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS ADAM CYRUS ENGERT, of Three Mills Lane, Bromley-by-Bow, in the county of Middlesex, England, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in Fire-grates," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed ; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four ; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years : And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Adam Cyrus Engert, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof ; to have, hold, and exercise unto the said Adam Cyrus Engert, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended : Provided always, that if the said Adam Cyrus Engert shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this seventh day of April, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Fire-grates.

SPECIFICATION of ADAM CYRUS ENGERT, of Three Mills Lane, Bromley-by-Bow, in the county of Middlesex, England, for an invention entitled "Improvements in Fire-grates."

THIS invention has for its object improvements in fire-grates.

In order to prevent the formation of smoke, I cause the coal to be heated in a partially closed chamber before it is brought into the open grate to be burnt.

I provide such a chamber at the back of the grate in the position which in domestic fire-grates is usually occupied by a fire-lump. The chamber is closed at the top and bottom, back and sides, but is open in front into the grate.

The fresh coal is placed in this chamber at the back of the fire, and here where it is not exposed to the upward draught of the fire it becomes gradually heated. By suitable appliances the fuel can be drawn forward out of the chamber to supply the fire in the grate when this has burnt low.

Any vapour which may be liberated by the coal whilst in the chamber passes amongst the glowing fuel in front lying in the fire-grate and so is consumed. When the fuel is drawn forward into the fire-grate it, having become thoroughly heated in the chamber, will burn without emitting that cloud of smoke which is evolved from fresh coal placed on the top of a glowing fire.

In cases where the fire-grate is enclosed, as in a locomotive fire-box, the fuel chamber may in some cases be at the front of the grate in place of at the back.

In order that my said invention may be most fully understood and readily carried into effect, I will proceed to describe the drawings hereunto annexed.

DESCRIPTION OF THE DRAWINGS.

Figure 1 is a vertical section from front to back of an open fire-grate constructed in accordance with my invention and adapted for domestic use. Figure 2 is a sectional plan of the same, the section being taken on the line 1 1 in figure 1. Figure 3 is a vertical section of a close stove or fire-grate to which my invention is applied. Figure 4 shows also a vertical section of the fire-box and part of the boiler of a locomotive engine with my invention applied.

In figures 1 and 2, *a a* are the front bars and *b b* are the bottom bars of the grate, both much in the usual position; *c c* are the side cheeks, and *d* is a register door by which the chimney can be closed when the fireplace is out of use; all these are ordinary and well known parts; *e* is the chamber which I provide at the back of the grate in the position usually occupied by a fire-lump; it is a box forming a backward continuation of the space in which the fire is contained. The bottom of this box is a dead plate which extends so far to the front that the bottom grating *b b* is rendered thereby somewhat narrower than usual from front to back. Within the chamber *e* there is a movable back plate, *f*, which is capable of being moved within the chamber from back to front and *vice versa*, by means of the bent bars *g g* which are attached to it and serve as handles. The bars *g g* pass through holes in the back of the chamber *e* and also through other holes in the curved plate *h* underneath the bottom bars of the fireplace. The bars *g g* are thus controlled in their movements; when they are drawn forward they bring with them the movable back plate *f*, and the fuel in the chamber *e* in front of this plate is pushed out into the open fireplace. When the plate *f* is caused to return to the back of the chamber *e* the chamber will be empty, or nearly so, and it should be at once filled with fresh coal.

There will be sufficient space over the top of the fire in the grate to permit of coal being filled into the chamber *e* without difficulty. The curved plate *h* below the fire-bars also serves to direct the draught approaching the fire and cause it to pass briskly upwards between the bottom bars *b b*, so that the front of the fire may be kept bright; *k* is another curved plate hinged at the front of the register *d*, and which, when the fire is well alight, is moved forward into the position in which it is represented in figure 1; it also aids in keeping the draught to the front of the fire, so that very little air finds its way amongst the fuel at the back of the grate or into the chamber *e*; consequently the fuel in this chamber emits little or no smoke, but it becomes heated and prepared to be burnt in the fire-grate, and such gases as it evolves pass in great part amongst the ignited fuel and are consumed.

The access of air to the fuel in the chamber *e* may be further checked by attaching a narrow flap to the curved plate *k* near the hinge. This flap when the plate *k* is back against the register-door will stand in a horizontal position, or nearly so, and then will not be in the way when coal has to be put into the chamber *e*. When the curved plate *k* is moved forward to the position in which the drawing shows it, the narrow flap attached to it will incline downwards and check the entrance of air into the upper part of the chamber.

The arrangement shown in figures 1 and 2 is applicable also to kitcheners and ranges.

Figure 3 shows clearly the way in which I apply the chamber *e* and pusher *f* to a closed stove. There is in this case a door in the upper side of the chamber, by means of which it is filled.

Figure 4 shows my invention applied to a boiler furnace of the locomotive type. In the locomotive engine the chamber *e* is beneath the foot-plate of the engine.

The furnaces of vertical boilers may be similarly fitted.

Having thus described the nature of my said invention and the manner of performing the same, I would have it understood that I claim—

First—My improvements in open domestic fire-grates, kitcheners, and ranges, consisting in providing at the back, in the position usually occupied by a fire-lump, a chamber, *e*, opening into the fireplace, and provided with a movable plate or pusher, *f*, by which when it is desired to feed the fire the fuel may be pushed forward out of the chamber *e* into the fireplace, substantially as described.

Second—My improvements in open domestic fire-grates, kitcheners, and ranges, consisting in combining with them the parts *e*, *h*, and *k*, substantially as described.

Third—My improvements in closed fire-grates, consisting in combining with them the chamber *e* and back plate or pusher *f*, substantially as described.

Improvements in Fire-grates.

In witness whereof, I, the said Adam Cyrus Engert, have hereunto set my hand and seal, this thirtieth day of December, 1880.

A. C. ENGERT.

This is the specification referred to in the annexed Letters of Registration granted to Adam Cyrus Engert, this seventh day of April, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

We do ourselves the honor to state, in reply to your blank cover communication of the 14th instant, No. 1,788, transmitting Adam Cyrus Engert's petition, specification, drawings, and claim of "Improvements in Fire-grates," for our report, that we are of opinion that the prayer of the petition may be complied with.

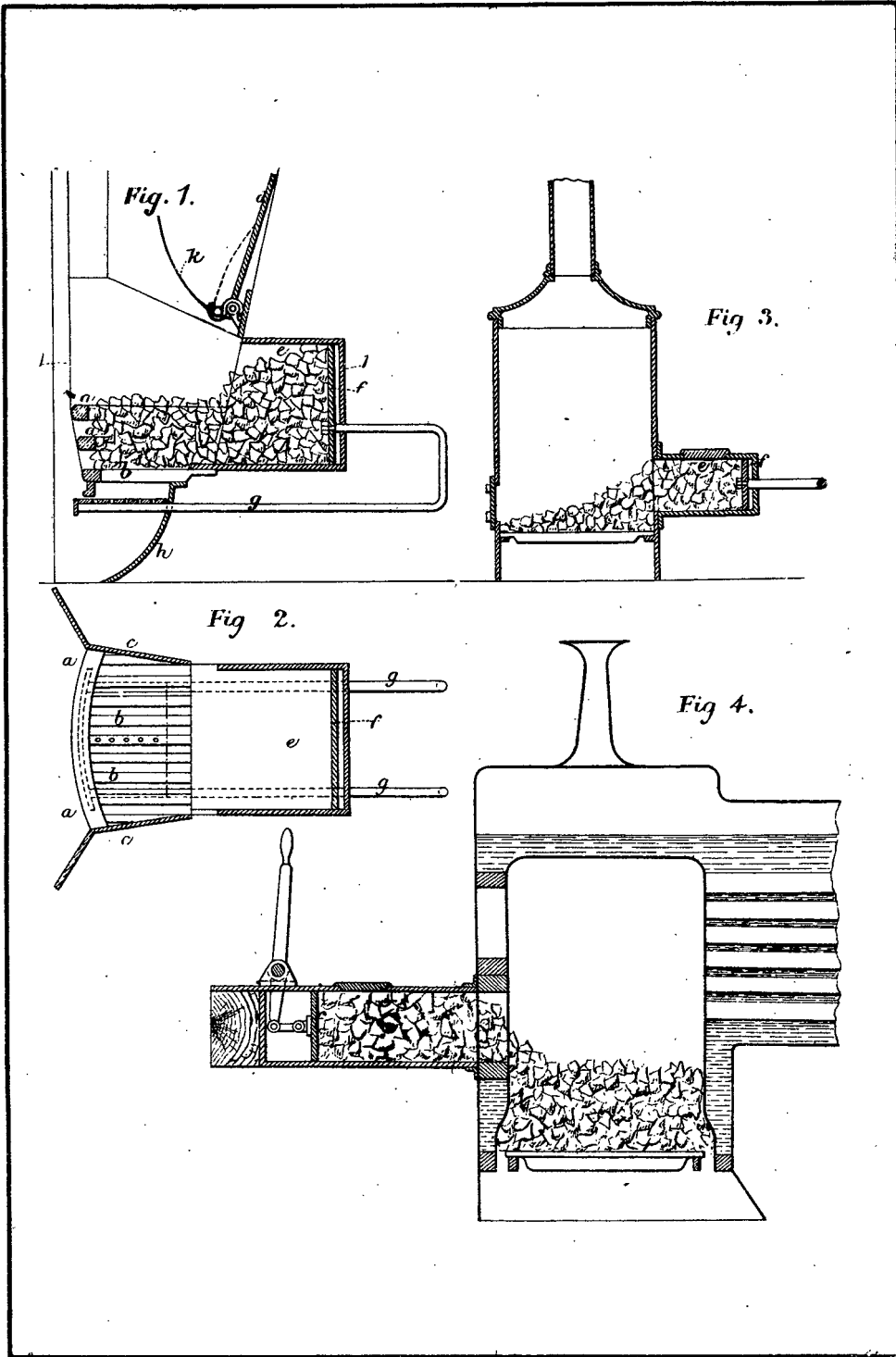
Sydney, 28 February, 1881.

We have, &c.,

JAMES BARNET.
GOTHEK K. MANN.

The Under Secretary of Justice.

[Drawings—one sheet.]



This is the Sheet of Drawings referred to in the annexed Letters of Registration, granted to Adam Cyrus Engert this seventh day of April, A. D. 1881.

Sig. 34.

PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE, SYDNEY, NEW SOUTH WALES.

Augustus Loftus.



A. D. 1881, 7th April. No. 924.

IMPROVEMENTS IN THE TREATMENT OF TASMANITE.

LETTERS OF REGISTRATION to the Tasmanite Manufacturing Company (Limited), for Improvements in the treatment of Tasmanite, for the purpose of producing silicate colours in powder, polishing powder, and moulders' powder.

[Registered on the 8th day of April, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS THE TASMANITE MANUFACTURING COMPANY (LIMITED), of Spencer-street, Melbourne, in the Colony of Victoria, hath by its Petition humbly represented to me that it is the assignee of John Henry Fector Bruyeres and George Theodore Adams Lavater, both of Melbourne aforesaid, who are the authors or designers of a certain invention or improvement in manufactures, that is to say, of an invention of "Improvements in the treatment of Tasmanite, for the purpose of producing silicate colours in powder, polishing powder, and moulders' powder;" which is more particularly described in the specification which is hereunto annexed; and that the said Company hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to it for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the Tasmanite Manufacturing Company (Limited) aforesaid, and its assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the Tasmanite Manufacturing Company (Limited) aforesaid, and its assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the Tasmanite Manufacturing Company (Limited) aforesaid, shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this seventh day of April, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in the treatment of Tasmanite.

SPECIFICATION of THE TASMANITE MANUFACTURING COMPANY (LIMITED), of Spencer-street, Melbourne, in the Colony of Victoria, the assignees of John Henry Fector Bruyeres, and George Theodore Adams Lavater, both of Melbourne aforesaid, gentlemen, the authors or designers of an invention entitled "Improvements in the treatment of Tasmanite for the purpose of producing silicate colours in powder, polishing powder, and moulders' powder."

THIS invention consists of certain improvements in the treatment of a mineral known as Tasmanite, with the object of making it of some commercial value. By our invention we produce silicate colours, polishing powder, and moulders' powder. To produce silicate colours of the darker hues, we take the raw material in lumps and evaporate its moisture by heat; practically we do this by subjecting it to a heat of about 120° Fahrenheit in a drying chamber for about twenty-four hours. The dried material we then calcine in a retort until all the ingredients inimical to the manufacture of paint are expelled. For this purpose we place about 2 cwt. at a time in each retort, and submit it to destructive distillation and calcination, at a temperature of (say) 1,500° to 2,000° Fahrenheit for four or five hours, the gases given off during the process of calcination being utilized as fuel or for the manufacture of oils for varnish, solvents, &c. The cooled calcined material we then grind to a fine powder in a Chilian mill or in any other suitable pulverizer, and then "silk dress" it like flour. This dressed material we then grind with oil or water, preferably the latter, in a paint mill, tinting as required; then evaporate the water by heat, and the product is a fine, dry, silicate colour. When about to be used, it should be mixed with water or with raw or boiled oil to the required consistency in the ordinary manner.

To produce silicate colours of the lighter hues, we substitute calcination in a reverberatory furnace for calcination in a retort. We do this in order to expel all the carbon, which we find takes about six hours at or nearly at white heat in order to accomplish. Otherwise the treatment is just the same as that already described for colours of darker hues.

To produce a polishing powder suitable for polishing metals, lenses, &c., we first dry the raw Tasmanite as already described, and then calcine it in a reverberatory furnace until all the colouring matter is destroyed. This generally takes about twelve hours. The earthy portions are then removed by washing, and the silicate residuum is ground with water in a mill until it becomes an impalpable powder, and finally evaporate the moisture by heat, the product being a splendid polishing powder for metals. If it is required finer than this, as for lenses, &c., we repeat the operation of grinding with water and evaporating as often as required.

To produce moulders' powder, we commence by drying the raw Tasmanite as usual, and then (omitting the calcination) we pulverize it in a suitable machine such as a Chilian mill and silk dress it. The dressed material is the product required.

Having thus described the nature of our invention and the manner of performing same, we would have it understood that we do not confine ourselves to the precise details herein set forth and described, so long as the nature of our invention be retained, but

What we claim is—

The manufacture of silicate colours, polishing powder, and moulders' powder from Tasmanite, substantially as herein described and explained.

TASMANITE MANUFACTURING COMPANY (LIMITED).

J. E. L. TUCKER,
Secretary.

Witness—

EDWD. WATERS,
Melbourne, Patent Agent.

This is the specification referred to in the annexed Letters of Registration granted to the Tasmanite Manufacturing Company (Limited), this seventh day of April, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 9 February, 1881.

The application of the "Tasmanite Manufacturing Company," as assignees of Messrs. J. H. F. Bruyeres, and G. T. A. Lavater, for Letters of Registration for "Improvements in the treatment of Tasmanite for the purpose of producing silicate colours in powder, polishing powder, and moulders' powder," having been referred to us, we have examined the specifications accompanying the same, and have now the honor to report that we see no objection to the issue of Letters of Registration as prayed for. We presume that the Attorney General will see that a proper deed of assignment is produced from the inventors to the Company.

We have, &c.,

J. SMITH.
CHARLES WATT.

The Under Secretary of Justice.



A.D. 1881, 7th April. No. 925.

IMPROVEMENTS IN APPARATUS EMPLOYED IN THE BURNING OF SULPHUR.

LETTERS OF REGISTRATION to Henry Glover, for Improvements in apparatus employed in the burning of sulphur, or of materials containing sulphur, and in the application and use of the heat generated.

[Registered on the 8th day of April, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS HENRY GLOVER, of Silvertown, Victoria Docks, in the county of Essex, in the Kingdom of England, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention of "Improvements in apparatus employed in the burning of sulphur, or of materials containing sulphur, and in the application and use of the heat generated," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Henry Glover, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said Henry Glover, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said Henry Glover shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this seventh day of April, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Apparatus employed in the burning of Sulphur.

SPECIFICATION of HENRY GLOVER, of Silvertown, Victoria Docks, in the county of Essex, England, for "Improvements in apparatus employed in the burning of sulphur, or of materials containing sulphur, and in the application and use of the heat generated."

ACCORDING to certain methods of burning sulphur, or materials containing sulphur, capable of being employed in the manufacture of sulphuric acid, a certain portion of sulphur is very liable to be volatilized.

Now, my said invention relates to effecting the entire combustion of the volatilized sulphur, and at the same time utilizing the heat that is produced from the entire combustion of the whole of the sulphur; and it consists in the employment of a mass of fire-brick work, or other suitable material, set pigeon-hole-wise, or in any other convenient manner, between the burning-plate of the furnace and the sulphuric acid chambers, or other apparatus, so as to form a reservoir of heat, in which heat may be conserved, and any sublimed sulphur, after admixture with the proper proportion of air, be burnt. The air previous to admission may, if necessary, be heated by the waste heat of the burning sulphur, or by any other suitable means, and the quantity of air admitted may be measured by an anemometer so as to secure the proper admixture of gases for any subsequent process. By the above-mentioned arrangements I obtain a very high temperature, and at any convenient portion of the apparatus I place platinum or other vessels, in which I concentrate sulphuric acids or other liquids.

The accompanying drawing illustrates one mode of carrying out my said invention, figure 1 being a longitudinal section, and figure 2 a sectional plan, of an apparatus constructed in accordance with the same. A is the burning-plate or hearth of the furnace, on which the sulphur or material containing sulphur is burnt, the same being supplied thereto through a hopper, B, in the usual manner. C is the passage leading to the sulphuric acid chambers—for example—into which the gases evolved from the combustion of the sulphur are conducted.

According to my said invention, I interpose between the burning-plate A and the sulphuric acid chambers, or other apparatus, a mass of fire-brick work, or other suitable material, set pigeon-hole-wise, or in any other convenient manner (an example of this is indicated at D), the same forming a reservoir of heat, and in which any sublimed sulphur may be burnt after admixture with the proper proportion of air admitted by the pipes E or other suitable apparatus situated in any convenient position. If found desirable, the air previous to admission may be heated by the waste heat of the burning sulphur, or by any other convenient means; and with the view to facilitate the process which is carried on in the sulphuric acid chambers or other apparatus, the quantity of air admitted may be measured by an anemometer, so as to secure the proper admixture of gases for the process. By the arrangements hereinbefore described I obtain a very high temperature, and in order to utilize the heat thus produced I employ platinum or other vessels, one of which is shown at F, in which I concentrate sulphuric acid or other liquids; such vessels being arranged at any suitable part of the apparatus—as for example—at the part indicated to receive and be subjected to the action of the heat generated, in the manner hereinbefore described. When the vessel F is used for concentrating sulphuric acid I prefer to construct the vessel with a surrounding trough, into which the weak acid is first conducted, and thence overflows in a partially concentrated condition into the body of the vessel, by which means the wear of the vessel is reduced to a minimum. Pans or vessels containing sulphuric acid may also be arranged at any convenient parts to be acted upon by the heat—as for example—at G H the weak acid from the chambers may be first introduced into the pan G, and when partially concentrated conducted into the pan H, to be thence conducted into the vessel F, where it is finally concentrated to the strength of the oil of vitriol, or such other density as may be required, whilst fresh acid is introduced into the pan G, and thence conducted into the pan H, to be in its turn subsequently passed into the vessel F for final concentration to the required strength, so that the operation proceeds in a continuous manner, and much of the available heat is utilized.

It is obvious that the details of arrangement of the apparatus may be greatly varied in practice without departing from the principle of my invention—as for example—two or more of the heat reservoirs D may be employed, either in superposition or side by side, or otherwise, or any combination of these may be used; and the concentrating vessels or pans may be placed in any convenient position, either so as to be heated by the gases before the latter enter the reservoir, or in any position in or beyond the same; the concentrating vessels or pans may also, if desired, be provided with covers so as to admit of the products evolved being drawn off independently of the products from the combustion of the sulphur; or when a number of vessels or pans are used, one or more of them may be covered whilst the other or others are left open, so that the products of evaporation from such of them as it may be desired to maintain separate are drawn off direct, whilst the products of evaporation from the others are allowed to pass with the products from the combustion of the sulphur to the sulphuric acid chambers or other apparatus. I therefore wish it to be understood that, although I have given as an example a mode of carrying out my said invention which will be found convenient in practice, I do not confine myself to the details hereinbefore described and illustrated on the accompanying drawings, but what I consider to be novel and original, and therefore claim as the invention, is—

First—The employment in apparatus for burning sulphur, or materials containing sulphur, of reservoirs of heat, substantially as and for the purpose hereinbefore described.

Second—In apparatus for burning sulphur, or materials containing sulphur, the combination with reservoirs of heat arranged as herein set forth, of vessels or pans for concentrating sulphuric acid or other liquid, substantially as hereinbefore described.

In

Improvements in Apparatus employed in the burning of Sulphur.

In witness whereof, I, the said Henry Glover, have hereunto set my hand and seal, this eleventh day of January, one thousand eight hundred and eighty-one.

HENRY GLOVER.

Signed and sealed in the presence of—

CHAS. MILLS,

47, Lincoln's Inn Fields, London.

This is the specification referred to in the annexed Letters of Registration granted to Henry Glover, this seventh day of April, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

The application of Mr. Henry Glover for Letters of Registration for "Improvements in apparatus employed in the burning of sulphur, or of materials containing sulphur, and in the application and use of the heat generated," having been referred to us, we have examined the specification and drawings accompanying the same, and have now the honor to report that we see no objection to the issue of Letters of Registration as prayed for.

Sydney, 7 March, 1881.

We have, &c.,
J. SMITH.
CHAS. WATT.

The Under Secretary of Justice.

[Drawings—one sheet.]

FIG. 1.

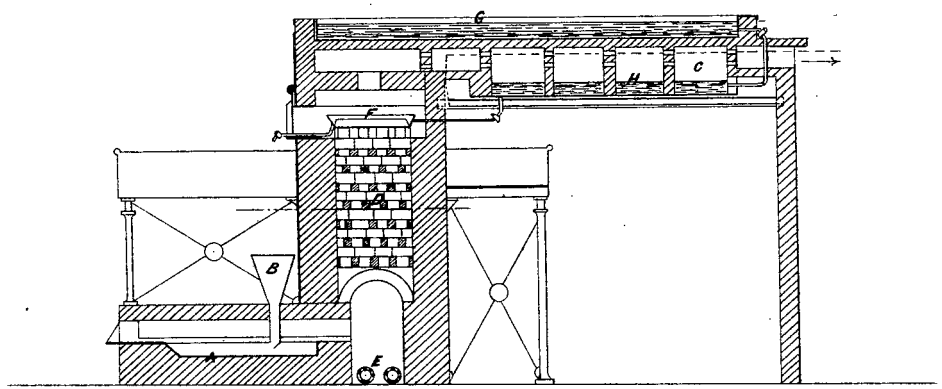
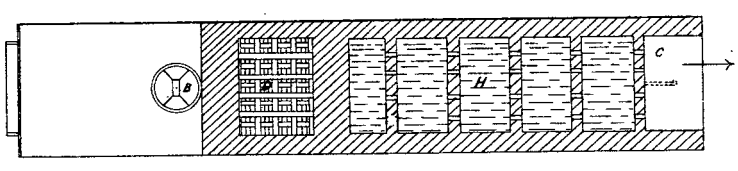


FIG. 2.



*This is the Sheet of Drawings referred to in the annexed
 Letters of Registration, granted to Henry Glover, this seventh
 day of April, A.D. 1881* *Augustus Loftus.*

Fig. 34.



A.D. 1881, 7th April. No. 926.

AN IMPROVED COMBINATION FOR THE PREVENTION OF WASTE OF WATER.

LETTERS OF REGISTRATION to William Dalziel, for an improved combination of cock and valve for the positive prevention of waste of water for water-closets and other domestic purposes.

[Registered on the 11th day of April, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS WILLIAM DALZIEL, of 62, Sussex-street, Sydney, in the Colony of New South Wales, coppersmith and brassfounder, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "An improved combination of cock and valve for the positive prevention of waste of water for water-closets and other domestic purposes," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said William Dalziel, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said William Dalziel, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said William Dalziel shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this seventh day of April, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

An improved combination for the prevention of waste of water.

SPECIFICATION.—Improved combination of cock and valve for the positive prevention of waste of water for water-closets and other domestic purposes.

TO ALL IT MAY CONCERN: Be it known that I, WILLIAM DALZIEL, of 62, Sussex-street, Sydney, in the county of Cumberland and Colony of New South Wales, coppersmith and brassfounder, send greeting:

WHEREAS I am desirous of obtaining Letters of Registration for securing unto me Her Majesty's special license that I, my executors, administrators, and assigns, and such others as I or they should at any time agree with, and no others, should or lawfully might, from time to time, and at all times during the term of fourteen years to be computed from the day this instrument is left at the office of the Colonial Secretary in Sydney, make, use, exercise, and vend within the Colony of New South Wales, an invention for the prevention of waste of water from constant high pressure service, more especially adapted for water-closets and other domestic purposes, the same being arranged by a peculiar combination of cock and valve; and in order to obtain the said Letters of Registration must, by an instrument in writing under my hand, particularly describe the working of the said invention in such a manner that others may understand and carry into effect the same:

Now know you that I, the said William Dalziel, do hereby declare the nature of the said invention, and by reference to the drawings and the following description, so that any one being skilled will be enabled to do the same and carry into effect, that is to say—

Fig. 1 represents a horizontal section of my improved combination of cock and valve for the prevention of waste of water for water-closets and other domestic purposes, the plane of section indicated by the line *xx*, fig. 2.

Fig. 2 is a vertical longitudinal section of the same taken upon the plane of *yy*, fig. 1.

Fig. 3 is a detailed vertical, sectional view, showing the parts in a different position.

Similar letters of references indicate corresponding parts.

This invention has for its object the prevention of the waste of water or other liquids drawn from reservoirs or other limited supply.

This invention consists in providing the cock through which such liquid is drawn with a self-acting apparatus whereby, after a certain quantity of the liquid has been drawn, the supply from the main will be stopped. The apparatus for stopping the flow of the liquid consists of a piston which is gradually raised by the liquid, and carries a valve whereby the discharge is ultimately stopped, the quantity thus supplied being regulated by the size of the orifice leading from the main service into the cylinder C and under the piston D.

By the use of this invention the waste of water is not only prevented but the destruction of valuable property prevented, either by design or neglect, that is to say, that no person can cause it to flow more than the given quantity unless a person stands by to turn the cock a quarter turn and back again, and then only will the resumption of the flow take place.

AA in the drawing represents the stationary pipe or conduit of the cock.

BB is the movable cock. The pipe A is at *a* connected with the water supply pipe, and contains a partition, *b*, which has an aperture, *c*, near its outer end, the said aperture serving to connect the chambers or channels that are formed by the partition *b*.

C is a cylinder arranged under the upper arm of the pipe A, and above the outer part of the cock B.

The cylinder C contains a piston, D, which, on its stem, carries a valve, *d*, for closing the aperture *c*.

A small pipe or conduit, *e*, leads from the outer channel *f* of the pipe A into the lower part of the cylinder C.

The cock B is open at its inner end to receive water from the inner channel *g* of the pipe A, and has a discharge opening, *h*, whereby it communicates with the nozzle *i*. The front part of the cock is solid, *i.e.*, not continued tubular, and contains a transverse orifice, *j*, for drawing water from the cylinder C, which has an opening, K, in its bottom.

The water from the supply pipe passes up the channel *f* through the orifice *c*, down the channel *g*, and into the cock B, being conducted into the nozzle, if said cock is turned on as in fig. 2. At the same time water passes slowly into the cylinder C through the pipe or conduit *e*, and raises the piston D until the same finally closes the orifice *c*, stopping the further discharge of water, *i.e.*, whenever the cylinder is filled the pipe will be certainly closed.

The cock can then be turned a quarter of a turn and so discharge the water from the cylinder C through the openings K and *j*, as shown in fig. 3, when the valve will be again open for a further discharge by returning the cock a quarter of a turn, and so on as often as you please.

l is an air pipe connecting the upper part of the cylinder C with the nozzle *i*; its object is to carry off the air when the piston raises, and to let it in when the same descends.

Having thus described my invention, what I claim as new and desire to secure by Royal Letters Patent—

- 1st. The cock provided with a piston and valve, which are operated upon by a small portion of the liquid passing through the cock for automatically closing the same, as set forth.
- 2nd. The pipe A divided by a partition, *b*, into the two channels, *f* and *g*, that are connected by the aperture *c*, which can be closed by a valve, substantially as herein shown and described.
- 3rd. The pipe *e* leading from the channel *f* of the main pipe A to the cylinder C under the piston D, which closes valve, as set forth.
- 4th. The air pipe for the egress and ingress of air from the cylinder C, as required and set forth.
- 5th. The cock B constructed with two sets of openings, one for discharging from the main pipe A and the other for emptying the cylinder C, as herein shown and described.

The above is the specification of my invention, signed by me this 19th day of February, A.D. 1881.

W. DALZIEL.

Witness—F. CLARKE.

This

An improved combination for the prevention of waste of water.

This is the specification referred to in the annexed Letters of Registration granted to William Dalziel, this seventh day of April, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

We do ourselves the honor to state, in reply to your blank cover communication of the 22nd ultimo, transmitting William Dalziel's petition, specification, and drawing of an invention for "positive waste of water prevention for water-closets and other domestic purposes" for our report, that we are of opinion that the prayer of the petitioner may be complied with.

Sydney, 4 March, 1881.

We have, &c.,
JAMES BARNET.
THOMAS RICHARDS.

The Under Secretary of Justice.

[Drawings—one sheet.]

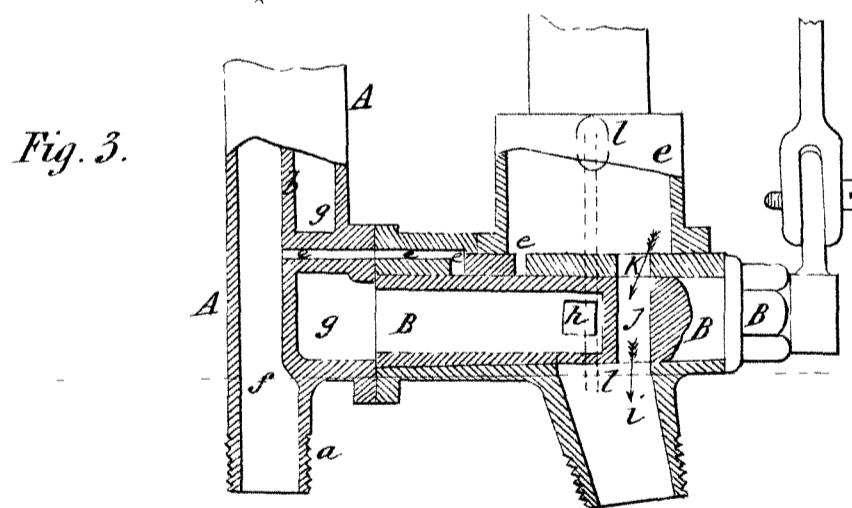
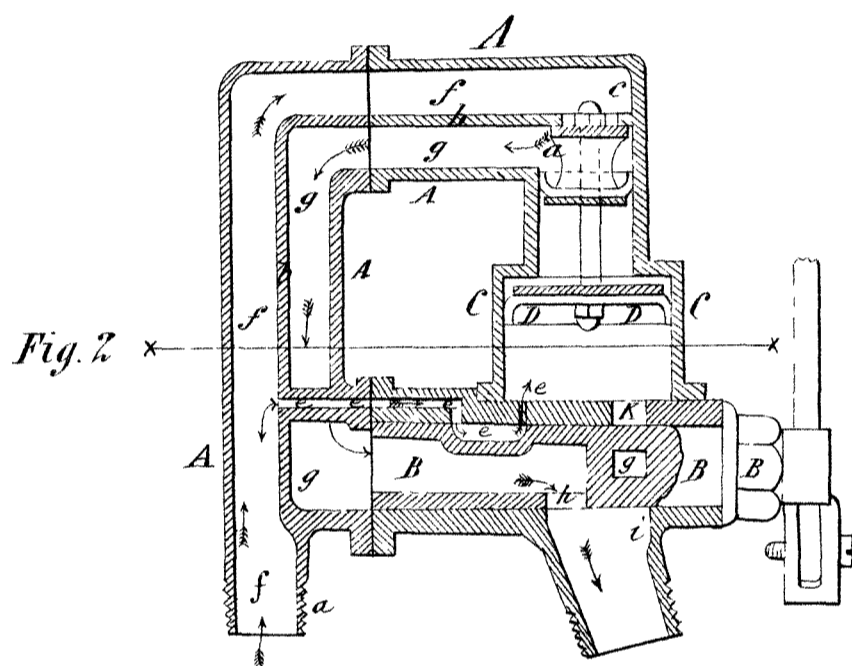
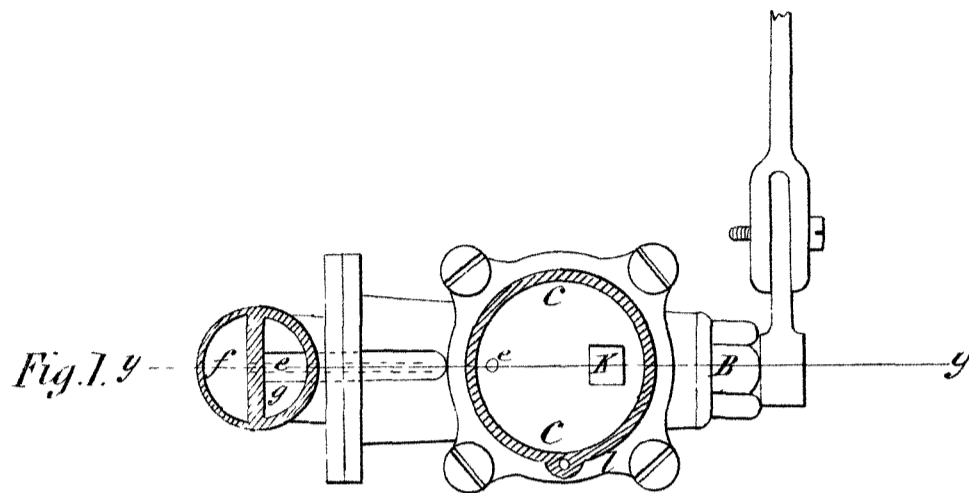
No. 927.

[Assignment of No. 242A. See page 73 of Return of 21 June, 1872.]

No. 928.

[Assignment of No. 750. See Letters of Registration for 1879, page 81.]

W. Dalziel's
Positive Waste of Water Preventer
For Water Closets and other domestic purposes.



Inventor
W. Dalziel
Feb 18th 1881.

This is the Sheet of Drawings referred to in the annexed
Letters of Registration granted to William Dalziel, this
seventh day of April A.D. 1881.

Augustus Loftus



A.D. 1881, 16th May. No. 929.

IMPROVEMENTS IN REFRIGERATING APPARATUS.

LETTERS OF REGISTRATION to Thomas Bell Lightfoot, for Improvements in Refrigerating Apparatus.

[Registered on the 17th day of May, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS, (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS THOMAS BELL LIGHTFOOT, of Dartford, in the county of Kent, England, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in Refrigerating Apparatus," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed ; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four ; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years : And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Thomas Bell Lightfoot, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof ; to have, hold, and exercise unto the said Thomas Bell Lightfoot, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended : Provided always, that if the said Thomas Bell Lightfoot shall not, within three days after the granting of these Letters of Registration, register the same in the proper office of the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this sixteenth day of May, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Refrigerating Apparatus.

SPECIFICATION of THOMAS BELL LIGHTFOOT, of Dartford, in the county of Kent, England, for an invention entitled "Improvements in Refrigerating Apparatus."

IN apparatus for effecting refrigeration by compressing, cooling, and afterwards expanding air while it is performing work, serious difficulties arise from deposition of moisture in the form of ice and snow, causing obstruction of pipes and passages, and also affecting the chamber in which the cold air is employed. My invention relates to means of overcoming these difficulties, which I effect in the following manner:— Instead of allowing the compressed and cooled air to expand to its full extent in one cylinder, I employ two or more cylinders of different sizes in which it expands by stages, introducing between the successive cylinders suitable vessels or passages in which moisture is deposited in liquid form, and from which it can be run or blown off. Thus, by the first stage of its expansion the temperature of the air may be sufficiently reduced to effect condensation of the greater part of its moisture without freezing it, the more intense cold being produced in the subsequent stages of expansion after the condensed moisture has been removed. In most cases two stages of expansion suffice for the object in view, and in such cases, instead of employing two separate cylinders, one cylinder with a trunk or differential piston may be employed, the first expansion taking place in the annular space of the cylinder, and the second expansion in its full capacity.

The accompanying drawings represent a combined steam-engine and refrigerating apparatus arranged according to my invention. Fig. 1 is a side elevation, and fig. 2 a plan of the whole apparatus. Fig. 3 is a longitudinal section of the expansion cylinder, and fig. 4 is a longitudinal section of the chambers for deposition of moisture. A is the steam cylinder, and B the expansion cylinder arranged in line with it, their pistons being fixed on one rod, which is connected to a crank on the fly-wheel shaft C. Another crank on the shaft is connected to the piston of a double-acting air-compressing pump, D. This pump is supplied with air by the pipe *d*, compresses it and discharges it into the coolers E, which are conveniently arranged as shown under the engine bed, and which may be of any known construction, as for example a number of tubes round which water is caused to circulate, so as to abstract from the air a large portion of the heat developed by its compression. From the coolers E the cooled compressed air passes to the front slide case F of the expansion cylinder B, which has a trunk piston as shown in fig. 3. A certain portion of the air is at each stroke admitted to act in the front annular space of the cylinder B, and expands therein, performing work and becoming considerably reduced in temperature. The exhaust air from this annular space passes by the pipe *f* to a set of chambers, G, in which it is caused to travel upwards and downwards as indicated by the arrows in fig. 4, depositing the moisture suspended in it. For more effectually securing deposit of the moisture, a number of inclined screens, *g*, of wire are placed in the descending channels, so that the air current is broken up and subdivided, the particles of moisture being more or less retained by the wires and gliding down along them. The moisture that collects at the bottom of the vessels G is from time to time run off or blown off by opening a stop-cock, *g*¹, in a pipe communicating with the bottoms of the deposit vessels. From these vessels the air, which is still under considerable pressure, passes to the hinder slide case H of the expansion cylinder B, and a portion of it is at each stroke admitted to act in the full capacity of B, expanding and performing work, and thereby having its temperature cooled to a very low degree. The exhaust air thus refrigerated is conveyed by the pipe *h* to the chamber or chambers where it is employed for refrigerating purposes. Such being the general construction and action of the apparatus, I will now refer to certain details which I find of advantage. The suction valves of the air-compressing pump D, instead of being self-acting, are worked from cams *c* on the fly-wheel shaft. An eccentric, *k*, works a force pump, K, for causing circulation of water through a jacket surrounding the compressing pump D, and through the coolers E. An eccentric, *l*, works simultaneously the slides of the expansion cylinder B, and of the steam cylinder A, and another eccentric, *m*, moves cut-off slides working on the backs of the main slides as shown in fig. 3. The rod of these cut-off slides is made with a swivel at L, where it is jointed to the eccentric rod, so that it can be turned round by a wrench or handle applied at its end M. Where the rod passes through the front cut-off slide N of the expansion cylinder, it is made with a screw-thread so that by turning the rod in the one direction or the other the cut-off slide can be adjusted to give more or less expansion in the annular space of the cylinder B. The cut-off slides of the steam cylinder may be made adjustable in like manner, and also the hinder slide O of the expansion cylinder, or the latter may be made to retain always a definite position by fitting it, as shown in fig. 3, between screw collars stationary on the slide rod.

Although I have shown a particular form and arrangement of apparatus, a considerable portion of which is of well-known construction and operation, I do not limit myself to this, as the parts may be arranged and proportioned in many different ways. For example, instead of employing a single expansion cylinder, B, having a piston of differential area so that two successive expansions of the compressed air are effected in it, there might be two separate cylinders, one larger than the other, so that the air might undergo its first expansion in the smaller cylinder, and after depositing its moisture might further expand in the larger cylinder.

Having thus described the nature of this invention and in what manner the same is to be performed, I claim as my invention in respect of apparatus in which refrigeration of air is effected by compressing it, cooling it, and then permitting it to expand while it performs work—

First—The herein-described method of separating moisture from the air by causing the air to expand in the first instance only so far that a large portion of its moisture is precipitated as liquid which can be run off, the air thus in great measure dried being afterwards further expanded.

Second—The use of refrigerating apparatus constructed and operating substantially as herein described with reference to the accompanying drawings.

In witness whereof, I, the said Thomas Bell Lightfoot, have hereunto set my hand and seal this twenty-sixth day of January, in the year of our Lord one thousand eight hundred and eighty-one.

T. B. LIGHTFOOT.

This is the specification referred to in the annexed Letters of Registration granted to Thomas Bell Lightfoot, this sixteenth day of May, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Improvements in Refrigerating Apparatus.

REPORT.

Sir, We do ourselves the honor to report, in reply to your blank cover communication of the 15th instant, No. 2,789, transmitting Mr. Thomas Bell Lightfoot's Petition for the registration of "Improvements in Refrigerating Apparatus," that we are of opinion that the prayer of the Petitioner may be granted, in terms of his specification, drawings and claim.

Sydney, 29 March, 1881.

The Under Secretary of Justice.

We have, &c.,
CHARLES WATT.
GOTHER K. MANN.

[Drawings—one sheet.]

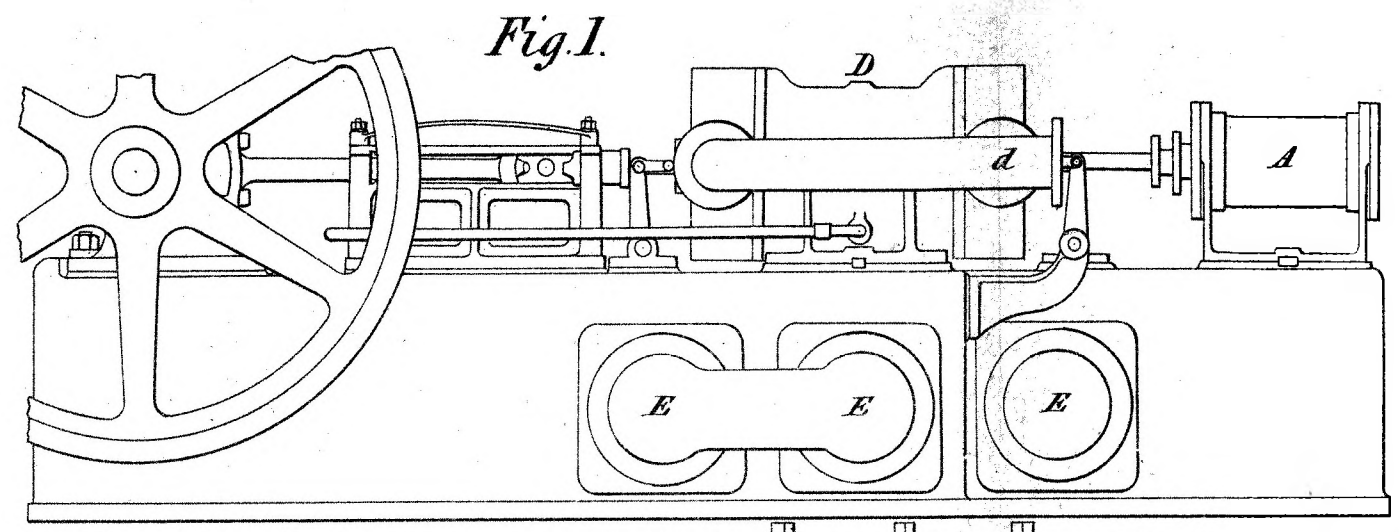


Fig. 1.

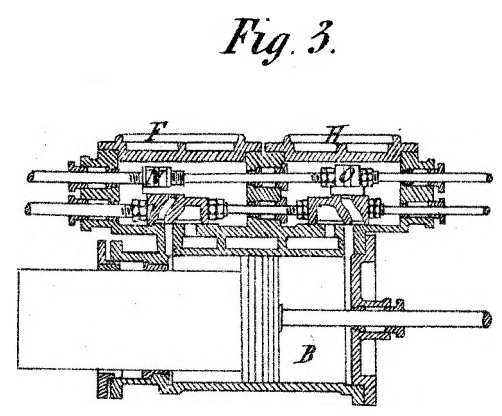


Fig. 3.

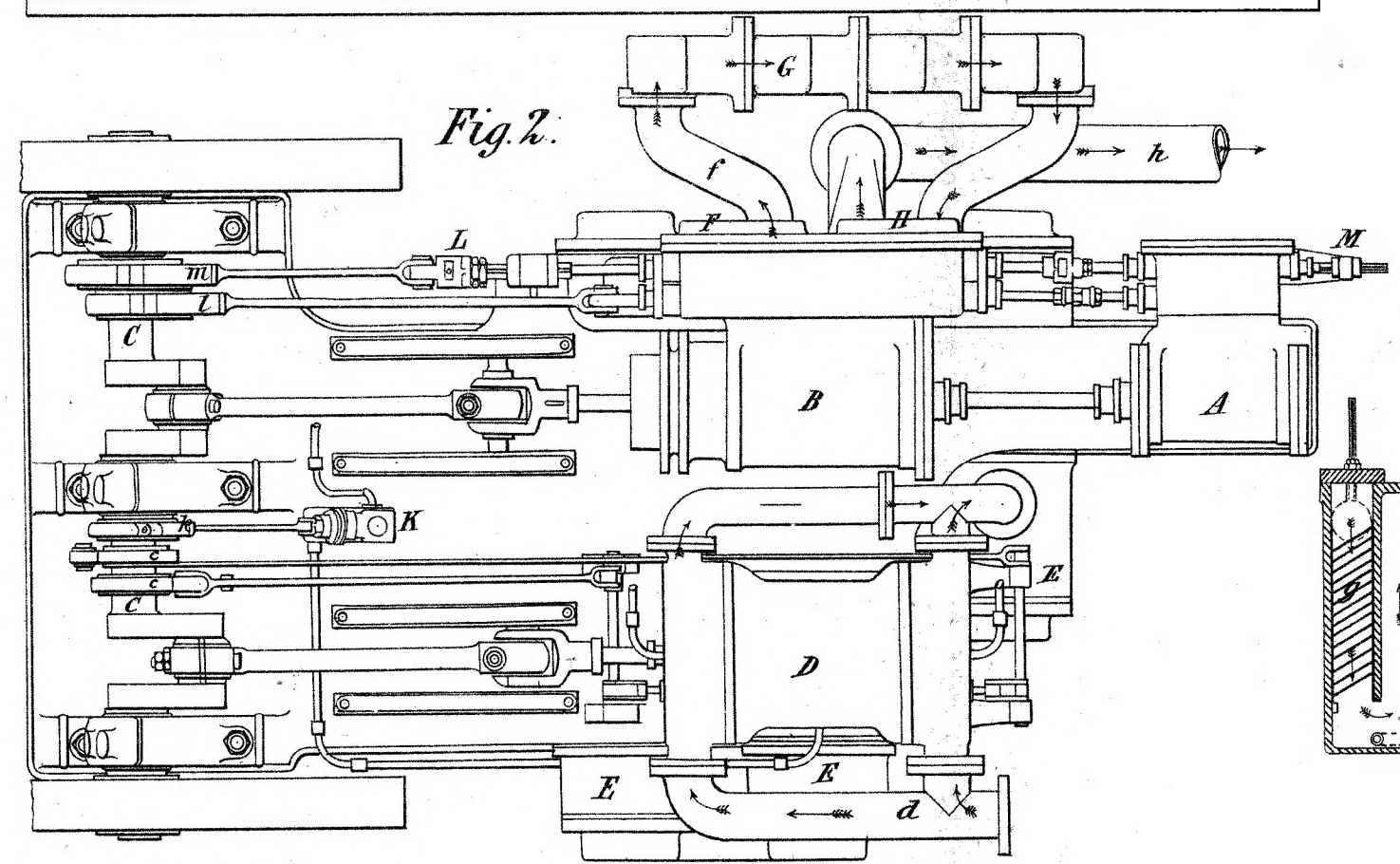


Fig. 2.

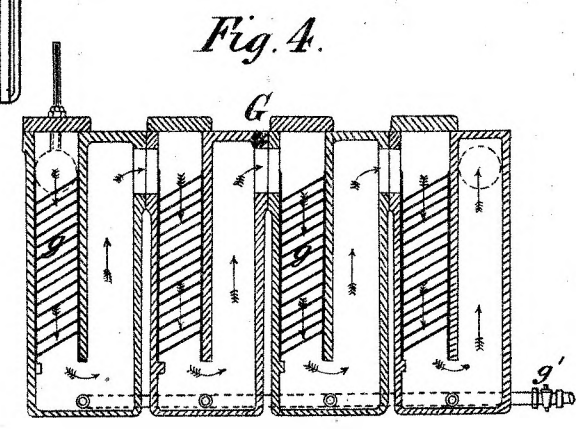


Fig. 4.

This is the Sheet of Drawings referred to in the annexed Letters of Registration granted to Thomas Bell Lightfoot, this sixteenth day of May A.D. 1881
Augustus Loftus.



A.D. 1881, 16th May. No. 930.

IMPROVEMENTS IN LAMPS.

LETTERS OF REGISTRATION to Frederick Siemens, for Improvements in Lamps.

[Registered on the 17th day of May, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS FREDERICK SIEMENS, of Dresden, in the German Empire, engineer, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in Lamps," which is more particularly described in the specification, marked A, and the three several sheets of drawings, marked B, C, and D respectively, which are hereunto annexed ; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four ; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years : And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Frederick Siemens, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof ; to have, hold, and exercise unto the said Frederick Siemens, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended : Provided always, that if the said Frederick Siemens shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this sixteenth day of May, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Lamps.

A.

SPECIFICATION of FREDERICK SIEMENS, of Dresden, in the German Empire, engineer, for an invention entitled "Improvements in Lamps."

My invention relates to a construction of lamps wherein the heat of the products of combustion from the flame is imparted to the air supply or to the combustible gas, or to both, for increasing the illuminating power of the flame, by causing such products of combustion and the air or gas to pass in opposite directions through adjacent regenerative chambers or passages filled with materials offering extended surfaces for giving off and taking up heat. I construct such lamps as follows:—An annular burner consisting by preference of a number of small vertical tubes rising from an annular chamber, into which the combustible gas passes, has its central space formed into a regenerative chamber containing materials offering extended surfaces for taking up heat, which chamber communicates at bottom with a passage or pipe leading to a chimney, and is extended upwards at top to a certain height beyond the level of the burner, such extension being by preference of reduced diameter. This inner chamber serves for the downward passage of the products of combustion which pass into it from the top of the flame at its upper end, and are drawn downwards through it by the draught of the chimney into which the products escape after imparting the greater part of their heat to the sides of the chamber and the materials contained therein.

Surrounding the outside of the burner is a second chamber open at its upper and lower ends, also containing material offering extended surfaces, which material becomes heated by conduction and radiation from the heat given off to the central chamber, and imparts such heat to the air passing upwards through the chamber on its way to the flame of the burner, at or about the level of which the chamber terminates, and at which point it is by preference made of reduced diameter. At the upper edge of such outer chamber, as also surrounding the extension of the inner chamber at a certain distance above the top of the burner, I prefer to provide annular notched or comblike shields which serve to divide the heated air supply into a number of separate jets that are made to impinge upon the outer and inner surfaces of the flame, thereby increasing its vividness and steadiness. As the flame of the burner is drawn inwards directly over the top of the inner chamber, it is necessary to carry this up to such a height as to afford the desired length of flame; for this purpose I fit on to the upper end of such chamber, which terminates at a moderate height above the burner, a separate cylinder, by preference of fire-clay or other suitable refractory material, that will readily withstand the high heat of the flame, at that point, and that can be renewed when it becomes deteriorated.

I prefer to construct the filling of the regenerative chambers of lamps of the kind above referred to of a number of perforated hollow cones or frustrums of cones of metal or fire-clay, placed one above the other, so that the currents of the products of combustion or the air in passing through the perforations of each cone in succession are effectually broken up, and each particle thereof brought into intimate contact with heat-absorbing or heat-imparting surfaces.

According to one arrangement for producing the requisite downward draught in the central chamber of the above-described lamp, I connect the lower end thereof to a pipe or pipes that is or are led up to and open into a tube situated immediately above the chimney of the lamp. By this arrangement, when the lamp is first lighted the whole of the products of combustion will pass up through the chimney and impart heat to the tube above, by which means a draught will be induced in the said pipes leading from the bottom of the central chamber, and after a short interval of time this draught will be sufficiently powerful to draw the whole or a great proportion of the products of combustion downwards through the chamber.

According to another arrangement suitable more particularly where a number of burners are arranged round a central stem, the arms supporting the burners constitute the pipes for leading off the products of combustion from the lower ends of the central regenerative chambers to a tube forming part of the central stem, and constituting a chimney of sufficient height for maintaining the requisite draught, this being in the first instance produced by the ignition of a gas jet inside the chimney. This gas jet may be afterwards extinguished and the draught be continuously kept up by not quite extinguishing the flames of the burners when not in use.

Lamps of the above-described construction may be adapted to burn effectually and with a steady flame without the aid of a chimney glass to the burner. For this purpose the outer regenerative chamber is made of increased vertical length, so as by the increased column of heated air passing up through it to obtain sufficient intensity of the air current for effecting perfect combustion and steadiness of flame. In this case the upper end of the outer chamber may be closed outside the burner, the whole of the air being made to pass into an annular space inside the burner, whence it is deflected in divided jets on the flame by the before-mentioned annular notched shield or deflector. When lamps constructed as above described are used in the open air the flame may be protected against the wind by a suitable lantern, by preference of bell-shape, having a wide opening at bottom.

Figs. 1 to 5 of the accompanying drawings show one arrangement of my before-described improved lamp; fig. 1 shows an elevation; fig. 2, an enlarged vertical section on line W W, fig. 3; fig. 3, a vertical section on line X X, fig. 2; fig. 4, a section on line Y Y Y, fig. 3; and fig. 5 shows a section on line Z Z, fig. 2. *a a* is a cylindrical chamber into which illuminating gas is conducted through a pipe, *a'*, which may either project from a wall or bracket, or form part of a gas pendant. In the top of the chamber is fixed a ring of small tubes, *c c*, through which the gas issues in a number of small jets, thus forming an annular burner. Within the chamber *a* is formed a second chamber, *i*, having a lateral opening communicating with the flue tube *i'*, and an upper opening concentrically within the burner *c*, and communicating with the lower end of the regenerative chamber *b*. This chamber contains one or more perforated metallic cones, *d*, and has its upper end contracted somewhat, as shown, and extended a certain height above the tops of the burner tubes *c*. Upon such upper portion is fixed the notched shield or deflector *g*, and above this is fitted a separate cylinder, *k*, by preference of fire-clay, but which may also be of other suitable heat-resisting material. Surrounding the outside of the gas chamber *a* is a casing, *e*, extending up nearly the tops of the burner tubes *c*, an annular space intervening between the two, into which are introduced one or more perforated conical frustra, *f*, and which constitutes the regenerative chamber for heating the air supply that enters the casing

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casing at the open lower end. The upper end of the casing e is turned over and notched, as shown at h , so as to form an outer notched air deflector. The flue-tube i^1 may lead to any convenient flue or passage for producing the requisite draught, but by preference it is connected as shown at fig. 1 to a tube, i^2 , immediately above the lamp, the action of which will be presently explained. The upper part of the casing e is surrounded by a gallery, o , carrying a lamp-glass, n , a metal continuation, n^1 , of which opens into the closed lower end of the tube i^2 , a slide or throttle-valve being provided at n^2 , whereby this communication may be more or less restricted.

The action of the lamp is as follows:—Illuminating gas being admitted into the chamber a , and the jets c being ignited, the lamp will first burn in the ordinary manner, that is to say, the air for supporting combustion will pass up through the regenerator f , and being partly caused to flow to the inner side of the ring of tubes will enter into combustion with the gas, and the resulting flame will be drawn upward by the draught created by the chimney glass. After this has continued a short time (a few seconds being sufficient) the tube i^2 will have become heated, and will also have heated the tube i^1 by conduction to such an extent as to induce a certain current in an upward direction in the latter, and in consequence of the suction thus produced at the upper end of the cylinder k , a portion of the heated products of combustion will be caused to pass downward from the flame through the regenerative chamber b and chamber i into the flue-tube i^1 , whence they will pass into the tube i^2 . On now more or less closing the communication between the chimney-glass o and the tube i^2 , nearly the whole of the products of combustion will be caused to pass downwards in the direction above indicated, and will thus impart their heat to the sides and filling of the regenerative chamber b . This heat will be imparted partly by radiation and partly by conduction to the regenerative chamber e and gas tubes c , and consequently also to the air and gas passing up through them, thus producing a greatly intensified light by their combustion, which is still further increased by the action of the notched air deflectors in dividing up the air supply into a number of small currents impinging on each side of the flame. By continuing the air-casing e some distance downwards as shown, and making it of heat-conducting material, a column of heated air of sufficient height will be produced therein to cause an air current of sufficient intensity for effecting perfect combustion without the aid of a chimney draught, so that in certain cases the lamp glass may be dispensed with. A small annular space is left between the cylinder o , forming the gallery and casing e , through which a small air current passes, serving to protect the glass n from becoming over-heated. As the flame of the lamp is drawn downward over the edge of the cylinder k by the down draught, it will be seen that the length of this cylinder will determine the height of the flame. It is of the greatest importance that lamps burning on the regenerative principle should have the current of heated products of combustion passing in a downward direction centrally through the burner, while the air-supply is made to pass in an upward direction surrounding the current of the products, according to my present invention, firstly, because by this arrangement the transmission of heat from the products to the air will be more perfect than with any other arrangement; and secondly, because by this means the before described draught of heated air to the burner, independently of a chimney draught, is obtained. The peculiar form of the regenerator filling, namely, perforated cones or conical rings of metal, or other heat-resisting material, is also of great advantage in offering extended surfaces for taking up and giving off heat in chambers that are comparatively of small height and width, and as compared with horizontal plates the cones not only afford greatly increased surface, but also the possibility of providing a much greater number of perforations, which is of great advantage for the perfect action of the regenerators. In small apparatus, however, the filling in for the regenerators may be dispensed with, as the surfaces of the chambers b and e will of themselves be sufficient for effecting the requisite interchange of heat. In this case it is of advantage to make the sides of the chamber b of corrugated or ribbed metal. The lamps may either be suspended by the gas supply pipe a' , or by the flue-tubes i^1 or i^2 , or they may be supported on a stand, or in any other convenient manner, and two or more may be combined as a candelabra. The tube i^2 may either be merely continued up a sufficient height to create the requisite draught, or it may be connected to a flue or passage for leading off the products of combustion, or the flue-tube i^1 may be connected directly to a chimney flue, the tube i^2 being dispensed with.

Fig. 6 shows a vertical section, and fig. 7 a sectional plan on line V V of a modified construction of the before-described lamp. The same parts are indicated by the same letters of reference. In this case the annular gas chamber a has connected to its central opening a double flue-tube, i^1 , communicating with the regenerator b , for the products of combustion, which branches to either side of the lamp, and is connected at top to the flue-tube i^2 . The construction and action of the lamp is otherwise the same as previously described. When two or more such lamps are used in combination as a candelabra they may be arranged as shown in elevation at fig. 8, where the products of combustion are caused to pass through the hollow arms i^1 , to the central stem p , the extension, p^1 , of which forms the chimney-flue for creating the requisite draught. For producing such draught in the first instance a gas-jet is provided in p^1 , which may be afterwards extinguished, and the draught may be maintained while the lamps are not in use by keeping them burning with a small flame during that time.

Lamps of the above described construction may be adapted to burn effectually and with a steady flame in the open air without the aid of a chimney glass to the burner. For this purpose the outer regenerative chamber is made of increased vertical length, so as by the increased column of heated air passing through it to obtain sufficient intensity of the air current for effecting perfect combustion and steadiness of flame.

Figs. 9, 10, and 11 show respectively a vertical section, a plan and sectional plan on line U U of a construction of lamp in which the regenerative chamber e for heating the air is made of some height, and constitutes a pedestal for the lamp, and may either be filled with conical perforated rings, as before described, or with wire gauze or other suitable material as indicated. The upper end of the chamber may either be entirely open, as in the previous arrangement, and provided both with an inner and an outer notched shield, or the space outside the burner may be closed at x , and the whole of the heated air be caused to pass between the burner tubes to the inner space y , whence it is caused by the notched shield g to impinge in divided jets upon the flame. The filling of the inner regenerative chamber b is in this case formed of perforated cones of fire-clay, d , formed in one, with cylindrical pieces, d^1 , that are separate from each other,

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so that they can be separately removed and renewed when defective. The lower end of the chamber *b* communicates with an underground flue, *g*, leading to a chimney flue for producing the necessary draught. This lamp would burn with a perfectly steady flame without a glass in a quiescent atmosphere, but when employed in the open air it should be protected from the wind or draught by a lantern, and by preference I employ for this purpose a bell-shaped glass with large opening at bottom, as shown. The lamp glass *r*, shown at fig. 6, is by preference made of the inverted bell-shape shown and of opal glass, an inverted conical mirror, *s*, being fitted on to the upper edge thereof, in order to reflect laterally and downwards that portion of the light which otherwise is projected upwards and is thus more entirely lost.

Fig. 12 shows a vertical section of a construction of my improved burner in which the internal filling of the chambers *b* and *e* is dispensed with, as hereinbefore mentioned. In this case also, the chamber *e* is surrounded by a second narrow annular chamber or passage, *e'*, through which a current of air also passes so as to take up heat that would otherwise be lost by radiation from the casing *e*, which current in impinging against the outer surface of the flame serves to steady it; a glass guard, *e''*, may also be used to increase the steadiness of the flame.

The burner is in this case shown enclosed with its chimney entirely within a lantern, for open air illumination, the arrangement being such that the burner is effectually protected against the action of external air currents, thus enabling it to burn without an ordinary chimney glass.

The lantern is for this purpose constructed of two glass frustra, A B, of which the upper one is by preference more or less opaque while the lower one is transparent. The part A is by preference of some height, and terminates in a chimney, C, covered with a cowl, C', within which is the chimney *i'* of the burner. The lower cone, B, terminates in a metal extension, D, closed near its lower end by a wire gauze or perforated diaphragm, D', and surrounded by a casing, E, closed at bottom and open at top, so that the air entering the lantern has first to pass down through the annular space between E and D and then to rise up through the diaphragm D' and tube D before arriving at the burner. The lower end of the latter extends down into D, and by means of the heat radiated therefrom produces a column of heated air therein sufficient to produce the requisite draught for the air supply of the lamp, and for effecting the perfect ventilation of the lantern, so that the products of combustion issuing into the chimney of the lantern from that of the lamp are effectually carried off.

Fig. 13 shows a part vertical section and part elevation of another modification of the burner, in which the products of combustion from the flame are not carried off from the bottom of the chamber *b*, as in the previous arrangements, but in lieu thereof the chimney *i'* has a downward extension, *i*, made of fire-clay porcelain, or other heat-resisting material, extended to some distance down into the chamber *b*, so that the flame and products of combustion first pass down into such chamber, as in the previous arrangements, and then rise up and escape through the chimney *i i'*. The heat imparted to the extension *i* is conveyed by radiation to the burner-tubes *c* and air chamber *e*. In this case the bottom of the chamber *b* may either be entirely closed, or it may have one or more small apertures for the admission of a small quantity of air, for entering into combustion with any particles of combustible gas that may escape down from the burner without being burnt at that point. By that means additional heat would be imparted to chamber *b*.

The lantern A B is similar in construction to that above described, the outer case E being dispensed with. Although I have shown the construction of burners at figs. 12 and 13 in combination with the lanterns, it is to be understood that they may also be used apart from such combination.

Having thus described the nature of my invention and in what manner the same is to be performed. I claim—

- First—A lamp wherein the products of combustion from the flame are caused to pass through and impart their heat to a regenerative chamber or passage, the filling of which presents extended heat-absorbing surfaces that impart such heat to other chambers or passages through which the air and gas supply to the lamp are passing, substantially as herein described.
- Second—A lamp wherein the products of combustion are caused to pass downwards from the flame through a central regenerative chamber within the annular burner of the lamp, while the air required for combustion passes upwards through an annular regenerative chamber surrounding the burner of the lamp, substantially as and for the purposes herein described.
- Third—In lamps wherein the products of combustion pass downwards from the flame through a central regenerative chamber, a cylindrical extension of such chamber constructed of fire-clay or other heat-resisting material, and projecting up beyond the burner to such a height as to afford the requisite length of flame, substantially as herein described.
- Fourth—A filling for the regenerative chambers of lamps, consisting of superposed hollow perforated cones or conical rings or frustra of suitable heat-resisting material, through the perforations of which the air or gases are made to pass to take up heat therefrom or impart heat thereto, substantially as herein described.
- Fifth—In lamps having regenerative chambers for taking up heat from the products of combustion and imparting such heat to the gas and air supply, a notched air deflector or shield, whereby the air supply is caused to impinge undivided currents against the flame at or above the level of the burner, substantially as herein described.
- Sixth—In lamps wherein the products of combustion are caused to pass downward through a central regenerative chamber, the method of producing the requisite down draught in the said chamber by connecting its lower end to a tube or tubes passing up to a chimney-flue above the lamp, the heat from which produces the requisite draught in the said flue, substantially as herein described with reference to figs. 1 to 6 of the accompanying drawings.
- Seventh—In regenerative lamps, the combination of the burner-tubes *c*, the regenerative chambers *b*, *e*, provided with filling, *d*, *f*, the notched shield or deflectors, *g*, *h*, and the tubular extension *k*, arranged and operating as herein described with reference to figs. 1 to 6 of the drawings.

Eighth—

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- Eighth—In regenerative lamps, the combination of the burner-tubes *c*, regenerative chambers *b*, *e*, tubular extension *k*, flue-pipe *i* *i*¹, and chimney *i*², arranged and operating as herein described with reference to figs. 1 to 6 of the accompanying drawings.
- Ninth—In regenerative lamps, the regenerative chamber *e*, for heating the air supply, having a downward extension, in order to produce an upward air current of sufficient intensity to effect perfect combustion without the aid of a chimney draught, substantially as herein described with reference to figs. 1 to 5 of the drawings.
- Tenth—In regenerative lamps wherein the products of combustion are caused to pass downwards through a central regenerative chamber, the method of connecting the lower ends of the central chamber of two or more such lamps by tubes to a central flue-pipe forming part of the stem by which the lamps are supported, such flue-pipe being provided with a gas-jet for producing the requisite draught, substantially as herein described with reference to fig. 8 of the accompanying drawings.
- Eleventh—The construction of lamps wherein the chimney is extended downwards into a central chamber within the burner, so that the products of combustion have first to pass down into such chamber in order to escape thence up the chimney, substantially as herein described with reference to fig. 13 of the drawings.
- Twelfth—The construction of lamps wherein the air supply is caused to ascend through two concentric annular passages, substantially as and for the purposes herein described with reference to figs. 12 and 13 of the drawings.
- Thirteenth—The construction of lantern arranged in combination with a lamp, substantially as herein described with reference to figs. 12 and 13 of the drawings, the upper end of the lantern being provided with a chimney enclosing the chimney of the lamp, while the lower end has a downward extension into which projects the lower end of the lamp so as to impart heat to the air ascending therein.
- Fourteenth—The construction of regenerative lamp herein described with reference to figs. 9 to 11 of the drawings, adapted for burning with an open flame.

In witness whereof, I, the said Frederick Siemens, have hereunto set my hand and seal, this first day of February, in the year of our Lord one thousand eight hundred and eighty-one.

FREDERICK SIEMENS

This is the specification, marked A, referred to in the annexed Letters of Registration granted to Frederick Siemens, this sixteenth day of May, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 5 April, 1881.

We do ourselves the honor to return to you the documents transmitted to us under your blank cover communication of the 30th ultimo, No. 3,246, which have reference to Frederick Siemens' application for Letters of Registration for "Improvements in Lamps," and to report that we are of opinion that the prayer of the petitioner may be granted.

We have, &c.,
GOTHER K. MANN,
THOS. RICHARDS.

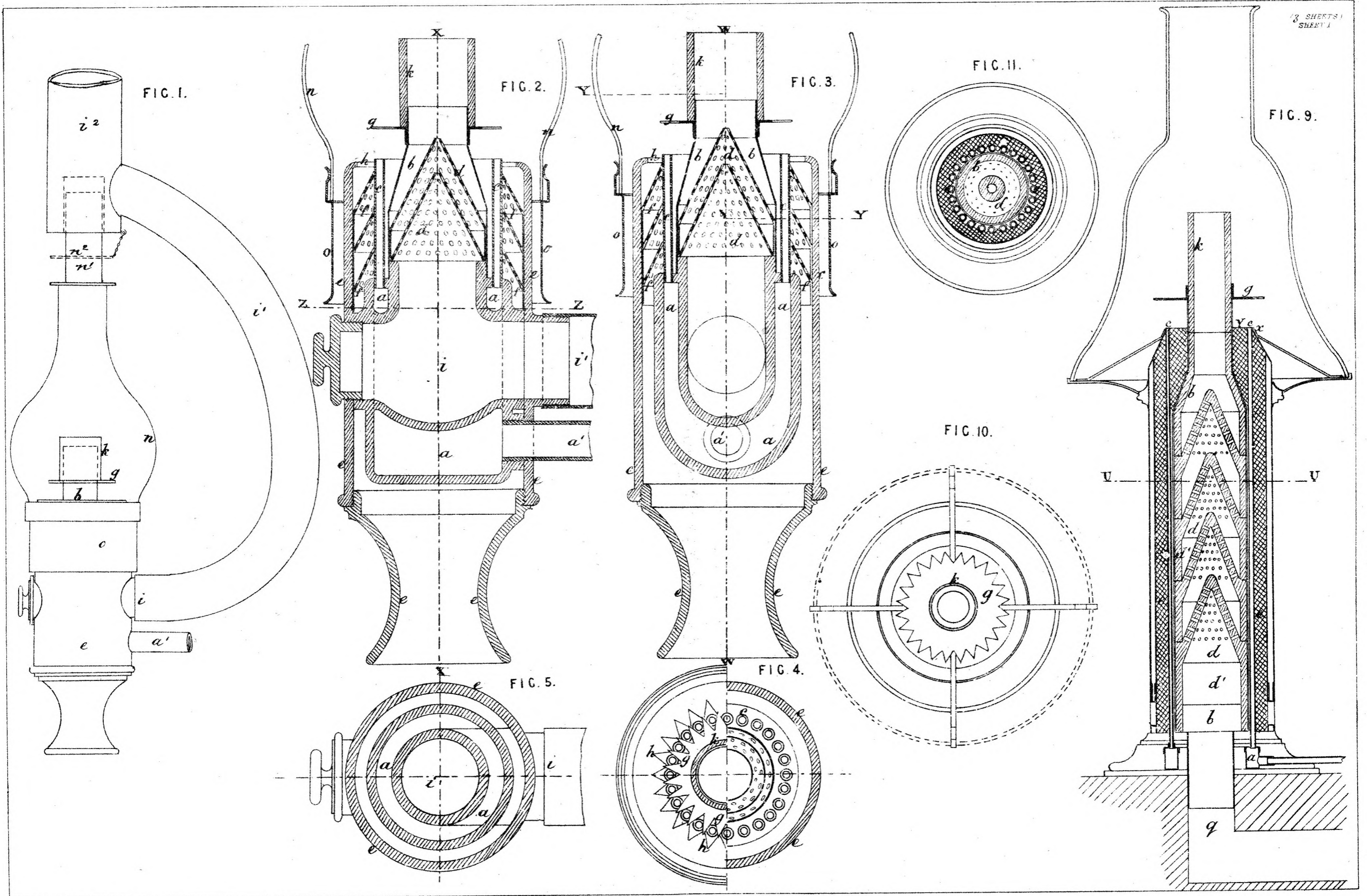
The Under Secretary of Justice.

[Drawings—three sheets.]

B.

[930]

3 SHEETS
SHEET 1



This is the Sheet of Drawings marked B referred to in the annexed Letters of Registration, granted to Frederick Siemens this sixteenth day of May, A.D. 1881.
Augustus Loftus.

PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE.
SYDNEY, NEW SOUTH WALES.

(Sig. 34-)

C.

1830

(3 SHEETS)
SHEET 2

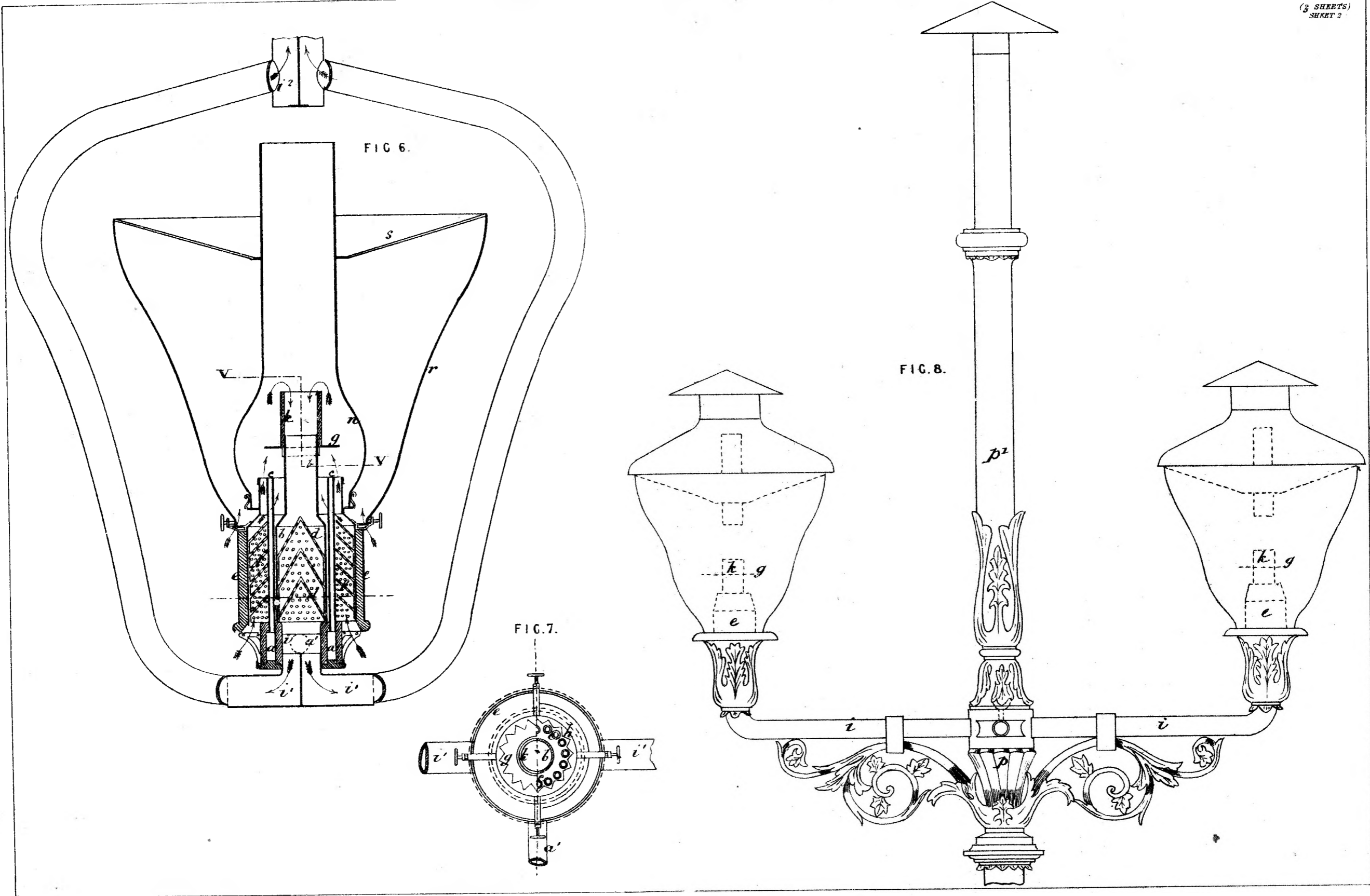
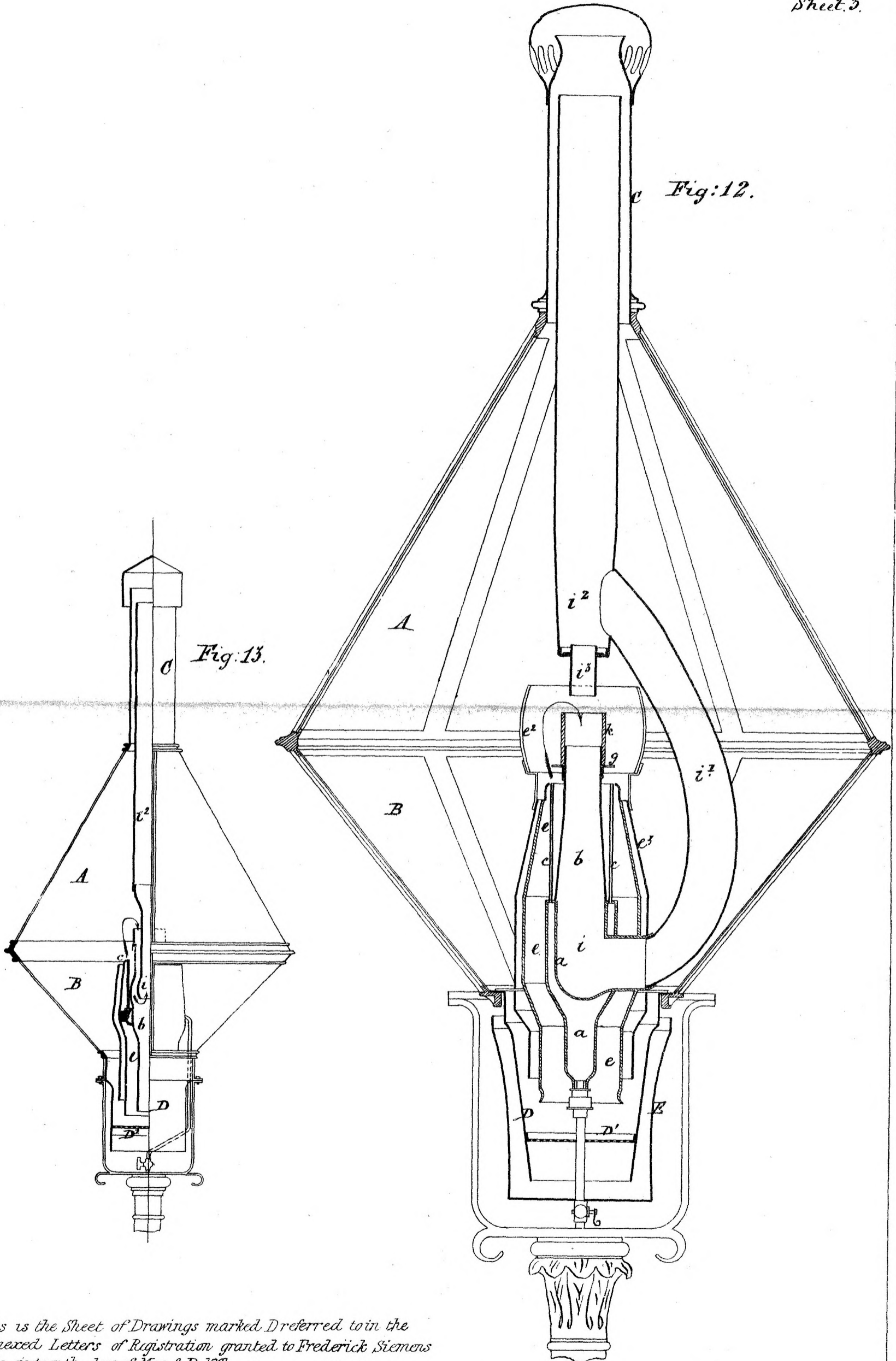


PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE,
SYDNEY, NEW SOUTH WALES.

*This is the Sheet of Drawings marked C referred to in the annexed
 Letters of Registration, granted to Frederick Siemens this sixteenth day
 of May, A.D. 1881.
 Augustus Loftus.*

(Sig 34)



This is the Sheet of Drawings marked D referred to in the annexed Letters of Registration granted to Frederick Siemens this sixteenth day of May A.D. 1881. Augustus Loftus.



A.D. 1881, 16th May. No. 931.

AN IMPROVED PROCESS FOR TANNING LEATHER.

LETTERS OF REGISTRATION to William Weber, for an improved process for tanning leather with the aid of chemicals, &c.

[Registered on the 17th day of May, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS WILLIAM WEBER, of Thebarton, in the province of South Australia, ice-manufacturer, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention of "An improved process for tanning leather with the aid of chemicals, &c.," which is more particularly described in the specification which is hereunto annexed ; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four ; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years : And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said William Weber, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof ; to have, hold, and exercise unto the said William Weber, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended : Provided always, that if the said William Weber shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this sixteenth day of May, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

An improved process for tanning leather.

SPECIFICATION.

TO ALL TO WHOM THESE PRESENTS SHALL COME: I, WILLIAM WEBER, of Thebarton, in the province of South Australia; ice-manufacturer, send greeting:

WHEREAS His Excellency the Right Honourable Lord Augustus Loftus, G.C.B., Governor and Commander-in-Chief of Her Majesty's province of New South Wales, by Letters Patent bearing date the day of _____ in the year of our Lord one thousand eight hundred and eighty-one, did for himself, his heirs and successors, give and grant unto me; the said William Weber, my executors, administrators, or assigns, or such others as I, the said William Weber, my executors, administrators, or assigns, should at any time agree with, and no other, from time to time, and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend in the province of New South Wales, certain improvements known as "An improved process for tanning leather with the aid of chemicals," upon the condition, among others, that I, the said William Weber, by an instrument in writing under my hand and seal, should particularly describe and ascertain the nature of the said improvements and in what manner the same were to be performed, and cause the same to be filed in the Registry Office within six calendar months next and immediately after the date of the said Letters Patent: Now know ye that I, the said William Weber, do hereby declare the nature of my said improvements, and in what manner the same are to be performed, to be particularly described and ascertained in and by the following statement, that is to say:—My invention consists of an improved process of tanning and finishing leather by the aid of chemicals. I use sulphate of alumina, alum, kiesel-gahr, chrom kali, ferrocyanide of potassium, chloride of barium, logwood, tannin, naphtha, paraffine, carbolic acid, resin, vaselin, whale-oil, and ox, cow, or sheep's brains in proportions, according to my judgment. The raw hides are treated with lime in the usual manner, and are manufactured into what is known in the trade as green leather. This green leather is then put into a solution of chrom kali, alum, sulphate of alumina, tannin, logwood, kiesel-gahr, and ferrocyanide of potassium. To fix or make fast the different above-mentioned tans, the leather will be put in a solution of chloride of barium. The chemically-tanned leather is dipped in a solution of paraffine, benzine, and carbolic acid, and is finished off with vaseline, whale-oil, and ox, cow, or sheep's brains. The treatment described in the last clause is particularly useful for belt leather, which after such treatment will not stretch. Other leather tanned by the above process is also made much tougher and considerably more durable than that produced by the method known as "Heinzerling's method," where zinc is used. The use of zinc makes the leather brittle. The leather manufactured in the manner above described will be perfectly watertight, very pliable, tough, and durable.

Having fully described my invention and the objects which I seek to accomplish by it, I claim—

First—The treatment of "green leather" with alum and sulphate of alumina, without the use of zinc.

Second—The use of chloride of barium to fix or make fast the different tans, &c.

Third—The use of soft green soap after the tans have been fixed, to preserve the evenness of the leather, where salts and alum have hitherto been used.

Fourth—The use of carbolic acid, resin, vaseline, whale-oil, and ox, cow, or sheep's brains, for finishing.

Fifth—The process of tanning leather with the above-mentioned ingredients, and substantially as described above.

Sixth—Leather manufactured by the process as above named.

W. WEBER,
Thebarton, Ice-manufacturer.

Witness—

JNO. FAIRFAX CONIGRAVE.

F. B. HALES, Agent, 128, Pitt-street.

This is the specification referred to in the annexed Letters of Registration granted to William Weber, this sixteenth day of May, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 26 March, 1881.

The application of Mr. William Weber, for Letters of Registration for an "Improved process for tanning leather with the aid of chemicals," having been referred to us, we have examined the specification accompanying the same, and have now the honor to report thereon as follows:—

Among the numerous substances named in the specification, there are a few that are already in use in tanning operations, such as alum, tannin, carbolic acid, and whale-oil, but no special claim is made for these substances; and taking the operation as a whole, we are not prepared to say that it trenches upon known methods to such an extent as would warrant us in rejecting the present application.

We therefore offer no objection to the granting of Letters of Registration as prayed for.

We have, &c.,

The Under Secretary of Justice.

J. SMITH.
CHAS. WATT.



A.D. 1881, 16th May. No. 932.

IMPROVEMENTS IN APPARATUS FOR ARRESTING SPARKS FROM STEAM-ENGINES.

LETTERS OF REGISTRATION to Robert Bodington, for Improvements in apparatus for arresting sparks from Steam-engines.

[Registered on the 17th day of May, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS ROBERT BODINGTON, of No. 4, Queensbury-street, Carlton, in the Colony of Victoria, engineer, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in apparatus for arresting sparks from Steam-engines," which is more particularly described in the specification, marked A, and the three sheets of drawings marked B, C, and D respectively, which are hereunto annexed ; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four ; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years : And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Robert Bodington, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof ; to have, hold, and exercise unto the said Robert Bodington, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended : Provided always, that if the said Robert Bodington shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this sixteenth day of May, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Apparatus for arresting sparks from Steam-engines.

A.

SPECIFICATION of ROBERT BODINGTON, of No. 4, Queensberry-street, Carlton, in the Colony of Victoria, engineer, for an invention entitled, "Improvements in apparatus for arresting sparks from Steam-engines."

APPARATUS for arresting sparks from steam-engines usually consists of a wire cage or screen affixed to the top of the funnel or flue of the engine, and so long as this can be kept clean it works satisfactorily enough, always supposing that the meshes are neither too large nor too small; but as a matter of fact they do not keep clean for any length of time, they get choked up with soot and other matters until they become worse than useless. Now my invention has been designed for the purpose of keeping such apparatus always clean and preventing its ever getting choked up. In order to this, I provide each apparatus with a cleaner, which may work constantly or intermittently, as may be preferred, against either the inside or outside of the cage. According to one form of my invention the cage may revolve around the top of the funnel or flue, and according to other forms it may remain stationary; if it is made to revolve, the wires may be placed either vertically or horizontally. In some cases my cleaners have an elastic pressure against the cage, and in others they are kept in position by springs, whilst according to another modification I use no springs or elasticity at all. My cleaners may consist either of a series of washers, fitting loosely on a spindle, or of a series of strips of metal fitted around a spindle; such washers or strips of metal being of such a size and placed such a distance apart as to enter sufficiently far between the wires to ensure the removal of anything adhering thereto, or they may consist of a metal comb. These cleaners may either be worked by the hand or by suitable gearing driven from the engine, and where made of a series of washers I prefer to thread them on to a tube and screw them tightly together, and then to pass the tube over a spindle on which it is free to revolve.

Referring to my drawings, figures 1 to 4^a relate to that class of apparatus in which the cage revolves, the wires are horizontal, and the cleaner consists of a series of washers fitting loosely on a central spindle. Figure 1 shows plan of such an apparatus; figure 2, vertical section, with the right-hand side in elevation in order to show the cleaner; figures 3 and 4 show elevations from opposite sides of the apparatus; and figure 4^a shows section of this form of my cleaner. A is the funnel, B a cast-iron ring fastened thereon, C is another cast-iron ring having a projecting flange, C¹, on the underside of which are teeth, C², forming a circular rack, into which gears the worm D on shaft D¹, which may be driven either by hand or by the engine. On the outer side of the cast-iron ring C is a series of three or more catches, G, which travel just underneath the rim B¹ on ring B; E E are rings at top and bottom of the cage, to which are attached the standards or strips of metal E¹, through perforations in which I make the wires to pass. The lower of said rings E is bolted to the flange C¹ of ring C, whilst to the upper one is attached the sheet metal cover E²; F are the metal washers screwed by nut F¹ on tube F², fitting loosely on spindle F³, supported on bracket F⁴, which centres and swivels on pivot F⁵, and extends to coiled spring F⁶.

The mode of operation is as follows:—Motion is imparted to shaft D from the engine, as indicated in figures 1 and 2, or by hand as may be preferred, and as the cage revolves the washers F pass between the wires and push away any soot or other material that may have gathered there, the tube carrying such washers revolving on its own axis by the friction, and as each standard E¹ arrives at the cleaner it pushes out the cleaner by allowance of the spring F⁶, which continues its pressure against the cage so as to keep the cleaner always in position.

Figures 5, 6, 7, and 7^a relate to that class of apparatus which is the same as that shown in figures 1 to 4, except that the wires are vertical, and the cleaner consists of strips of metal fitted radially from its spindle, so as to fit into the spaces between the wires in the same way that the washers do in the figures already described. These strips of metal are marked F, to indicate that they are to do the same work as said washers, and are clearly shown by section of cleaner in figure 7^a.

I would here observe that it is quite obvious the cleaner may be made to travel around the cage instead of the cage revolving against the cleaner, and that the cleaner may be placed inside the cage, without departing from the principle and essence of my invention.

Figures 8, 9, and 10 relate to that class of apparatus in which the cage remains stationary, and the cleaner travels over it intermittently as often as may be found necessary. Figure 8 shows top view of an apparatus of this description with the cleaner in the middle of its stroke. Figure 9 shows section thereof on the line *a a*; and figure 10, section thereof on the line *b b* in figure 9. In this case the cage is made to cover the top of the funnel or flue in the shape of an arc of a circle struck from the centre of the spindle F³. It is supported by bell-mouthed framing, A¹, which is bolted on to the top of the funnel or flue A, as shown. The cleaner consists of metal washers F on spindle F¹, supported by two arms or brackets, F², which are made to swivel on spindle F³ by hand lever, F⁵, but instead of the springs F⁴, shown in figure 1, I give sufficient play to the cleaner by making the bearings of the spindle F¹ large enough to allow of the necessary rise and fall, as clearly shown in figures 9 and 10.

The mode of operation is simply this:—That the hand lever F⁵ is moved to and fro when and as often as may be found necessary for the purpose of cleaning the cage, and which motion may be given by the engine and made continuous if so preferred, as all engineers will clearly understand, although I prefer that it should be worked intermittently and by hand, because it will be cheaper to make. It is obvious that in this case also the cleaner may be made to work on the under side as well as on the upper side of the wires of the cage if so preferred.

Figures 11, 12, 13, 14, 15, and 16 also relate to that class of apparatus in which the cage remains stationary, but in which the cleaner is of different construction to those already described, the first four figures showing said cleaner working inside the cage (as I prefer), and the other two figures showing it working outside. Figure 11 is an elevation of this form of my invention. Figure 12, sectional elevation through centre line of figure 11. Figure 13 is top view of same; and figure 14, a similar view with the wire top removed. The cleaner in this case consists of a metal comb, F, the teeth of which project between the wires of the cage, which are bent outwards at each rib or stay, E³, sufficiently far to allow of the passage of the teeth of the comb without touching them. The plates H form a space on each side of the cage, into which

Improvements in Apparatus for arresting sparks from Steam-engines.

which the cleanings are scraped by the comb, and from which they may be discharged at intervals or conducted away through door H¹. J J are supports for a shield, J¹, which I use in locomotives for the steam to impinge against and break its force. I do not use this shield in portable and stationary engines.

Figures 15 and 16 represent elevation and plan of a similar apparatus to that last described, except that the cleaner comb F works outside instead of inside the cage, and in which the wires are not bent as at E³, figure 12, although if preferred the wires may be bent in so as to allow of the comb cleaner being used without springs in this case also; the arrangement being exactly the reverse of that shown in figures 13 and 14.

Figures 17 and 18 are elevation and plan of a cage made as shown in figures 1 to 4^a, but with my comb cleaner attached instead of the washer cleaner there shown. All the parts are marked with similar letters of reference to those shown in said figures.

Circular or flat brushes revolving or stationary may be substituted for my cleaners, but I prefer to use what I have called the comb cleaner, and the form of cage shown in figures 11 to 14 inclusive.

I construct the comb cleaner with pivots working in levers, F¹, and have springs, F², at either end, but on opposite sides of the comb, in order to keep it radially inclined to the wire-work and allow it to pass over the ribs or stays E³ and recover its normal inclination.

Having thus described the nature of my invention and the manner of performing same, I would have it understood that I do not confine myself to the precise size or shape of the several parts of my invention, nor to the precise materials of which they may be made or manufactured, so long as the nature of my invention be retained; but what I claim as my invention is, in apparatus for arresting sparks from steam-engines—

First—Making the cage to revolve.

Second—The construction of the cleaner as shown in figures 4^a and 7^a.

Third—Combining with a revolving cage a cleaner, constructed as shown in figures 4^a and 7^a, and arranged as shown in figures 1 to 4 and 5 to 7 inclusive.

Fourth—The combination of a cage made in the form of an arc of a circle, with a cleaner constructed and worked substantially as herein described, and as illustrated in figures 8, 9, and 10, or with flat or circular brushes stationary or revolving, as substitutes for such cleaner.

Fifth—The comb form of cleaner for cages of any description, either with or without springs, substantially as herein described and explained.

Sixth—Making the bend E³ (either inwards or outwards) in cages made in the form of an arc of a circle, so as to allow of the passage of the comb cleaner as described.

In witness whereof I, the said Robert Bodington, have hereto set my hand and seal, this second day of September, one thousand eight hundred and eighty.

ROBT. BODINGTON.

Witness—

EDWD. WATERS,
Melbourne, Patent Agent.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to Robert Bodington, this sixteenth day of May, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

We do ourselves the honor to report, in reply to your blank cover communication of the 10th September, 1880, with reference to Mr. Robert Bodington's petition for Letters of Registration for an invention of "Improvements in apparatus for arresting sparks from Steam-engines," that we are of opinion that Letters of Registration may be granted to the Petitioner, in terms of his specification, drawings, &c.

We have, &c.,

E. O. MORIARTY.
JOHN WHITTON.

The Under Secretary of Justice.

[Drawings—three sheets.]

R. BODINGTON'S PATENT.

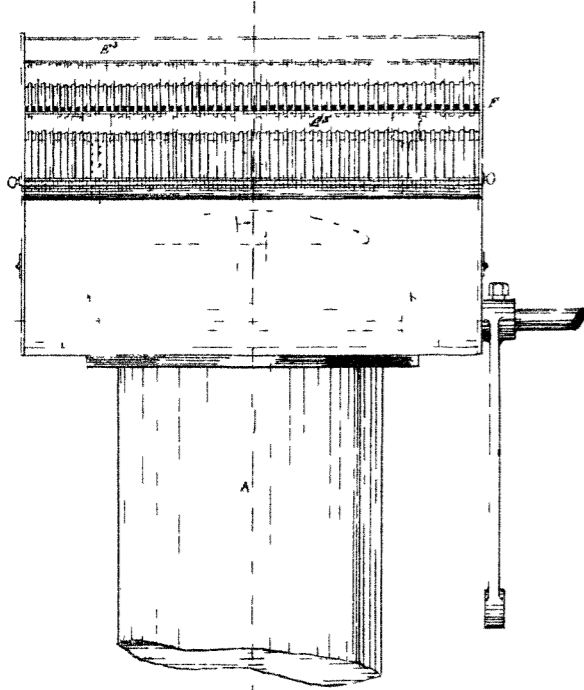


Fig 11

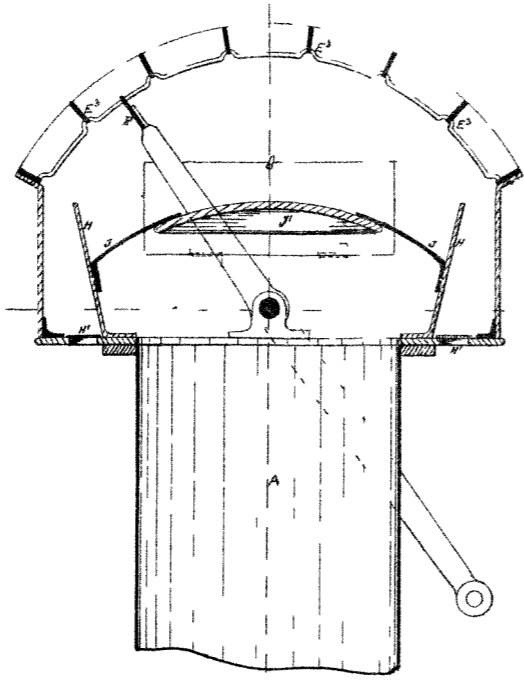


Fig 12

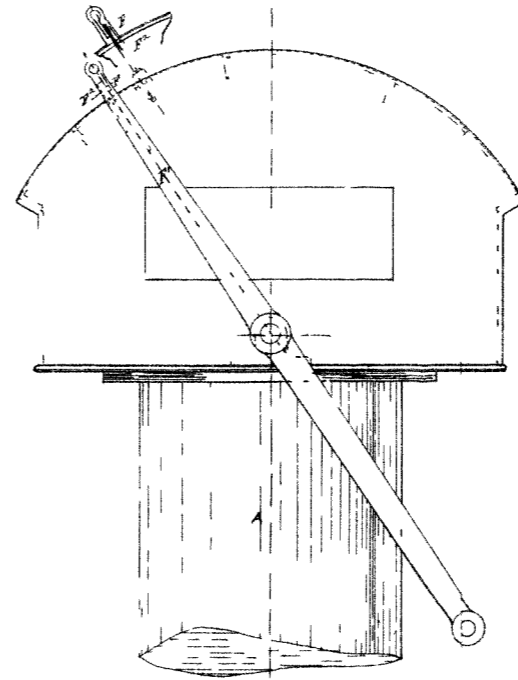


Fig 15

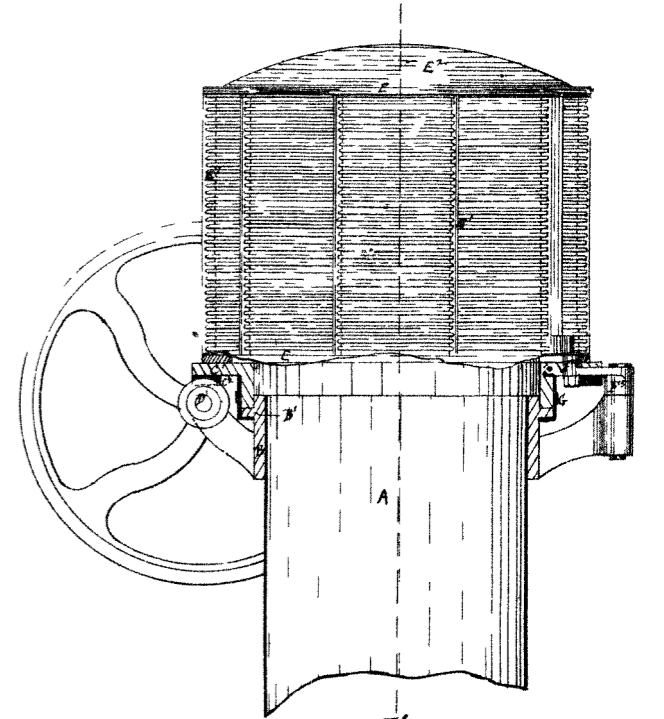


Fig 17

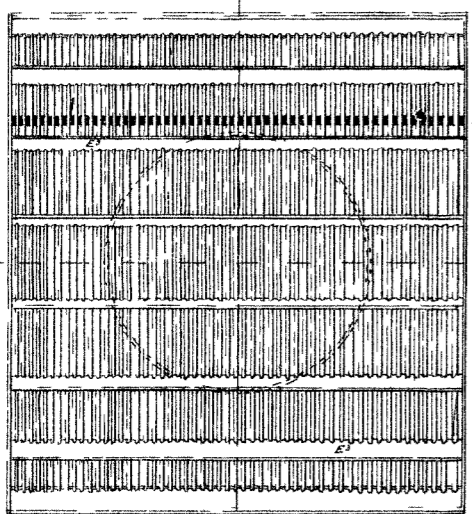


Fig 13

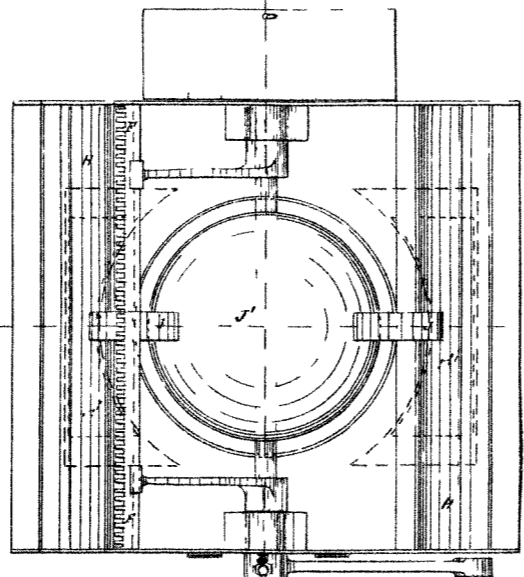


Fig 14

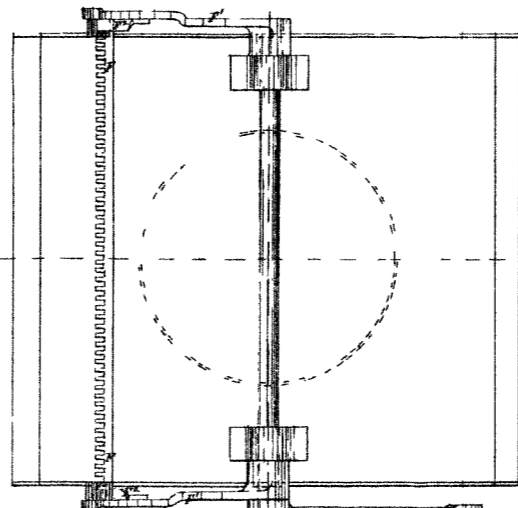


Fig 16

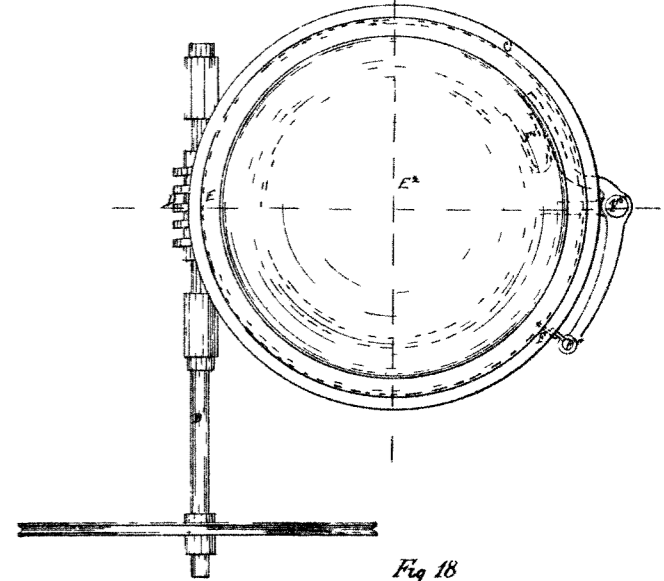


Fig 18

This is the Sheet of Drawing marked "D" referred to in the annexed Letters of Registration granted to Robert Bodington this sixteenth day of May -- 1887.

(Sig 34-)

Augustus Effus

R. BODINGTON'S PATENT.

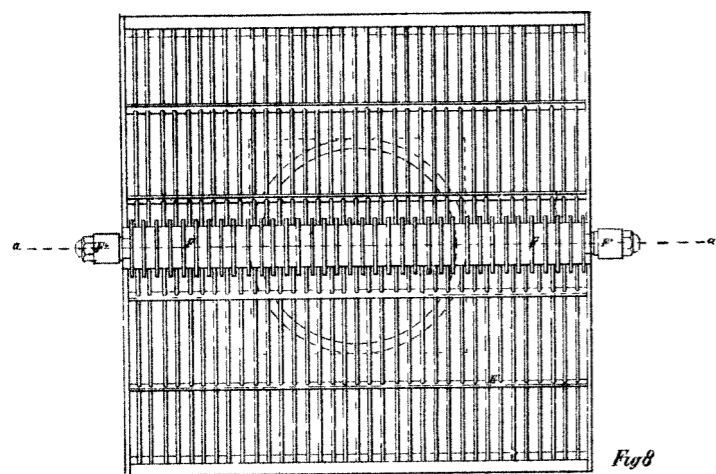


Fig 8

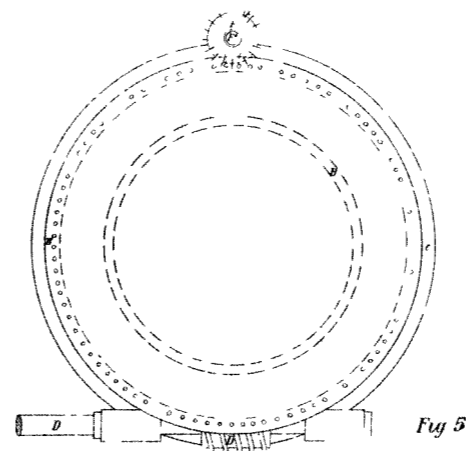


Fig 5

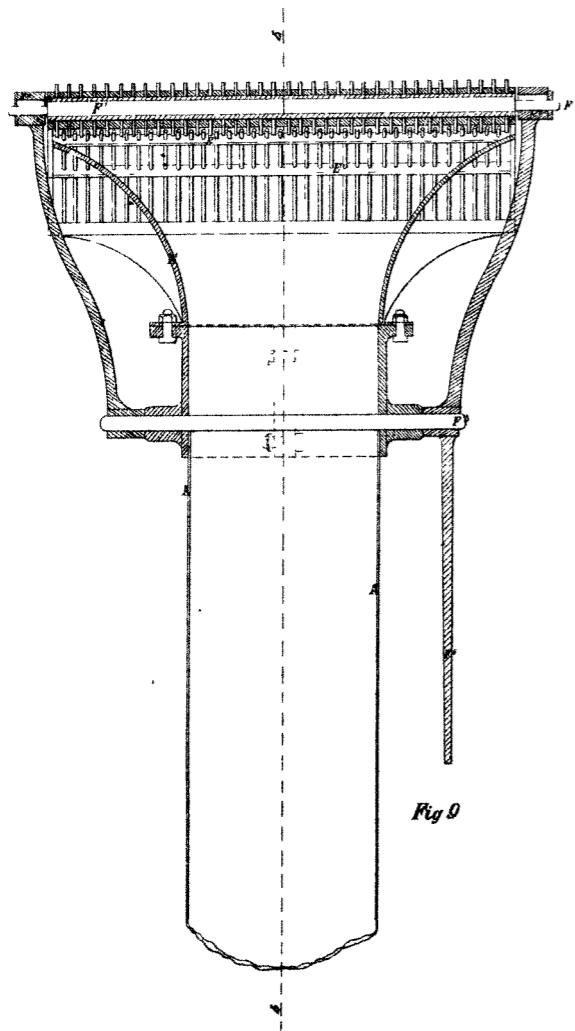


Fig 9

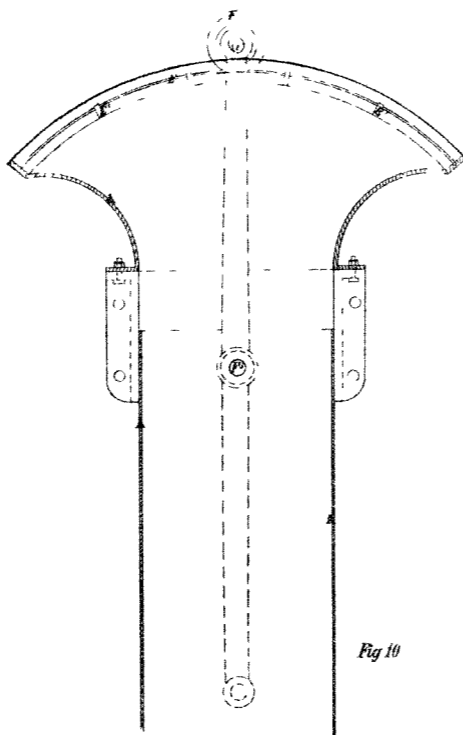


Fig 10

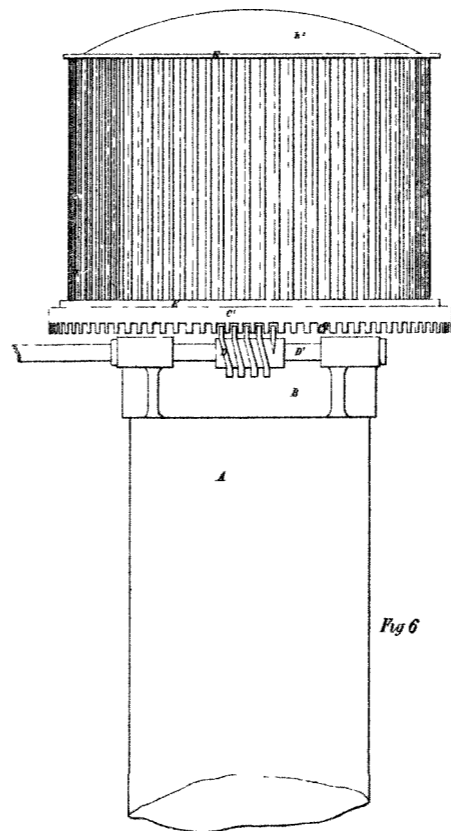


Fig 6

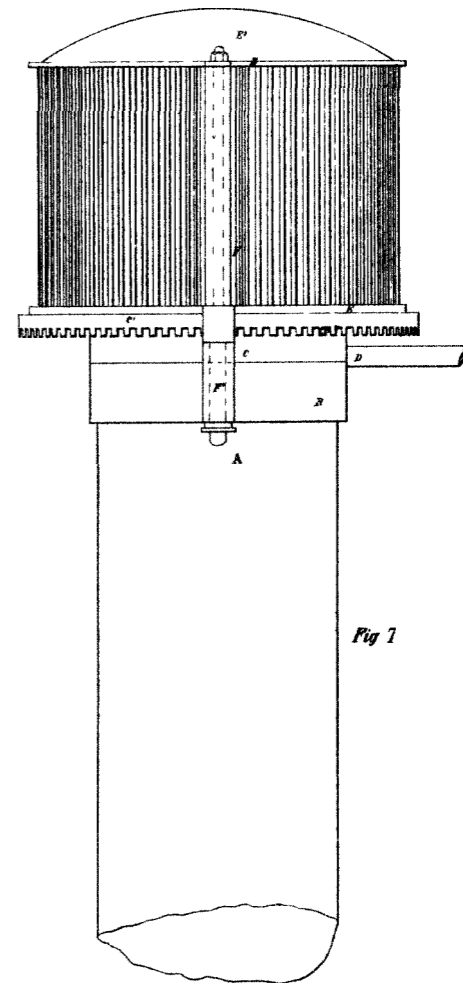


Fig 7



Fig 7a

This is the Sheet of Drawings marked "C" referred to in the annexed Letters of Patent granted to Robert Bodington this 28th day of May - 1881.
 (See 34)
 Augustus Letuo

R. BODINGTON'S PATENT.

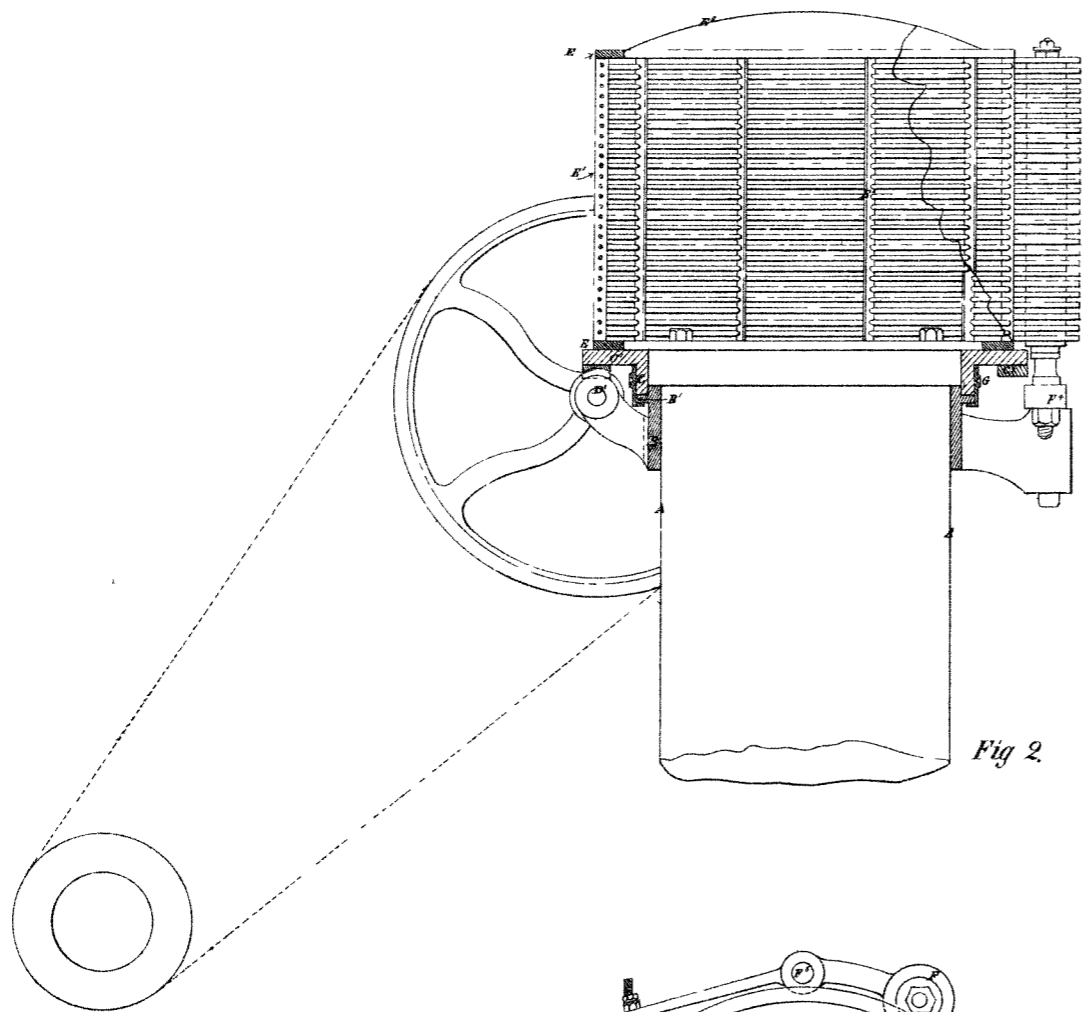


Fig 2

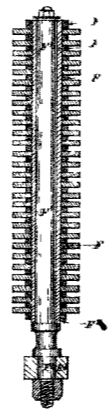


Fig 4a

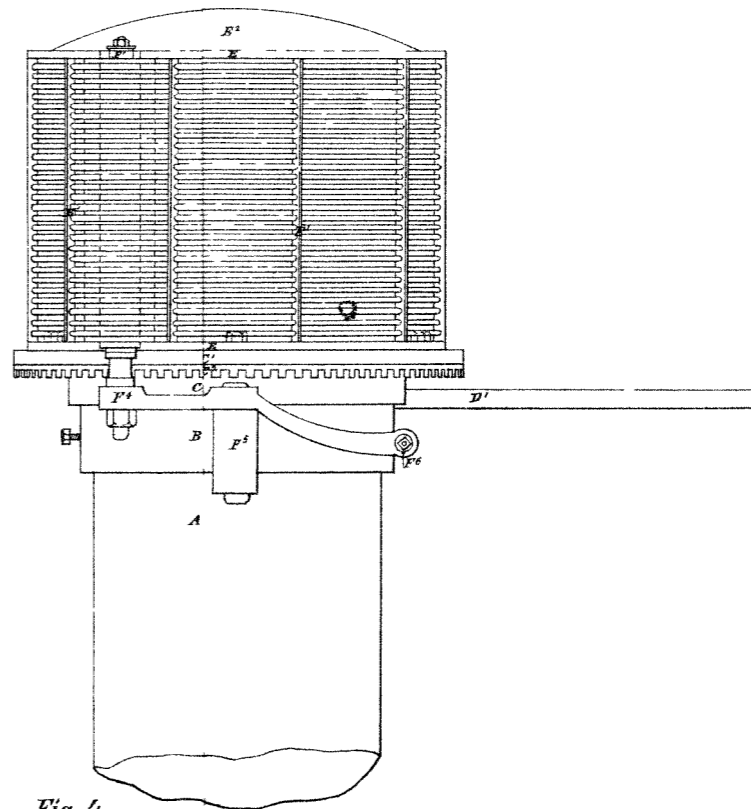


Fig 4

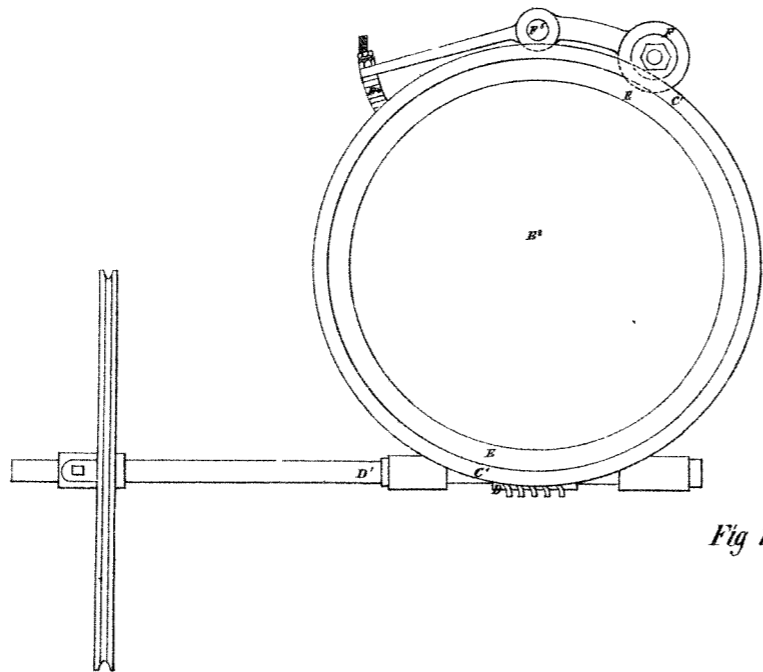


Fig 1

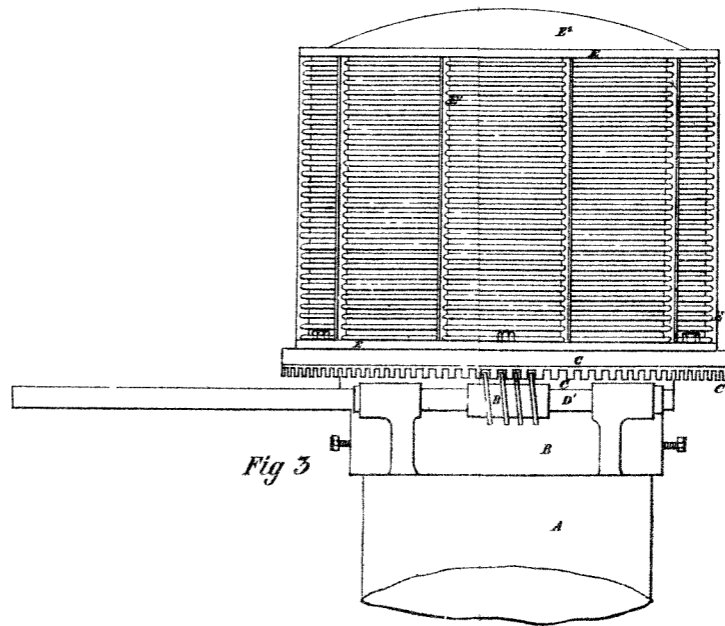


Fig 3

This is the Sheet of Drawings marked "B" referred to in the annexed Letters of Registration granted to Robert Bodington this sixteenth day of May - 1881.
 (Sig. 34) "Augustus Loftus?"



A.D. 1881, 16th May. No. 933.

AN IMPROVED PORTABLE HAND-POWER MACHINE FOR DRILLING HOLES
IN ROCKS AND OTHER SUBSTANCES.

LETTERS OF REGISTRATION to Henry Francis Parsons, for an improved portable hand-power Machine for drilling holes in rocks and other substances.

[Registered on the 17th day of May, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting:

WHEREAS HENRY FRANCIS PARSONS, of the city and county of San Francisco, in the State of California, one of the United States of America, machinist, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "An improved portable hand-power Machine for drilling holes in rocks and other substances," which is more particularly described in the specification, marked A, and the two sheets of drawings, marked B and C respectively, which are hereunto annexed; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Henry Francis Parsons, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said Henry Francis Parsons, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said Henry Francis Parsons shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this sixteenth day of May, in the year of our Lord one thousand eight hundred and eighty-one.

[L.s.]

AUGUSTUS LOFTUS.

An improved portable hand-power Machine for drilling holes in rocks, &c.

A.

SPECIFICATION of HENRY FRANCIS PARSONS, of the city and county of San Francisco, in the State of California, one of the United States of America, machinist, for an invention entitled "An improved portable hand-power Machine for drilling holes in rocks and other substances."

My invention relates to a portable hand-power machine for drilling holes in rocks and other hard substances. In one form of my machine the drilling is done by percussion, the stroke being delivered against the end of the drill-rod by a spring hammer which is thrown back and released by the rotation and action of a cam or cams on the crank-shaft. In another form of the machine the drilling is done by a boring-bit which is driven by gearing from the crank-shaft.

In each form of the machine its chief feature consists of a steadying-bar, having its front end pointed so as to hold when pressed against the rock or other substance to be bored, while on its opposite end is secured a breast-plate against which the operator leans or presses while operating the cranks. The barrel or drill holder is suspended on this steadying-bar, and moves along it as the drilling progresses.

Telescopic or adjustable legs are arranged to support the rear end of the machine, being connected with and to either the barrel or the breast-plate as desired.

In the following specification I will describe first the percussion drill, and then indicate the changes to be made to convert it into a boring drill.

Referring to the drawings herewith furnished,—Figure 1 is a side elevation of my improved machine, showing the position when at work. In this view, the adjustable supporting legs are shown as attached to the rear end of the steadying-bar. Figure 2 is a top view of the machine, figure 1. Figure 3 is an elevation in vertical transverse section through figures 1 and 2 at the line $x-x$. Figure 4 is a vertical longitudinal section through the barrel and spring-hammer of the machine. Figures 5, 6, and 7 are vertical transverse sections through the barrel of the machine at the lines $x-y$, $x-z$, $y-z$, respectively in figure 4. Figure 8 is a view of the ratchet-face hollow nut. Figures 9 and 10 show detail views of the tool holder. Figure 11 is a detail view of the barrel of the machine. Figures 12 and 13 are detail views of the spring-hammer. Figures 14 and 15 are the long and short cams that operate on the hammer and upon the drill-holder respectively. Figure 16 is the cross-head that is placed on the rear end of the drill-holder. Figure 17 shows my machine converted into a rotary drilling-machine for boring in soft substances. Figure 18 is the adjustable leg or support that is arranged at the rear end of the steadying-bar when the position of the machine is such that it would be difficult or impracticable for the operator to use the breast-plate. Figure 19 is an extension for the steadying-bar to lengthen it at the front end.

A represents the steadying-bar of the machine. This is simply a straight bar of metal of uniform thickness, with its front end pointed or otherwise formed so as to take into or hold and remain in a fixed position on the face of the rock when pressed against it. When the bar is pointed, a small indentation can be made in the rock to receive the point.

On the opposite end of this bar, a cushion, pad, or breast-plate, B, is secured, and against this plate the operator will lean when he is working the machine, so as to press the opposite point against the rock and keep the machine steady.

C is the barrel of the machine, through which the drill-holder passes and in which it is held and operated. This barrel is several inches in length, and has a passage or hole extending longitudinally through its upper portion, and of a size to correspond with the size or thickness of the steadying-bar, so as to receive the bar and allow the barrel to be shifted upon it to any point of its length. The underside of this steadying-bar is slotted longitudinally, and a projecting rib or feather, b , provided on the inside of the hole or bore of the barrel, enters and works in this slot, in order to prevent the barrel from turning on the bar but to allow it to move longitudinally on the bar from one end towards the other.

Through the rear end of this barrel, and across or in a direction transverse to the steadying-bar, passes the crank-shaft D, by which the drill is operated. On each end of this shaft is a crank, E, to permit the operator to use both hands in turning the shaft. This shaft D runs through a transverse hole or bore in the rear part of the barrel, and it is supported at each end in bearings, 3, on the ends of the upright arms of a frame or bracket, F, which is arranged below the rear end of the barrel, and is connected to it at its forward end by a stay or angle brace, h . The lower end of this bracket extends downward and meets the angle brace h , at which point of meeting the two are strongly bolted together. The end of the angle brace has a box or slotted piece, i , in which is fastened the lower end of a strong bent spring, J. From this fixed point the spring J bends upwards and backwards to a position at the rear of the barrel C, and to its upper end is secured a heavy hammer block or head, K.

The drill-holder L is a round bar which fits and is supported in a bore or cylindrical chamber, m , in the barrel C, directly below and parallel with the hole for the steadying-bar A. In the forward end of this bar L is a socket in which is placed the end of the drill-rod or boring-tool M, and when inserted in this socket the tool is secured by means of a set screw and clamp, n . The drill rod will then project beneath and parallel with the steadying-bar, and will strike the rock below the pointed end of the bar.

This drill-holder extends through and projects beyond the rear end of the barrel C, and in this end of the holder is a socket, g , in which is secured a short striking-pin, p , that receives the blows of the spring hammer. To hold this pin in place, the socket end of the holder is split, and on its surface is cut a left-hand thread over which fits a nut, t , and as this end is made tapering, the nut t when screwed down will close the split parts firmly around the inserted pin and hold it in place in the socket. By this construction the striking pin can be renewed when worn down.

At the middle of the barrel C, and below the line of the bore wherein the steadying-bar works, a transverse opening or slot is made entirely through the sides of the barrel, and with its centre in line with the axis or centre line of the drill-rod bore. This slot divides the drill-rod bore into two portions, and it is made to receive a ratchet-face hollow nut, T, that has on the outside of the barrel C, at one side, a spring pawl, u , to bear against the ratchet face of this nut. The aperture through the nut T coincides with the bore or chamber that receives the drill-rod holder L, and the holder passes through and moves in this ratchet-face nut.

These

An improved portable hand-power Machine for drilling holes in rocks, &c.

These two parts are connected together so that, when sliding in one direction in the barrel C, the drill-holder shall turn or rotate the nut T backwards for the distance of one ratchet tooth, but shall have of itself no rotation while moving backward in the barrel, and when sliding in the other direction through the nut T it shall be caused to rotate as it moves forward while the nut is held stationary. This is effected by making in the exterior surface of the holder L several short spiral grooves, *w*, into which a corresponding number of spiral ribs, *v*, provided on the interior surface of the hollow nut are made to fit. This nut will turn freely in one direction, but will be locked and held by the pawl *u* from turning in the opposite direction, consequently when the drill-holder is caused to move in one direction, or backwards within the barrel C, the ratchet-face nut will be rotated by the action of the spiral grooves on the holder and the ribs *v* within the hollow of the nut, but when the drill-holder moves in the opposite direction or forward, the nut T being held by its pawl, will not turn in the other direction, but will be locked so that the spiral grooves and ribs then re-act upon the drill-rod holder and cause it to rotate as it moves forward in the barrel. This rotation of the drill-holder L produces a change in the position of the end of the drill while at work, so that it shall not strike always in the same place at the bottom of the hole, but shall be regularly rotated as the operation of drilling goes on.

Upon and surrounding the forward end of this drill-holder is a strong coil spring, S, that presses against a shoulder, N, on the drill-holder, so as to force the tool forward and keep it against the bottom of the hole being made. The rear end of this spring rests against a fixed shoulder within the bore or chamber in the barrel wherein the drill-holder moves.

The spring-hammer K which operates against the striking-pin *p*, in the end of the drill-holder L, has on each side a forwardly projecting arm, R, extending towards the crank-shaft D, and furnished on the end with a stud and friction roller, *l*. These arms are arranged one on each side of the barrel and in line with the cams V, so as to be struck and forced backward by them. As the crank-shaft is rotated, these cams V act against the arms R and force back the hammer, and as they are double cams, or with two surfaces or members, they produce two backward movements of the hammer to one revolution of the shaft D.

When the crank-shaft is rotated by the cranks on its ends, the cams V strike the friction rollers on the arms R, and force back the hammer until the ends of the cams slip from the rollers *l*, when the hammer is thrown forward with force against the end of the drill-holder by the reaction of the spring. Thus at each blow of the hammer the tool in the end of the drill-holder is forced into the rock or substance to be drilled.

Two smaller cams, X X, are also secured on the crank-shaft D, one on each side of the barrel and between it and the larger cams, V, in a position to strike against a cross head, *y*, that is fixed on the rear end of the drill-holder and projects laterally at both sides. These cams X act against this cross-head *y*, to draw the drill-holder backward and the drill out of the bottom of the hole a short distance after every blow of the hammer to prepare the drill for the next stroke. These cams X are shorter than the hammer-actuating cams V, and the cross-head *y* slips from their points, and the drill-holder L is returned to its forward position by the coil spring on its front end, before the hammer is ready to make the next blow.

Two adjustable supports, P P, are attached to the machine for holding it in position at the required height. They consist of the telescopic legs secured to the crank-shaft and on each side of the barrel, and capable of being lengthened or shortened as required to bring the drill at the desired point for work. They extend downward at a diverging angle, and they have journal boxes with hinged or removable caps to fit on the crank-shaft D, for the purpose of allowing the legs to be removed from this part of the machine and shifted back to the end of the steadying-bar where the breast-plate is fixed. To receive these legs, P, a stud or journal, *r*, is formed on each end of the breast-plate, and these supports, P, can be removed from the crank-shaft and fixed to the breast-plate when desired.

The object of this arrangement is to enable the level of the steadying-bar to be maintained as the barrel moves forward, because the motion of the barrel as the drilling progresses would change the angle of the drill if the legs were centred on the crank-shaft. In some cases this adjustment will not be required, and then it will be more convenient to have the legs support the machine at the crank-shaft, but when it is necessary to have the drill move forward in substantially a straight line the legs are to be attached to the breast-plate.

When working the machine in positions where it would be difficult or impractical to lean and press against the breast-plate, I employ an adjustable support consisting of a clamping piece, 1, for fixing it to the back of the breast-plate B, and an extension leg, hinged or pivoted to the back of this clamp 1, so as to be set at any required inclination. This leg is adjustable in length, and is formed in part of a hollow tube, 2, with a telescopic leg, 3, in the lower end, and a screw-rod, 5, in the upper end that works in the tube and through a hand-nut, 6, by which it is changed in length and held at any point of adjustment. The screw-rod 5 is attached to the back of the clamping-piece 1, and by turning the hand-nut 6 the support is kept of the required length behind the machine to maintain a continuous support and pressure against the end of the steadying-bar as the drill moves forward into the rock.

When beginning work with a long drill the steadying-bar can be increased in length at the front end by using a supplemental bar, 7, provided with a socket, 8, on its rear end, having a set screw, 9, to receive and be secured to the front end of the steadying-bar A. This attachment is shown in figure 19 of the accompanying drawings.

The operation of the machine will be as follows:—The point of the steadying-bar is set against the rock to be bored, and the legs are braced and adjusted to the inequalities of the surface so as to support the weight of the machine. The operator throws his weight upon the rear end of the steadying-bar by pressing against the breast-plate, and reaching forward, turns the shaft D by means of the hand-cranks E. The coil-spring S holds the drilling-tool in the end of the drill-holes with a strong pressure against the face of the rock, and as the crank-shaft is rotated the long cams V force the hammer back and then release it so that it flies forward with great force and strikes the rear end of the drill-holder and drives the drill into the rock. The short cams X then draw the drill-holder back a short distance but quickly release it, and allow the coil-spring to throw it forward into position again before the hammer gives another blow.

At

An improved portable hand-power Machine for drilling holes in rocks, &c.

At this movement of the drill-holder its rotation is effected in the following manner, for the purpose of turning the drill in the hole:—When the drill-holder is drawn back by the short cams, the hollow ratchet-face nut T on the centre part of the holder will be rotated in the barrel the distance of one tooth or ratchet by the action of the spiral grooves and projections *w v*, on the holder and in the bore of the hollow nut; but when the drill-holder moves forward again the nut T is locked by the pawl *u*, and will not rotate, but will cause the spirals to give a short rotating movement to the drill-holder L as it moves forward in the barrel and through the hollow nut. The drill is thus turned at each forward movement of the drill-holder before it is struck by the hammer.

The drill and the operating mechanism are fed forward on the steadying-bar in the following manner:—A friction brake, *f*, is applied to the steadying-bar A at the barrel C, by means of the screw-shaft *e*, working in a screw-threaded nut or bearing in the top of the barrel, and turned by means of a hand-wheel. The brake *f* is pressed against the face of the steadying-bar by the screw-shaft with a pressure that is regulated as required, so that the stroke of the hammer as it is received against the end of the drill-holder acts also against the rear end of the barrel C, and forces it forward upon the steadying-bar as fast as the drill enters the rock. The forward travel of the barrel C upon the steadying-bar will be controlled by the amount of pressure put upon the brake.

A piece of leather, *d*, or other cushion is placed against the rear end of the barrel, to ease the stroke of the hammer against it.

The tension of the spring J can be increased by adding additional leaves to it so as to increase the striking force of the hammer K when required.

I use a twisted drill-rod, M, in the machine, so that the rotation imparted to it by the spiral grooves and splines in the nut will cause the drillings to be discharged from the hole as fast as they are produced.

It will be noticed that the impact of the hammer is received by the short striking-pin *p*, which is secured in the end of the drill-rod so that it can be easily renewed.

To convert this drill into a boring drill, I remove the cams from the cam-shaft and place thereon at one side of the barrel C a bevel gear, *a*. I also fix to the end of the drill-holder L another bevel gear, *c*, in a position to mesh with and be driven by the gear of the crank-shaft. In place of the percussion drill, I substitute an augur or boring drill, and I employ a ratchet feed connected with a rack on the steadying-bar so that the barrel shall be fed forward upon the bar as the boring progresses, or I use a pressure feed. In the latter case I connect the breast-plate B directly to the rear end of the barrel instead of to the steadying-bar, so that the weight of the operator is thrown against and caused to move the barrel forward upon the steadying-bar. The rear end of the steadying-bar will then be formed of two parts, one being the sleeve B', carrying the breast-plate, and the other the bar or rod A', sliding through the barrel and into the sleeve B'.

I claim as my invention—

First—A machine for drilling in rock and other substances, having a tool-holder for holding the drilling-tool, a hammer operated by a spring for striking the tool-holder, a mechanism for drawing back the hammer and then releasing it to cause the spring to throw it against the end of the tool-holder, and a steadying-bar by which the machine is held and guided to its work and upon which it is fed forward as the drilling progresses, substantially as hereinbefore described.

Second—A machine for drilling in rock and other substances having a tool-holder for holding the drilling-tool, a spring hammer operated by mechanism to strike a succession of blows against the rear end of the tool-holder, and a mechanism for giving to the tool-holder an intermittent rotating movement between the blows of the hammer during the operation of drilling, substantially as hereinbefore described.

Third—In a hand-operated machine for drilling in rock and other substances, a steadying-bar which also serves as a guide-bar and support for the drilling machine, substantially as hereinbefore described.

Fourth—In combination with the barrel of a rock-drilling machine, which is arranged to be guided and fed forward on a steadying-bar, A, the friction brake for regulating the feed of the machine, substantially as hereinbefore described.

Fifth—The cam-shaft D, having the two cranks E, held in the barrel C, and in suitable bearings thereon, and carrying the long cams V in combination with the spring-hammer K, having the arms R with their studs and friction-rollers, substantially as and for the purpose hereinbefore described.

Sixth—The cam-shaft D, having the two cranks E for operating it, and carrying the short cams X in combination with the cross-head *y* on the rear end of the tool or drill-holder, and the coil-spring S arranged and applied on the forward end of the drill-holder, substantially as and for the purpose hereinbefore described.

Seventh—A machine for drilling in rock and other substances, having a barrel to hold and present the drilling mechanism, a tool-holder to receive in its front end the drilling-tool, and working in a bore or socket in the barrel, an operating shaft held in a bearing in the barrel for working the drilling mechanism that operates upon the tool-holder, and the steadying-bar on which the barrel is supported and fed forward, and the adjustable legs and supports, substantially as hereinbefore described.

Eighth—In a drilling machine for drilling in rock and other substances, the tool-holder L having a socket in the forward end to receive and hold the drilling-tool, and provided with spiral grooves, *w*, in its surface, in combination with the ratchet-face nut T, having the spiral ribs or splines *v* in its bore to engage with the grooves in the tool-holder and held in an opening in the barrel of the machine, and controlled in its rotation in one direction by a pawl, *u*, but left free to rotate in the other direction, substantially as and for the purposes hereinbefore described.

Ninth—

An improved portable hand-power Machine for drilling holes in rocks, &c.

Ninth—In a rock-drilling machine for drilling in rock and other substances, the spring-hammer operated in one direction or backward by mechanism from a rotating shaft, and in the other direction or forward by the reaction of the spring, to deliver a succession of blows against the end of a tool-holding bar, substantially as herein described.

Tenth—The tool-holding bar L, having in one end the socket to receive and hold the drilling-tool, and at the other the detachable and removable striking-pin *p*, against which the blows of the hammer K are applied, substantially as hereinbefore described.

Eleventh—In a machine for drilling in rock and other substances, having a steadying-bar, A, the extensible supporting legs 2, 3, 4, adapted to be attached to the rear end of the steadying-bar, substantially as hereinbefore described for the purpose set forth.

Twelfth—In a machine for drilling in rock and other substances, having a steadying-bar, A, the supplemental point or bar provided with a clamp or socket by which it can be secured to the end of the steadying-bar for extending its length at the front, substantially as hereinbefore described for the purpose set forth.

In witness whereof, I, the said Henry Francis Parsons, have hereto set my hand and seal, this eighth day of December, one thousand eight hundred and eighty.

HENRY FRANCIS PARSONS.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to Henry Francis Parsons, this sixteenth day of May, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

We do ourselves the honor to report, in reply to your blank cover communication of the 23rd ultimo, with reference to Mr. Henry Francis Parsons' Petition for Letters of Registration for an invention of "An improved portable hand-power Machine for drilling holes in rocks and other substances," that we are of opinion that Letters of Registration may be granted to the petitioner, in terms of his specification, drawings, &c.

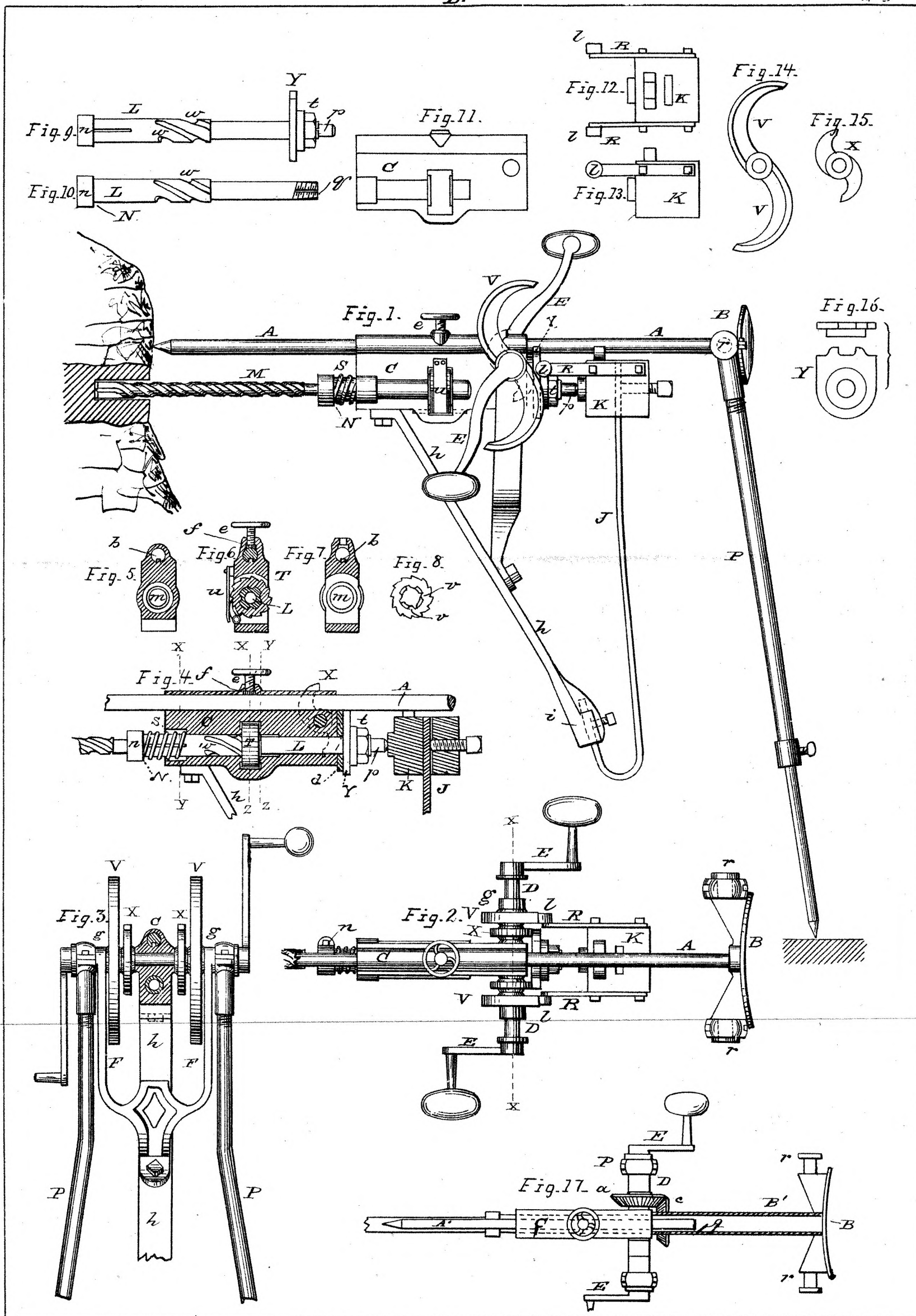
Sydney, 18 March, 1881.

We have, &c.,

E. O. MORIARTY.
JOHN WHITTON.

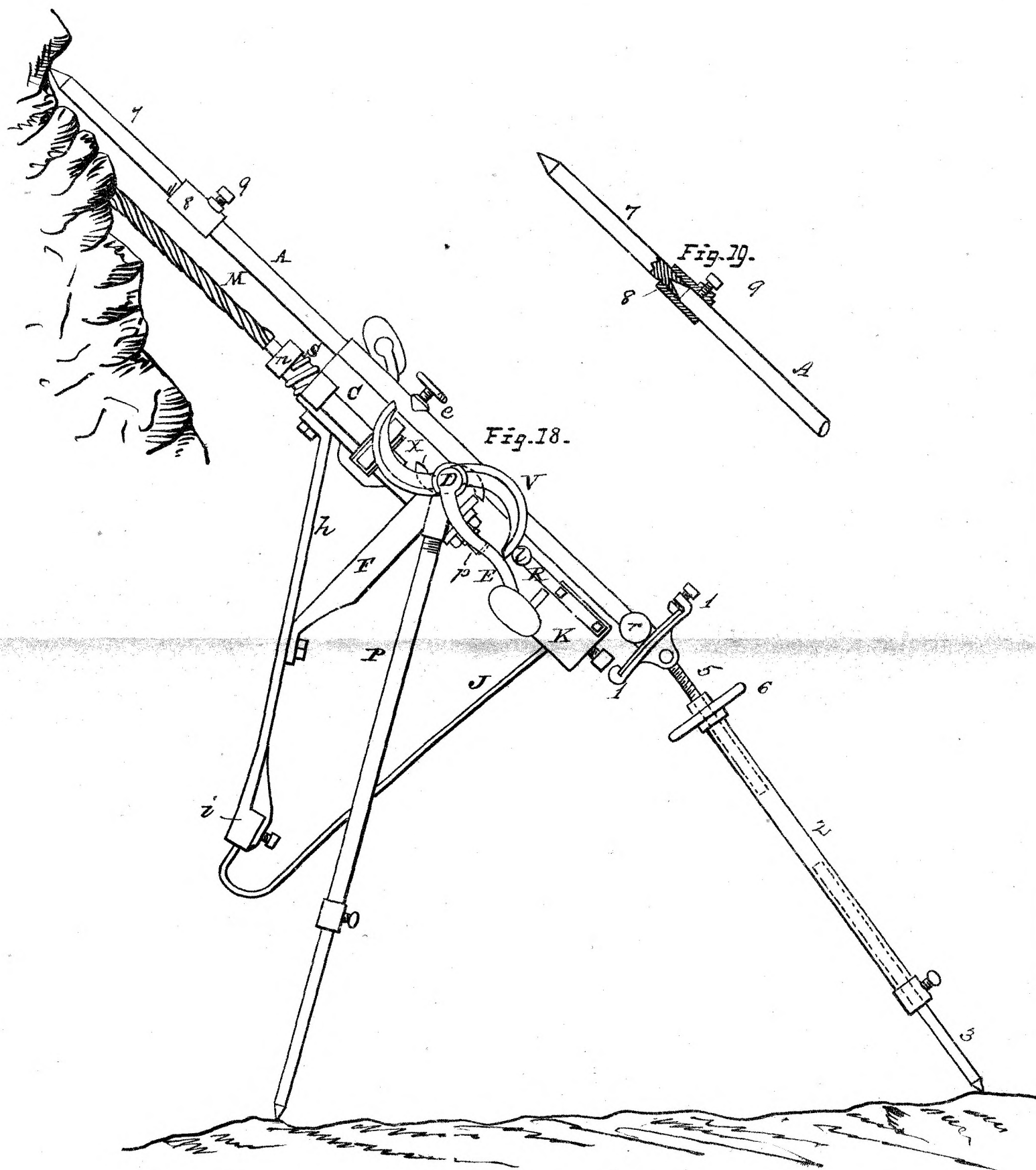
The Under Secretary of Justice.

[Drawings—two sheets.]



This is the Sheet of Drawings marked B referred to in the annexed Letters of Registration, granted to Henry Francis Parsons this sixteenth day of May, A.D. 1881.

Augustus Loftus.



This is the Sheet of Drawings marked C referred to in the annexed Letters of Registration granted to Henry Francis Parsons, this sixteenth day of May, A.D. 1881. Augustus Loftus.

PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE, SYDNEY, NEW SOUTH WALES.



A.D. 1881, 21st May. No. 934.

NYETAGRAPH OR IMPROVED SYSTEM OF SIGNALLING.

LETTERS OF REGISTRATION to Elphinstone Roe, for Nyetagraph or improved system of signalling.

[Registered on the 21st day of May, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS ELPHINSTONE ROE, of Eucla, in the Colony of Western Australia, Telegraph-line Inspector, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Nyetagraph or improved system of signalling," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed ; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four ; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years : And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Elphinstone Roe, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof ; to have, hold, and exercise unto the said Elphinstone Roe, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended : Provided always, that if the said Elphinstone Roe shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this twenty-first day of May, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Nyctagraph or improved system of signalling.

SPECIFICATION.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, ELPHINSTONE ROE, of Eucla, in the Colony of Western Australia, Telegraph-line Inspector, send greeting :

WHEREAS His Excellency the Right Honorable Lord Augustus Loftus, G.C.B., Governor and Commander-in-Chief of Her Majesty's province of New South Wales, by Letters Patent bearing date the _____ day of _____ in the year of our Lord one thousand eight hundred and eighty-one, did for himself, his heirs and successors, give and grant unto me, the said Elphinstone Roe, my executors, administrators, or assigns, or such others as I, the said Elphinstone Roe, my executors, administrators, or assigns, should at any time agree with, and no other, from time to time, and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend in the province of New South Wales, certain improvements known as "Nyctagraph or improved system of signalling," upon the condition, among others, that I, the said Elphinstone Roe, by an instrument in writing under my hand and seal, should particularly describe and ascertain the nature of the said improvements, and in what manner the same were to be performed, and cause the same to be filed in the Registry Office within six calendar months next and immediately after the date of the said Letters Patent: Now know ye, that I, the said Elphinstone Roe, do hereby declare the nature of my said improvements, and in what manner the same are to be performed, to be particularly described and ascertained in and by the following statement, that is to say:—My invention consists of a process of semaphore signalling at night, with a lamp and coloured glasses, or at day with coloured flags, and may be used at sea or on land, or as a scientific toy. The main idea is,—arrange a code of colour signals which, in various combinations, may be formed into words and sentences, and I am confident that my invention will not only prove exceedingly serviceable for ship signalling, either from vessel to vessel, or from ship to shore, but may also be applied to signalling purposes upon land. The drawings deposited herewith fully set forth the principle of my invention, and show in detail the manner in which I propose to work my invention.

Figure 1 is an external view of the night signalling apparatus. Figure 2 is an internal view of the lamp chamber, showing the key by which the signal apparatus is worked. Figure 3 is a sectional view of the lamp chambers. Figure 4 is a view of the bull's-eye glasses by which the colour signals are displayed. Figure 5 is the signal code.

The apparatus is composed of metal, brass, bronze, or iron, and is constructed substantially, as shown in fig. 1, in a cylindrical form. Rather below the centre of the cylinder is a slide, B B, semicircular in shape, filled with three glasses; one red bull's-eye, one blue bull's-eye, and a glass in the centre to display a white light when required. This slide travels in grooves specially made to receive it, and is operated by the key E and the spindle marked F, and travellers on each side similar to that marked G. H is a stop key for lifting the shade A when it is required to display the white light. This stop key is attached to the main key and always travels with it. The lamp proposed to be used is a self smoke consuming hurricane lamp, which of course can be used in all weathers; but the mode of lighting is immaterial to my invention,—gas, lime, or electric light may be employed for transmitting the signals. The lamp however is recommended for its cheapness and facility in use. I will now proceed to describe the mode of working my invention. I utilize for the purposes of signalling the telegraphic code in general operation, with this difference, that instead of the signals being given by dots and dashes, as in telegraphy, they are transmitted by red and blue lights or colours; one colour red representing a dot, and the other blue representing a dash. I will suppose that a vessel has arrived off a light-house or telegraph station at night-time, and wishes to communicate by means of my invention. Having attracted the keeper's attention, he proceeds to signal, "Report Hesperus, all well" or "Report small-pox aboard," as shown in drawing 6. At day-time the same system of signalling would be employed, substituting however for the lights, red, blue, and white flags, which would be raised or lowered as required. To transmit the night signals, the operator holding the key turns the slide B B so as to bring the red bull's-eye in front of the lamp reflector and red is displayed; then he reverses the slide to show blue, and again reverses the slide to show red; these three signals form the letter "R" in the code, and after each letter a brief pause is made; and in this way the word (say) "Report" is spelt out. Then he returns the key to its normal position, pulls down the stop key which raises the shade, and displays the white light as shown on fig. 4, indicating that the word is complete. An expert will be able to send and receive messages with the same facility as a telegraph operator; but where a person has not acquired this facility, it will be only necessary for him to have an attendant to mark down on a slate, or on paper, the colour signals as displayed. Thus,—

red, blue, red (dark; pause) red (dark; pause) red, blue, blue, red (dark; pause) blue, blue, blue (dark; pause) red, blue, red (dark; pause) blue (dark; pause) white light, and so on. My invention is so simple that facility in working it may easily be acquired, and the system of signals adopted by me is clear and comprehensive.

Having described the manner in which I propose to work my invention, I claim—

First—The system of signalling by coloured lights at night as herein described, or by coloured flags in the day-time.

Second—The construction of the signalling apparatus substantially as described.

I don't bind myself to the exact measurements or dimensions as shown in my drawings, or to the particular colours mentioned; but to reserve to myself the right to make the apparatus of such size and to use such colours as may be most convenient, either for a scientific toy or for ordinary ship signalling, or for special purposes on land or sea, requiring the use of powerful lights, such as gas, lime light, or electric light.

F. B. HALES, Agent,
128, Pitt-street.

ELPHINSTONE ROE,
Eucla, Telegraph-line Inspector.

This is the specification referred to in the annexed Letters of Registration granted to Elphinstone Roe, this twenty-first day of May, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Nyetagraph or improved system of signalling.

REPORT.

Sir, We have examined Mr. Elphinstone Roe's design for an improved system of signalling, and see no reason why Letters of Registration should not be granted to him.

Sydney, 21 April, 1881.

Yours, &c.,
FRANCIS HIXSON.
H. BRODERICK.

The Under Secretary of Justice.

[Drawings—one sheet.]

THE NYCTAGRAPH, Or Improved System of Signalling.

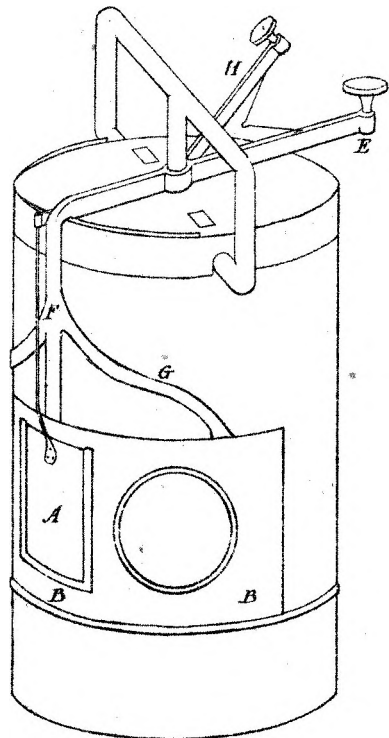


Fig. 1

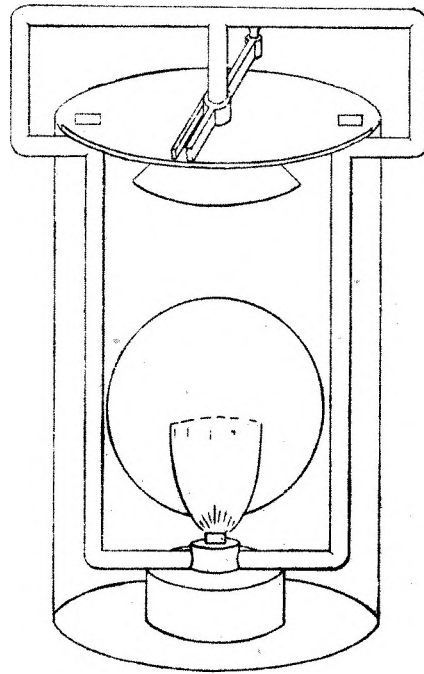


Fig. 2

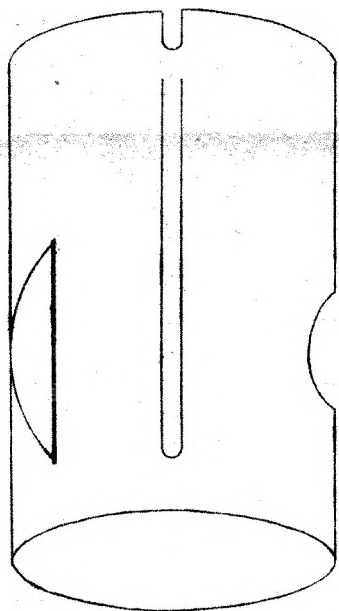
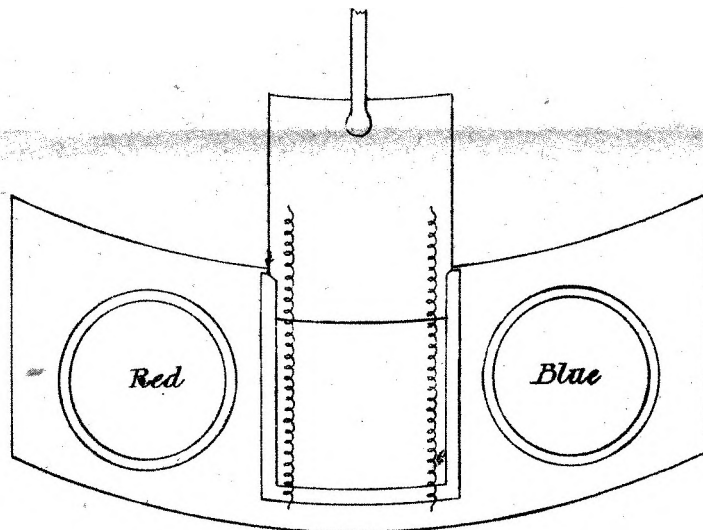


Fig. 3



View of Slide - Enlarged

Fig. 4

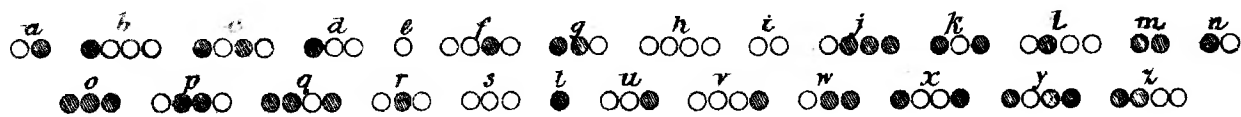


Fig. 5

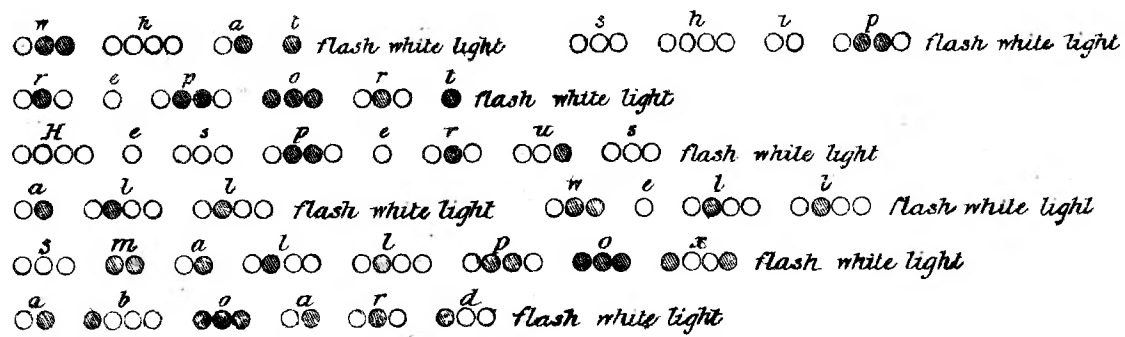


Fig. 6

○ signifies Red light
● - Blue -

*Elphinstone Roe
Esq.
Telegraph and Inspector*

*This is the Sheet of Drawings referred to in the annexed
Letters of Registration granted to Elphinstone Roe
this twenty first day of May, A.D. 1881.*

Augustus Loftus.



A.D. 1881, 21st May. No. 935.

IMPROVEMENTS IN THE TREATMENT OF ORES CONTAINING COPPER, &c.

LETTERS OF REGISTRATION to Paul Gustave Louis Gabriel Designolle, for Improvements in the treatment of ores or compounds containing copper, and the separation of copper from precious metals, and in apparatus connected therewith.

[Registered on the 21st day of May, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS PAUL GUSTAVE LOUIS GABRIEL DESIGNOLLE, of Paris, in the Republic of France, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in the treatment of ores or compounds containing copper, and the separation of copper from precious metals, and in apparatus connected therewith," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed ; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four ; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years : And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Paul Gustave Louis Gabriel Designolle, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof ; to have, hold, and exercise unto the said Paul Gustave Louis Gabriel Designolle, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended : Provided always, that if the said Paul Gustave Louis Gabriel Designolle shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this twenty-first day of May, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in the treatment of ores containing copper, &c.

SPECIFICATION of PAUL GUSTAVE LOUIS GABRIEL DESIGNOLLE, of Paris, in the Republic of France, for "Improvements in the treatment of ores or compounds containing copper and the separation of copper from precious metals, and in apparatus connected therewith."

My invention relates to an improved process for treating copper ores containing precious metals, and it consists partly—first, in the application of my improved system of electro-chemical amalgamation to the purpose of effecting its simultaneous extraction of the copper contained in the said ores and of the precious metals which may also be present in certain proportions; and, secondly, in simple and practical means for separating the copper and precious metals when united together in a complex amalgam, obtained either by electro-chemical amalgamation or by trituration with metallic mercury. I have ascertained that when cupreous matts or sulphurous ores containing copper, gold, and silver are treated according to my improved process of electro-chemical amalgamation hereinbefore referred to (that is to say, by bichloride of mercury with the addition of a certain quantity of chloride of sodium in the presence of iron), an amalgam is obtained, which is complex, hard, pulverulent, and disseminated in the mass when the proportion of bichloride of mercury does not exceed the quantity normally requisite to obtain the theoretical amalgam $Cu Hg^1$; this amalgam becomes, on the other hand, pasty and capable of adhering to the amalgamated plates when a sufficient quantity of metallic mercury has been added.

I have also ascertained that the same results are obtained when treating certain ores containing copper alone or copper mixed with precious metals, such as subsulphuret of copper ($Cu^2 S$) or antimonial arsenical, sulpho-antimonial, sulpho-arsenical copper, and even the oxides of copper ($Cu^2 O$, $Cu O$), for which purpose it is not found necessary to convert these ores into matts.

Substances resulting from the roasting of certain pyrites employed for the extraction of sulphur in the manufacture of chemicals, particularly the pyrites of San Domingo, Tarcis, Rio Tinto, and others of the same nature, may be treated directly by my improved process, at the same time dispensing with the chloridation of the products hereinbefore enumerated by means of sea-salt as usually practised, and the treatment with iodides or iodurets ordinarily adopted for the purpose of extracting the silver; the simplicity of my improved process enables it to be applied not only to rich ores but also to such ores as are too poor to be exported.

And in order that my said invention may be fully understood I shall now proceed to describe the same, and for that purpose shall refer to the several figures on the annexed sheet of drawings, the same letters of reference indicating corresponding parts in all the corresponding figures.

Figure 1 of the accompanying drawings is an elevation of the grinding and triturating apparatus employed in carrying out my invention. Figure 1a is a transverse section of the same, and figure 1b is a detail hereinafter referred to. Figure 2 is a side elevation, partly in section, of a mixing apparatus and settling tanks hereinafter described. Figure 3 is a side elevation, and figure 3a is a corresponding transverse section of an amalgamating apparatus, and figure 3b is a detail connected therewith. Figure 4 is a vertical section of a mixing or pugging apparatus, with two chambers. Figure 5 is a side elevation, partly in section, of the apparatus for collecting the amalgam; and figure 6 is a plan of the same. Figure 7 is a transverse section of the distilling apparatus employed according to this invention; and figure 8 is a detail of the same hereinafter referred to.

The cupreous substances containing precious metals are pulverized or ground as finely as possible by any suitable methods, either when in a dry condition or in the presence of water, after which they are introduced into an amalgamator constructed of wrought or cast iron, together with a sufficient quantity of water to render them semi-fluid, and a suitable weight of bichloride of mercury, with the addition of a certain quantity of chloride of sodium.

In order to reduce to a minimum the quantity of bichloride of mercury employed, the said quantity should be calculated at the rate of one equivalent of mercury to two equivalents of copper; when the materials are rich in precious metals it is necessary also to allow for the same.

It may be advantageous, in order to reduce the wear of the metal of which the cylinder of the amalgamator is composed, to introduce into the said cylinder a certain quantity of iron, either in the condition of filings or simply in the condition of sponge, such as is obtained by the coluation in presence of carbon of the peroxides of iron (figure 2^o), which forms the residue from wasting pyrites.

The amalgam resulting from the operation does not possess the trititious consistency *sui generis* of theoretical amalgam, as the quantity of mercury contained in the bichloride only corresponds to half the weight of copper to be dissolved, so that the amalgamation is merely commenced. In order to complete it, it is necessary to add to the mass of a quantity of metallic mercury equal to that contained in the bichloride which was employed in the first charge.

I have found that the total weight of metallic mercury which it is desirable to add for the purpose of promoting the proper performance of the subsequent operation is about four times greater than that necessary to obtain the theoretic amalgam $Cu Hg$.

The supplementary quantity of mercury is added with a view to imparting a high degree of fluidity to the amalgam to facilitate the reunion in the mass, and consequently the almost complete separation before the materials are passed over the plates of amalgamated metal for collecting the amalgam.

In order to obtain this result, a mixing or pugging apparatus having two bodies or chambers of special construction, hereinafter more fully described, is arranged between the amalgamator and the apparatus for receiving and collecting the amalgam, and a quantity of water sufficient to render the mass perfectly fluid, that is to say, equal to about five times its volume, is added to the said mass in the pugging apparatus.

The globules of amalgam are caused to unite and fall into the lower chamber of the apparatus, where they accumulate in consequence of their great density, so that the gangue alone remains in the upper part or chamber of the apparatus, mixed with a few globules of amalgam, which are subsequently separated by passing the materials over the amalgamated collecting plates, with the addition of a suitable quantity of water.

The liquid amalgam accumulated in the lower part of the pugging apparatus is continually stirred by a helix in presence of a sufficient quantity of pure water, and the amalgam thus obtained, after being washed and freed from all impurities, is subjected to a high degree of pressure in a skin of chamois leather,

Improvements in the treatment of ores containing copper, &c.

leather, in order to extract as much of the mercury as possible, after which it is submitted to distillation in order to drive off the remainder of this metal which still remains associated with the copper, gold, and silver.

This operation of distilling the amalgam effects the separation of the copper and the precious metals, the latter being precipitated and deposited to the lower part of the vessel, whilst the copper forms a spongy mass and occupies the upper part of the said vessel.

A true eliquation of the amalgams is thus produced during the distillation, being a phenomenon not heretofore observed. I find that amalgam of copper when heated to about 300 degrees Centigrade possesses the property of swelling up, and at the same time sweating out drops of mercury, whilst amalgams of gold, silver, platinum, and other metals separate from the mercury with which they are associated without swelling, consequently after the operation of distillation a spongy mass remains clearly separated from the previous metals, which occupy the lower part of the vessel, and may then be readily detached by a knife or other suitable means.

The spongy copper being mechanically pure may be melted and cast in bars, or simply submitted to a high degree of pressure in order to agglomerate it into ingots.

In order to ensure success in carrying out the operation it is necessary to observe the following conditions, videlicet:—

- 1st. That amalgam of copper predominates even to a considerable amount in proportion to the amalgam of gold and silver.
- 2nd. That before being submitted to distillation the complex amalgam is powerfully compressed.
- 3rd. That the heating of the amalgam and its distillation is conducted, at starting, very slowly and with great care, and that the temperature during the whole operation is not allowed to exceed from 400 to 500 degrees. An apparatus of great simplicity, which enables these conditions to be fulfilled, is hereinafter described.

It will be readily understood that as the swelling of the amalgam of copper is effected at a relatively low temperature, and causes the amalgam of gold to be precipitated to the bottom of the vessel before the distillation, the latter amalgam may be separated by simply drawing or running it off when in a heated condition, the two amalgams being then distilled separately.

The grinding or triturating apparatus (figure 1, 1*a*, and 1*b*) is composed of a cast-iron drum or cylinder, *a*, which may be made in two pieces to facilitate its transport. This drum is capable of rotating in a horizontal axis, and is provided with a toothed wheel, *b*, driven by a pinion, not shown in the drawing, actuated by driving pulleys, *b'*. This drum contains a number of metal cylinders, *c* (figures 1*a* and detail figure 1*b*), which may be either solid or hollow, their number and dimensions being duly proportioned to the hardness of the ore and the internal capacity of the drum.

A suitable quantity of water and ore, previously broken in a suitable apparatus, is introduced into the drum, which is then caused to revolve; and after a certain time a valve, *d*, operated by a hand-wheel, *e*, is opened, whereupon the liquid portion contained in the upper part of the drum is discharged, whilst the insufficiently triturated materials remain in the apparatus, in order to be ground over again with a fresh supply of ore and water introduced into the apparatus.

A funnel or hopper, *f*, is arranged underneath the valve *d*, and serves to conduct the liquid to a pugging or mixing apparatus, *i* (figure 2), which collects and retains the coarse grains whilst the parts held in suspension pass on to a series of settling tanks, *g*, in which the products from the grinding apparatus are deposited in order of fineness, the parts which are too coarsely ground being returned to the apparatus.

The last one of the series of settling tanks, *g*, terminates in a double perforated partition enclosing sponges, *h*, which only allow the clear liquid to escape, all the solid matter, including even the finest particles, being retained in the tank.

The ground material or pulp thus obtained is introduced into an amalgamating apparatus, represented in figures 3 and 3*a*, similar to the grinding apparatus hereinbefore described, the contents being, however, discharged at the lower part of the drum *a* (figures 3 and 3*a*), so that the whole of the amalgam is drawn off at once; for this purpose the cylinders *c* in the apparatus are provided with helical grooves, as shown in figures 3*a* and in the detail figure 3*b*, in such a manner that they only come in contact with the internal periphery of the drum at certain isolated points, and consequently enable the amalgam to escape with facility through plug-holes, *j*, provided for the discharge of the contents of the drum.

The form and arrangement of this apparatus may be modified if considered desirable.

The pugging or mixing apparatus represented in figure 4 is constructed with two bodies or chambers, and serves to retain the greater part of the amalgam, when treating copper ores, before causing the materials containing the said amalgam to pass through the apparatus with revolving plates for collecting the amalgam.

This mixing apparatus consists essentially of two cylindrical chambers, an upper chamber, A, and a lower and smaller chamber, B. The upper or larger chamber A is provided with a rake or stirrer, C, of cast-iron, turning upon a vertical shaft or axis, D, and having for its object to maintain in suspension in the water the materials delivered by the amalgamator or amalgamators.

The same vertical shaft or axis also actuates a cast-iron helix, E, in the smaller and lower cylindrical chamber B, which helix serves to maintain the amalgam collected in this chamber in continual motion, in order to promote the washing of the materials and their separation from the gangues.

The mud or slime contained in the upper chamber A is discharged separately through valves, F F, and is conducted to an ordinary mixing or pugging apparatus before being treated in the apparatus with revolving plates, which latter collect the last remaining parts of amalgam still held in suspension in the said mud. The amalgam collected in the lower chamber B is discharged directly through a valve, G.

The apparatus for collecting the amalgam, and illustrated in figures 5 and 6, is provided with plates, *a*, carried by a rotating shaft, *d*, and stationary plates, *c*, attaching to the sides of the casing *b*, composed of hinged segments.

This apparatus is surmounted by a mixing or pugging apparatus, *e*, which receives the liquid mud or slime from the mixing apparatus (figure 4) with two bodies hereinbefore described, and discharges them on to the plates *a* and *c*, which serve to collect the amalgam.

Figures

Improvements in the treatment of ores containing copper, &c.

Figures 7 and 8 represent the improved form of distilling apparatus employed according to my invention for effecting the distillation of the amalgam of copper and the separation of the precious metals. This apparatus is composed of a cast-iron case, H, arranged in the interior of a furnace, I, of any suitable construction, provided with a movable plate or door, J, facing a corresponding plate, J', in the side of the vessel H, in order to enable a species of cast-iron crucible, *k*, of rectangular form, to be introduced into the interior of the said vessel.

The lower part of the crucible *k* is in the form of an inverted truncated pyramid, in which the precious metals accumulate, the copper remaining in the upper part of the crucible in the condition of spongy metallic froth.

The crucible *k* is mounted or suspended upon rollers, L, running upon rails, M, attached to the cast-iron vessel or case H, for the purpose of enabling the crucible *k* to be readily transferred to the interior of the vessel H from a traveller or carrying platform, N, and *vice versa*.

The vessel H is surmounted by a cover provided with a pipe, H', for the escape of the mercurial vapours resulting from the distillation of the amalgam, and which are condensed in a refrigerator of any suitable construction.

The crucible *k* being suitably coated internally, or lined with peroxide of iron, the cake of copper does not adhere to the cast-iron, but may be withdrawn in a block, after which it is simply necessary to cut off the base in the form of a truncated pyramid in order to divide the precious metal from the copper, as hereinbefore described.

Having now described and particularly ascertained the nature of my said invention and the manner in which the same is or may be used or carried into effect, I would observe in conclusion that what I consider to be novel and original, and therefore claim as the invention secured to me by the hereinbefore in part recited Letters Patent, is—

First—The application of my process of electro-chemical amalgamation, that is to say, trituration of ground or pulverized ores with bichloride of mercury, with the addition of chloride of sodium, the whole being in the presence of metallic iron, to the treatment of ores or other substances containing copper, oxides of copper, salts of copper, or sulphurets, antimonourets, or arsnurets of copper, and the like, substantially as hereinbefore described.

Second—The addition to the mass after the commencement of the amalgamation, as hereinbefore described, of a certain quantity of metallic mercury, in order to complete the amalgamation and render the amalgam pasty and susceptible of being agglomerated and becoming fixed upon the amalgamated plates provided for its reception, substantially as hereinbefore described.

Third—The method hereinbefore described of effecting by decantation and filtration the preliminary separation of the greater part of the amalgam produced.

Fourth—The mode of effecting the separation of the precious metals contained in a complex amalgam of copper by a simple distillation or drawing off of the said amalgam, the phenomenon of eliquation being utilized, substantially as hereinbefore described.

Fifth—The system hereinbefore described, and illustrated on the accompanying drawings, consisting of grinding apparatus working with metal cylinders turning freely in a rotating drum.

Sixth—The description of amalgamating apparatus having cylinders provided with helical grooves turning freely in a rotating drum, substantially as hereinbefore described, and illustrated in the accompanying drawings.

Seventh—The mixing or pugging apparatus, having two bodies or chambers arranged the one over the other, and provided with agitators for the direct separation of the greater part of the amalgam obtained, substantially as hereinbefore described, and illustrated in the accompanying drawings.

Eighth—The retort or apparatus for distilling the amalgam, the said apparatus having a double case with metallic crucibles in the form of a truncated cake mounted upon rollers so as to travel upon rails, for the purpose of facilitating the manipulation and transport of the said crucibles, substantially as hereinbefore described, and illustrated in the accompanying drawings.

In witness whereof I, the said Paul Gustave Louis Gabrielle Designolle, have to this my specification set my hand and seal, this fifteenth day of February, one thousand eight hundred and eighty-one.

P. G. L. G. DESIGNOLLE.

Signed and sealed in the presence of Eugene Louis Designolle, engineer, 95, Boulevard Beaumarchais, Paris—

AUGUSTE HENRI GARISOT, employé, 18, rue des Ecouffles, Paris.

This is the specification referred to in the annexed Letters of Registration granted to Paul Gustave Louis Gabriel Designolle, this twenty-first day of May, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

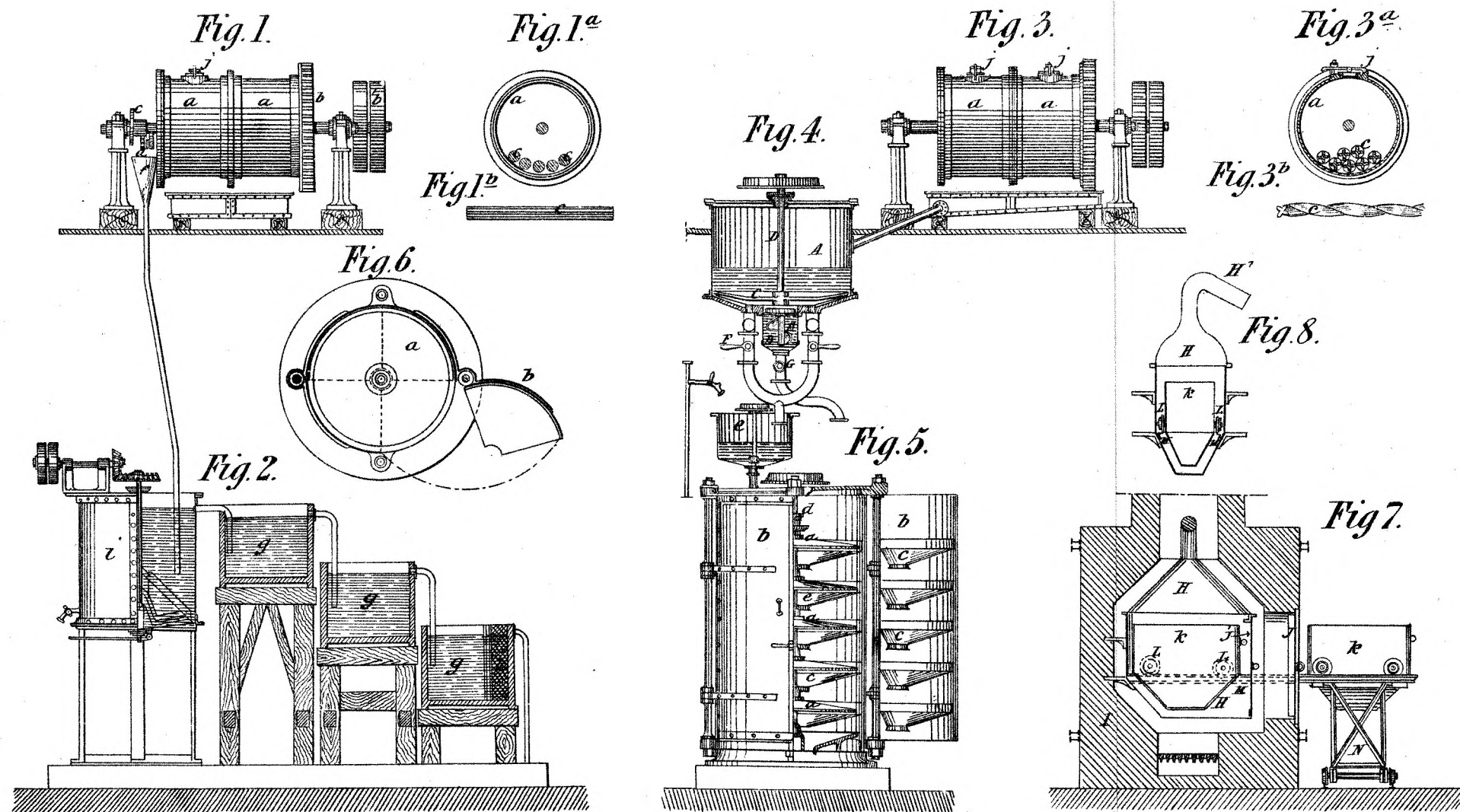
The application of Mr. P. G. L. G. Designolle for Letters of Registration for "Improvements in the treatment of ores or compounds containing copper, and the separation of copper from precious metals, and in apparatus connected therewith," having been referred to us, we have examined the specification and drawings accompanying the same, and have now the honor to report that we see no objection to the issue of Letters of Registration as prayed for.

We have, &c.,

J. SMITH.

CHAS. WATT.

The Under Secretary of Justice.



This is the Sheet of Drawings referred to in the annexed Letters of Registration granted to Paul Gustave Louis Designolle, this twenty first day of May A.D.1881.

Augustus Loftus.

PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE, SYDNEY, NEW SOUTH WALES.



A.D. 1881, 21st May. No. 936.

THE HEINZERLING TANNING PROCESS.

LETTERS OF REGISTRATION to Christian Heinzerling, for Improvements in converting skins or hides into leather.

[Registered on the 21st day of May, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS CHRISTIAN HEINZERLING, of Frankfort-on-the-Main, in the Empire of Germany, doctor of philosophy, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in converting skins or hides into leather," which is more particularly described in the specification which is hereunto annexed ; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four ; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years : And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Christian Heinzerling, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof ; to have, hold, and exercise unto the said Christian Heinzerling, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended : Provided always, that if the said Christian Heinzerling, shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this twenty-first day of May, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

The Heinzerling Tanning Process.

SPECIFICATION of CHRISTIAN HEINZERLING, of Frankfort-on-the-Main, in the Empire of Germany, doctor of philosophy, for an invention entitled "Improvements in converting skins or hides into leather."

THIS invention relates to the process of converting skins or hides into leather by means of chromates. Hitherto this has always proved a failure, the chromic acid hardening and eventually disintegrating the leather.

I have found, however, that if the hides, after being subjected to the chromate process as lately improved by me, are well permeated with stearine, paraffine, or their isomeric compounds, and exposed to the action of light, the chromic acid appears to have an action on the stearine compound, changing its constitution in the course of a month or two, and effecting thereby a great improvement in the leather. The exact chemical changes that go on in this process have not yet been ascertained, but probably insoluble compounds of chromic acid and the stearine or equivalent are formed. If free chromic acid or chromates have been used, a partial reduction of these materials and an oxidation of the paraffine appears to take place. The action and re-action of the light upon chrome compounds and paraffine, and the like stuffs, when used for impregnating in the manner hereafter described, make the leather nearly impermeable and give a great resistance to the action of water, so that it no longer has a tendency to harden or disintegrate.

I have found too in experimenting that there are many chrome compounds besides chromate of potash or magnesia that are effective. Thus, chromic acid, the other soluble chromates, especially those of ammonium, aluminium, iron, or the sulphate, chloride, acetate, and other soluble acid chromium salts, are all efficacious for the purpose of converting skins or hides into leather.

I also find that the precipitation of soft white neutral mineral material in the pores of the leather is very advantageous in preserving it, improving its colour and making it impervious to moisture.

Further, that the addition of such salts or oxides as the sulphates of copper, manganese, and zinc, chloride and borate of zinc, tungstate of sodium, or of potassium ($\text{W}\text{o}\text{O}_3\text{Na}$ or $\text{W}\text{o}\text{O}_3\text{K}$), sulphate or chloride of protoxide or sesquioxide of iron, and oxide of manganese, improve the texture, durability, or colour of the leather.

I will now give the actual process in its most improved form as practised by me in Germany.

The hides being unhaired in the usual manner, I put them first into a weak, and after a few days into a stronger solution of a soluble chromate or chromic acid or chromium salt, as hereinbefore described. To this solution I usually add a soluble salt of aluminium or the soluble hydrated oxide which is formed when carbonate of soda is added to a solution of sulphate of alumina or alum. The quantity of aluminous matter in the solution depends on the texture of the hides, the density of leather required, and the salts used; it varies therefore from nothing up to (say) four parts by weight of Al_2O_3 to 100 of water. The quantity of chromium salt or acid used also varies from one-half to five parts of the salt or acid to 100 of water. In the first pit, both the chrome and the aluminous materials are weak, especially the latter; while in succeeding pits, while the quantity of chrome does not vary much, that of the aluminous matters varies widely—sole leathers and other hard leathers requiring large quantities, whereas wash leather and thin uppers require none or very little. During the cold season the pits can be moderately heated (say) to 30 degrees Celsius.

The hides are left in this chrome and aluminous solution with or without the addition of any of the above-mentioned metallic salts useful for improving the colour or for tanning, for from one to twenty days, according to size, texture and thickness of the hides until they are perfectly converted. Their progress and complete conversion may be easily tested by cutting off a piece and seeing if the tanning liquor has thoroughly penetrated it. After this they are put into a solution of (say) from 3 to 8 per cent. of a soluble carbonate, such as carbonate of sodium or potassium, or a solution of soluble soap (say) 3 to 6 per cent., in order to fix superficially the tanning materials. In some cases it is advantageous to use instead of the above bath a soluble barium salt, such as the chloride, especially when alum or other sulphates have been largely used.

Instead of treating the hides with carbonate of sodium or soap solution as before mentioned, in some cases it may be advantageous to use albuminous matter, such as the serum of blood, either dissolved in acid or alkalis or in the solid state, finely divided as it is used in the kid leather manufactories. The hides are either immersed for a certain time till the matter has entered superficially, if a solution be used or "fouled" (*foule*) or tramped in a "fouling" or tramping ton for an hour, in order to facilitate the mechanical entering of the albuminous matter.

The hides intended for upper or belt leather are now dried till they are merely damp and then stretched; those for sole leather are made quite dry. They are then put into a solution of paraffine, stearine, colophony, or the like (dissolved in any suitable solvent such as benzol or photogen), or into vegetable or animal wax, or such stuff as that formed from treating rape or linseed oil with 10 to 18 per cent. of chloride of sulphur, or the solid soluble residues which are obtained in petroleum and paraffine refineries, or varnish and birch-tar oil; the above solution is heated from 26 to 38 degrees Celsius, in a water-bath, before and whilst the hides are in. The hides are kept in this bath at preferably from 28 to 30 degrees Celsius, for from one to three days, according to size, texture, and thickness; they are then exposed to the light for from twenty-five days to sixty, until the stearine, paraffine, colophonium, or other hydro-carbon used, appears oxidized throughout. Upper and belt leather can be greased a second time if required, with the usual substances or with vaseline. The above described stuffs may also be used in the melted state if they are fusible at a low temperature.

After a certain quantity of hides have been tanned, it will be found advantageous, instead of adding soluble aluminous salts, to add a quantity (proportional to the acids set free) of basic aluminium compounds got by incomplete precipitation of aluminium salts with carbonate of sodium or ammonium or of hydrate of alumina.

The tanning liquor should be analysed from time to time, and the mixture kept up to standard chemical composition.

Having

The Heinzerling Tanning Process.

Having now described my invention, to which I have given the name of the "The Heinzerling Tanning Process," what I claim as my invention is as follows:—

- 1st—As a new article of manufacture, leather made from skins which have been soaked in a chrome solution and then treated with stearine or an equivalent compound as described, and afterwards submitted to the action of light before use, as specified.
- 2nd—As a new article of manufacture, leather made from skins which have been treated with a chrome solution, an aluminous solution, a solution of soap, chloride of barium, or other material having a decomposing action on the aluminous solution (causing hydrate of alumina or barium sulphate, or both, to be deposited in the pores of the skin), then treated with stearine, or its chemically equivalent compounds herein mentioned, and exposed to light before use, as specified.
- 3rd—The process of tanning leather by soaking it in a chrome solution, an aluminous solution, a fixing solution acting upon the aluminous material, so as to form a precipitate in the pores of the leather, and then treating it with stearine or its chemical equivalent as described, and exposing it to light before use, as specified.
- 4th—The process of converting skins into leather by soaking them in a chrome solution, and then treating them with stearine or the herein-described equivalent materials, and then exposing them to light before use, as specified.
- 5th—In the process of converting skins into leather by means of chromium compounds, the employment of a soluble salt of alumina and of albuminous matter successively, as described.
- 6th—In the process of converting skins into leather by means of chromium and aluminium compounds, treating the said skins with sulphate of copper, sulphate of zinc, sulphate of manganese, chloride or borate of zinc, protoxide or sesquioxide of iron in the uncrystallized state, or oxide of manganese, or tungstate of sodium or potassium.
- 7th—The combination in the tanning of leather, of the chromium process, and the tanning process, that is converting a hide into leather by treating it with a solution of a chrome compound, and also with materials containing tannic acid.

In witness whereof, I, the said Christian Heinzerling, have hereunto set my hand and seal, this eighth day of December, 1880.

CHRISTIAN HEINZERLING.

Witness—

ERNST MEIB.

This is the specification referred to in the annexed Letters of Registration granted to Christian Heinzerling, this twenty-first day of May, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 14 April, 1881.

The application of Mr. C. Heinzerling for Letters of Registration for "Improvements in converting skins or hides into leather" having been referred to us, we have examined the specification accompanying the same, and have now the honor to report that we see no objection to the issue of Letters of Registration as prayed for.

We have, &c.,

J. SMITH.
CHAS. WATT.

The Under Secretary of Justice.



A.D. 1881, 21st *May*. No. 937.

**IMPROVEMENTS IN MACHINERY OR APPARATUS FOR RAISING AND LOWERING
HEAVY BODIES.**

**LETTERS OF REGISTRATION to Henry Cherry, for Improvements in Machinery
or Apparatus for raising and lowering heavy bodies.**

[Registered on the 21st day of May, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS
(commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of
the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-
Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS HENRY CHERRY, of Aston, near Birmingham, in the county of Warwick, mechanical engineer, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in machinery or apparatus for raising and lowering heavy bodies," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Henry Cherry, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said Henry Cherry, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said Henry Cherry shall not, within three days after the granting of these Letters of Registration, register the same in the proper officer in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this twenty-first day of May, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Machinery or Apparatus for raising and lowering heavy bodies.

SPECIFICATION.

TO ALL WHOM IT MAY CONCERN :

BE it known that I, HENRY CHERRY, of Aston, near Birmingham, in the county of Warwick, mechanical engineer, have invented certain improvements in machinery or apparatus for raising and lowering heavy bodies.

My invention consists of the improvements hereinafter described in machinery or apparatus for raising and lowering heavy bodies, in which machinery fluid pressure is the motive power employed.

I construct a cylinder bored from end to end, in which a piston works. To this piston one or more chains, ropes, or bands are attached, a casing enclosing a drum being bolted to the end of the said cylinder. On this drum the said ropes, chains, or bands coil and are attached to it. Instead of the drum a toothed chain wheel may be employed. The drum spindle passes through a stuffing-box in the said casing. On one end of the drum spindle outside the casing another drum pulley, gear wheel, or rope wheel is fixed, which sets in motion a chain, rope, or band, or other well-known means of communicating motion. A slide or other valve or valves admit and exhaust fluid from the cylinder.

In using an ordinary chain I prefer to form a V-shaped thread on the internal drum, on which the chain works. The slide valve I prefer to construct of a circular periphery, and rotating in a cylindrical bush in which the ports are formed. The said bush I force into a casing, having the inlet and outlet passages cast on and having suitable projections dividing the same. The fluid passes inside the bush and presses the valve to its seat.

As a means of thoroughly controlling the motion of the piston, I employ either the above described valve or an ordinary slide valve or other well known substitute. The spindle moving the valve has a screw-thread cut on it. This screw-thread works in a nut formed in the boss of a gear-wheel or a substitute for the same. This gear-wheel is prevented from moving endways, but is rotated by another gear-wheel or substitute receiving motion from the drum spindle. The said gearing is arranged so that when the screwed spindle moving the valve is turned in the direction for lifting, the consequent motion of the drum spindle turns the gear-wheel in the boss of which the nut is cut in the same direction, thus tending to reverse the motion of the valve.

The apparatus may be made double-acting by using two drums and casings, the drum spindles being connected by suitable gearing for producing simultaneous motion.

In applying a cylinder, as above described, to a crane, I use the cylinder as the strut of the jib part of the crane. I prefer to employ two chains to connect the piston to the enclosed drum, as thereby the strain is always applied most directly to the said piston.

The cylinder may be lagged or covered with an imperfect conductor of heat. The exhaust steam, when steam is the fluid used, may be passed into the opposite end or round it, or all three methods employed conjointly for the purpose of keeping it hot.

To lessen friction of the drum spindle I sometimes use roller bearings.

Having described the nature of my invention, I will proceed to describe, with reference to the accompanying drawings, the manner in which the same is to be performed.

Figure 1 represents a longitudinal section of one arrangement of the improvements constituting my invention; and figure 2 represents a section of the same taken through the line A, figure 1; *a* is the bored cylinder, and *b* the piston working steam-tight therein; *d* is the casing bolted to the end of the cylinder *a*, and *e* is the drum working in the said casing *d*. One or more chains, ropes, or bands, *c*, are connected at one end to the piston *b*, and their other ends are connected to the drum *e*. The shaft *e* of the drum *e* passes through stuffing-boxes, *f f* (see figure 2) in the ends of the drum *d*. On one end of the axis *e* and external to the casing, is another drum pulley or gear wheel or rope wheel, *g*, by means of which motion is given to the chain, rope, or other agent by which the heavy body is to be raised. When steam is admitted to the right-hand side of the piston *b* the said piston is forced towards the end *a* of the cylinder. The chain *c* is thereby uncoiled from the drum *e*. The rotation of the drum *e*, shaft *f*, and drum *g* causes the winding of the chain *h* on the said drum *g*, and the raising of the heavy body to which the said chain is attached.

Figure 4 represents on a small scale the application of my invention to a steam crane. The cylinder casing and external drum are marked with the same letters as the corresponding parts in figures 1, 2, and 3. The chain *h* on the drum *g* passes over the pulley *g*² and is connected in the usual way to the body to be raised. It will be seen in figure 4 that the cylinder *a* constitutes the strut of the jib part of the crane. I prefer to employ two chains, *c c*, figure 2, to connect the piston *b* to the drum *e*, and when I employ ordinary chains I prefer to form v-shaped ribs or threads on the drum, as shown at *k* in figure 5, which figure represents in section a half-drum of this kind.

In order to control the motion of the piston, I prefer to employ the arrangement of valve represented in longitudinal section in figure 6 and in cross section in figure 7. The valve *l* is cylindrical, and works in the cylindrical bush *m* forced into the casing *o*, having an inlet passage, *p*, and outlet passages, *q, q*. The ports in the bush *m* are marked *n, n*; or a slide valve of the kind represented in figure 11 may be employed. The spindle *r*, turned by a hand-wheel, has a screwed part, *t*, working on the fixed screw box *u*. By turning the hand-wheel, motion in one or other direction may be given to the slide valve *s*. I do not, however, limit myself to the use of any particular kind of valve.

Figure 8 represents in longitudinal section, and figure 3 in end elevation, a double-acting arrangement of my invention. The cylinder *a* is provided with one piston, *b*, two casings, *d, d*, each having its drum with spindle and external drum. The external drums are connected respectively to opposite sides of the piston *b*. The shafts are geared together by the endless chain *w* passing round the pitch chain wheels *w*² *w*². As the steam is made to act on one or other side of the piston *b*, the said piston is moved in one or other direction, and motion communicated to the external pitch chain wheels *w*² *w*² and drum *g*.

Instead of the drum *e* having a chain, *c*, coiled upon it, a toothed chain wheel and chain passing over it may be employed, as represented in the section, figures 9 and 10.

In

Improvements in Machinery or Apparatus for raising and lowering heavy bodies.

In the section figure 10 a second cylinder and piston of small diameter are represented, an endless chain passing over pulleys at each end of the cylinders. The object of this arrangement is the same as that represented in figure 8, namely, to rotate the lifting chain drum *g* by the fluid pressure in both directions instead of merely in one. The same result is obtained by the arrangement represented in figure 11.

Figure 11 represents a modification of my invention, in which two parallel cylinders and pistons of equal or different diameters are employed. These pistons are connected by a chain passing over a pitched chain wheel or secured to a barrel, and by the action of the steam on the upper sides of the pistons alternately an alternating lifting power in opposite directions is obtained, that is, the drum on the axis *e*² of the chain wheel *e* raises the chain passing over it with equal or different force in whichever direction the said chain wheel turns.

Figure 12 represents a modification of my invention, in which motion from the piston is communicated to the shaft of the chain drum by means of a rack on the piston and a spur pinion on the said shaft. As the connection between the piston and shaft is in this modification rigid, the motion of the piston is available for giving the required raising power to the external drum in either direction, and the cylinder is provided with valve mechanism for enabling the steam to act both on the upper and under side of the piston. In this arrangement the same advantages are obtained with a single cylinder and piston as are obtained in the arrangement, figure 11, by the use of two cylinders and pistons.

In order to lessen the friction of the drum spindle in its bearings anti-friction rollers may be employed, as illustrated at *x* in figures 1, 2, and 8.

Although for the sake of brevity I have only described my invention in connection with steam, yet my invention may be used with water or other elastic or inelastic fluid as the motive power.

Having described the nature of my said invention and the manner in which the same is to be performed, I wish it to be understood that I claim as my invention of improvements in machinery or apparatus for raising and lowering heavy bodies the combination of a cylinder and piston with a rotating drum contained in a casing on the end of the cylinder, rotatory motion being communicated to the said drum by the said piston and transmitted by the axis of the drum to the exterior of the casing, whether the cylinders and piston be used singly or in pairs, and whether the apparatus be worked by steam or water or other fluid pressure, substantially as herein described, and illustrated in the accompanying drawings.

In witness whereof, I, the said Henry Cherry, have hereunto set my hand and seal, this twentieth day of March, in the year of our Lord one thousand eight hundred and eighty-one.

HENRY CHERRY,

By his attorney,
OWEN BLACKET.

This is the specification referred to in the annexed Letters of Registration granted to Henry Cherry, this twenty-first day of May, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 12 April, 1881.

We do ourselves the honor to state that, on examination of Mr. Henry Cherry's specification, drawing, and claim for "Improvements in machinery or apparatus for raising and lowering heavy bodies," transmitted for our report under your blank cover communication of the 4th instant, No. 3,462, we are of opinion that the prayer of Mr. Cherry's petition may be granted.

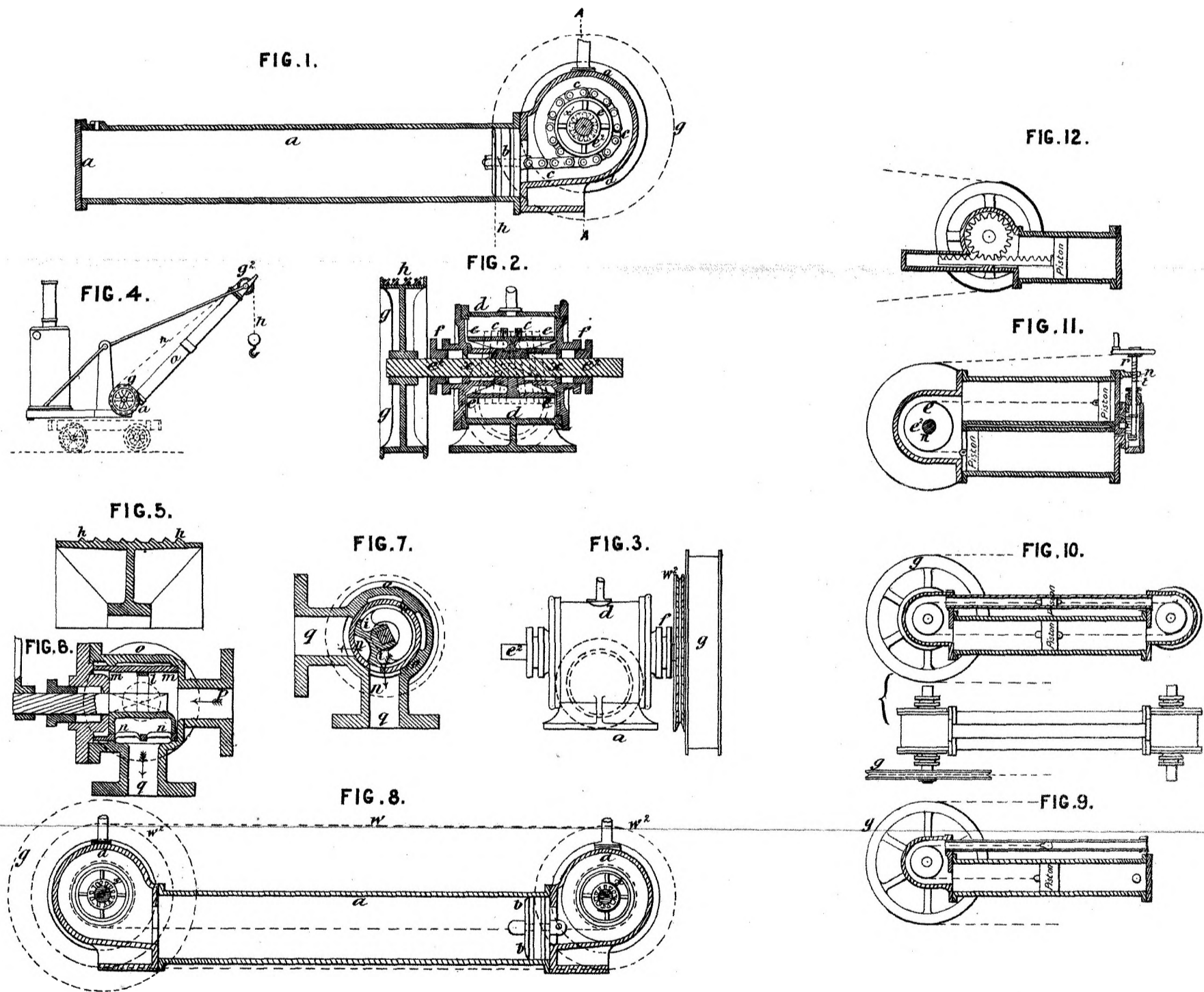
We have, &c.,
GOTHER K. MANN.
E. C. CRACKNELL.

The Under Secretary of Justice.

[Drawings—one sheet.]

MACHINERY FOR RAISING AND LOWERING HEAVY BODIES

INVENTED BY
HENRY CHERRY



*This is the Sheet of Drawings referred to in the annexed
Letters of Registration granted to Henry Cherry, this
twenty-first day of May, A.D. 1881.*
Augustus Loftus.



A.D. 1881, 21st May. No. 938.

AN IMPROVED FURNACE FOR THE COMBUSTION OF FUEL.

LETTERS OF REGISTRATION to Thomas Denny, for an improved Furnace for the combustion of fuel.

[Registered on the 21st day of May, 1881, in pursuance of the Act, 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting:

WHEREAS THOMAS DENNY, of 113, Pitt-street, Sydney, in the Colony of New South Wales, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention of "An improved Furnace for the combustion of fuel," which is more particularly described in the specification and sheet of drawings which are hereunto annexed; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Thomas Denny, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said Thomas Denny, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said Thomas Denny shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this twenty-first day of May, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

An improved Furnace for the combustion of fuel.

SPECIFICATION.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, THOMAS DENNY, of 113, Pitt-street, Sydney, in the Colony of New South Wales, send greeting :

WHEREAS I am desirous of securing by Royal Letters Patent Her Majesty's special license that I, my administrators, executors, and assigns, or such others as I or they should at any time agree with, and no others, should and lawfully might, from time to time, and at all times during the term of fourteen years (to be computed on the day of which the instrument shall be left at the office of the Chief Secretary), make, use, exercise, and vend within the Colony of New South Wales and its Dependencies, an invention for the combustion of fuel, more particularly described in specification hereunto annexed.

THOS. DENNY.

SPECIFICATION of Furnace for burning coal, suitable for burning bricks in brick kilns, and generating steam in steam boilers.

THE necessity existing for an improvement in furnaces for burning bricks is patent to anybody who has had an opportunity of seeing the huge volumes of unconsumed carbon surrounding the brick-kilns in this country when the operation of burning is going on. It is marvellous that a law has not been passed for the suppression of this nuisance, which so greatly disfigures and pollutes the neighbourhood where brickmaking is carried on, whilst it also acts injuriously on animal and vegetable life.

The cost of burning bricks by all the ordinary kilns is about 10s. per 1,000; about four-tenths of this amount goes to make the nuisance above named; and the average time taken to burn a kiln of bricks is 100 hours, being at least twenty-five too many.

The object of my invention is—

Firstly—To burn bricks in a much shorter time than taken in all ordinary cases.

Secondly—To supply a greater degree of heat than can be possibly supplied under the present system, and to accomplish this with from 30 to 40 per cent. less coal.

Thirdly—To bring about proper chemical union of the coal gases with the oxygen of the air, thus producing proper combustion and preventing the formation of smoke.

To a man having a knowledge of the chemistry of combustion, one look at the present brick-kiln furnaces reveals the fact that chemical union of the coal gases with the oxygen of the air for the formation of carbonic acid is practically impossible. The coal is crammed into a small hole made in the casing of the kiln, no consideration having been given to the size of the combustion chamber, either in length or height, hence the loss in labour and fuel.

This invention consists of a brick furnace lined with fire-bricks, and fitted with cast iron frame dead plate, and firebars and sliding doors.

This furnace is intended to be built outside the present fire-holes of brick-kilns, making a length of combustion chamber of not less than 5 feet. This length of 5 feet will bring about a proper union of the elements carbon, hydrogen, and oxygen, forming carbonic acid, which gives the greatest amount of useful heat it is possible to get from coal.

When this carbonic acid is once formed in the combustion chamber it will enter the unburnt brick apartment in a long sheet of flame, which not meeting with any more carbon does not readily lose its heat, except in the way intended, viz., heating the bricks.

Without a combustion chamber, a proper area of fire-bar, and, what is of the most importance, a definite quantity of air for the amount of coal consumed, combustion is impossible and waste is certain.

The object of the sliding door A is to permit the fireman to open the door just sufficient to admit of the coal being thrown in, admitting only the minimum amount of cold air.

Hinged doors, when opened for adding fuel, must be thrown full open, thus exposing a surface or area of from 2 to 3 square feet, which admits a large body of cold air, which has the effect of cooling the combustion chamber to such an extent that it requires several minutes to again get up the heat after the doors have been closed; and until the same degree of heat is again obtained a waste of fuel is going on through the formation of smoke, which always takes place in any furnace when the temperature is below what is necessary for proper combustion.

I wish it to be understood that I provide space for the proper amount of oxygen to pass in when the doors are closed, so that what passes in when the doors are opened is in excess of what is required, hence the larger the opening the greater the power for cooling. In any case it is a wrong principle to allow a large body of cold air to enter any combustion chamber, whether for burning bricks or generating steam.

My invention will be a considerable benefit to the owners of steam boilers, for the following reasons:—

In setting a boiler, arrangements should be made to carry on combustion under the highest possible heat; this requires good non-conductors of heat, such as white fire-brick, with which to surround the fire. All those arrangements by which the fuel is consumed in coal fire-bars, as in marine boilers, locomotives, and land boilers, are unprofitable in respect to fuel. Fire-boxes should always be lined with white fire-brick. The form of the material is not only of importance in combustion—the colour also has an influence. Combustion is more perfect in white than in black or dark, coloured vessels, carbonic acid is formed with greater facility in a chamber composed of white material than in one formed of dark matter. A black body, such as the bottom of a boiler or a cloud of black smoke, above the fire, is sufficient to smother combustion, that is to prevent or at least to disturb the formation of carbonic acid. The roof as well as the sides of the furnace should be of white fire-brick if we would secure good combustion.

It is therefore a bad arrangement to lay the furnace in the boiler and surround the fire by black cold iron; it is also an imperfect plan to lay the boiler's bottom above and close to the fire; combustion will never be perfect under such conditions.

An improved Furnace for the combustion of fuel.

I claim as my invention the sliding rolling door, with door frame and rollers, as shown in drawing.
 I claim as my invention the combination of brick furnace with iron frame, perforated dead plate, and sliding rolling door, set at the angle shown or any convenient angle; thus admitting the necessary quantity of oxygen for complete combustion, and admitting the supply of fuel to the furnace through a very small opening; and yet when it is necessary to clean the furnace out the door may be opened the full width of furnace. I accomplish this by making the maximum height of opening in the door-frame 9 inches, by any length to suit the size of boiler or brick-kiln.

I disclaim any right to giving any new view of the nature of combustion, but I claim the practical application on a large scale of a furnace which shall do away with the smoke nuisance in brick-kilns and steam boilers, with a saving of from 25 per cent. to 40 per cent. over the present method.

THOS. DENNY.

DESCRIPTION.

A is the sliding perforated door, B the rollers it runs on, C the iron frame, D the perforated dead plate, E the roller bracket, F the combustion chamber, G the boiler flue, and H the ash-pit.

And I do hereby for myself, my heirs, executors, and administrators, covenant with Her Majesty, Her Heirs and Successors, that I believe the said invention to be a new invention, as to the public use and exercise thereof; and that I do not know or believe that any other person than myself is the true and first inventor of the said invention, and that I will not deposit these presents at the office of the Chief Secretary with any such knowledge as aforesaid.

In witness whereof, to these presents I have hereunto set my hand and seal, this
 at Sydney, in the Colony aforesaid.
 THOS. DENNY.

This is the specification referred to in the annexed Letters of Registration granted to Thomas Denny, this twenty-first day of May, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

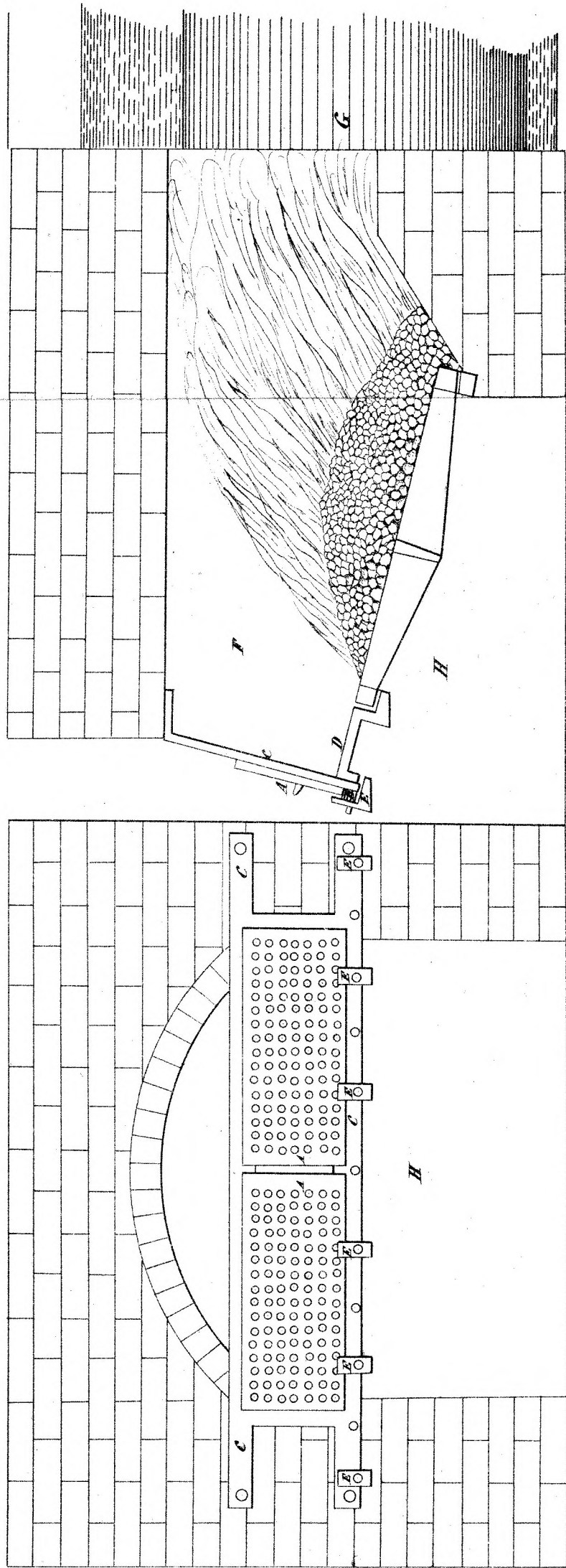
Sydney, 31 March, 1881.

Having examined the specification and plans accompanying the Petition, we have the honor to recommend that Letters of Registration should be issued to Mr. Thomas Denny, his executors, administrators, and assigns, for his invention of the sliding doors with door frame and rollers, and the combination of brick frame and furnace with iron frame, perforated dead frame plate, and sliding rolling doors set at the angle shown, or any convenient angle, as shown in the drawings and described in the specification attached to his Petition.

We have, &c.,
 JOHN WHITTON.
 E. O. MORIARTY.

The Under Secretary of Justice.

[Drawings—one sheet.]



*This is the Sheet of Drawings referred to in the annexed
Letters of Registration granted to Thomas Dewey, this
twenty first day of May A.D. 1881.*

Augustus Loftus.



A.D. 1881, 14th June. No. 939.

IMPROVEMENTS IN MACHINERY FOR CRUSHING, PULVERIZING, AND
AMALGAMATING.

LETTERS OF REGISTRATION to Richard James Tonks, for Improvements in
machinery for crushing, pulverizing, and amalgamating.

[Registered on the 15th day of June, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS
(commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of
the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-
in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS RICHARD JAMES TONKS, of Greymouth, in the Colony of New Zealand, settler, hath
by his Petition humbly represented to me that he is the author or designer of a certain invention or
improvement in manufactures, that is to say, of an invention entitled "Improvements in machinery for
crushing, pulverizing, and amalgamating," which is more particularly described in the specification, marked
A, and the three several sheets of drawings, marked B, C, and D respectively, which are hereunto
annexed; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said
Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting
these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four;
and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive
enjoyment and advantage of the said invention or improvement might be secured to him for a period of
fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts
or manufactures which may be for the public good, and having received a report favourable to the prayer of
the said Petition, from competent persons appointed by me to examine and consider the matters stated
therein and to report thereon for my information, am pleased, with the advice of the Executive Council,
and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by
these Letters of Registration grant unto the said Richard James Tonks, his executors, administrators, and
assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the
term of fourteen years from the date hereof; to have, hold, and exercise unto the said Richard James
Tonks, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and
during and unto the full end and term of fourteen years from the date of these presents next and
immediately ensuing, and fully to be complete and ended: Provided always, that if the said Richard
James Tonks shall not, within three days after the granting of these Letters of Registration, register the
same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South
Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and
become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters
of Registration to be sealed with the seal of the said Colony of New South Wales, at
Government House, Sydney, in New South Wales, this fourteenth day of June, in the year
of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

A.

Improvements in machinery for crushing, pulverizing, and amalgamating.

A.

SPECIFICATION of RICHARD JAMES TONKS, of Greymouth, in the Colony of New Zealand, settler, for an invention entitled "Improvements in machinery for crushing, pulverizing, and amalgamating."

THIS invention consists of certain improvements in machinery for crushing, pulverizing, and amalgamating. That which relates to crushing has reference to that class of machine in which the substance to be crushed is thrown with great velocity by a rapidly revolving disc, or arms on such disc, against the inner periphery of a stationary cylinder armed with inwardly projecting teeth; and the improvements in this part of my invention consist, first, in the peculiar method of constructing and arranging such inwardly projecting teeth; secondly, in having two or more of said rapidly revolving discs placed under one another; and third, in screwing such discs on to their supporting shaft.

That which relates to pulverizing has reference to that class of machine in which the substance to be pulverized is placed in a revolving drum with iron balls; and the improvements in this part of my invention consist, first, in perforating both body and ends of the drum; second, in making such drum of chilled iron plates, combined with an outer casing of wire gauze; and third, in providing a hollow horizontal axle through the centre of the drum, for the purpose of allowing a blast of cold air to be supplied to the interior.

That which relates to amalgamating has reference to what are known as barrel amalgamators, and consists in the special combination and arrangement of parts forming the complete machine as hereinafter set forth and explained, and illustrated in the drawings.

The crushing or disintegrating machine consists of two main or principal parts, constructed to take every and full advantage of a blow given by rapidly revolving arms, and the economizing of the full power in the centrifugal force of a rapidly revolving disc, said disc having revolving motion from two to three thousand revolutions per minute.

The first main part is a circular cast-iron casing or number of casings. In the drawing I have shown two such casings, AA, with flange A¹ on the outside to secure lower one to wood frame-work, and also to secure them to one another when constructed of more than one. The inner circumference has also a complete flange, A², in which is cast a number of triangular holes, into which are fitted a number of pieces of triangular chilled cast iron, forming a complete serrated circumference; these are secured in their places by bands of iron, A³, and screws on outside of each casing. A⁴ is a cast-iron cover with flanges secured to circular casing by bolts and screws. A⁵ is an open space for the admission of the material to be crushed. From and through the above-named cover or top, and through the casing, is fitted a vertical spindle or shaft, B, the foot of which is secured in a cross-bracket, B¹, fitted with a phosphor bronze bearing, B², said cross-bracket being fitted to lower cast-iron casing with screws. The lubrication is effected by a pipe passing along cross-bracket and screwed into phosphor bronze bearing. The foot of vertical shaft and bronze bearing are secured from any dust by a tube fitting close to shaft and bearing. The vertical shaft or spindle is fitted with a plate or disc, C, in each casing, made of cast steel, with shoulders cast upon it, against which are secured by bolts and screws, or by riveting, a piece of hardened cast steel, C¹. The cast-steel plates on disc are pierced at centre, and are secured to vertical shaft by being screwed upon it, the worm of said screw running with the revolving motion. The top of casing or cover is fitted with gun-metal bearing, B³, for carrying vertical shaft, and with driving pulley, B⁴, to give it the required rapid revolving motion. The material to be crushed is passed through the opening in top cover, and is immediately struck by steel arms fitted upon revolving disc, and to a certain extent broken and crushed. The material is then thrown by the centrifugal force of revolving disc against the chilled triangular pieces of iron forming serrated inner circumference of casing. If not reduced to powder the material rebounds and falls upon revolving disc, is again struck by revolving arms, and again thrown against serrated circumference by centrifugal force of the revolving disc. When reduced fine, the material passes between revolving disc and flange of casing, and falls upon a curtain, C², that directs it to centre of lower revolving disc, where it passes through the same operations as in first chamber till reduced to powder; it then passes through open space between revolving disc and flange of casing to receiving hopper (not shown) below.

By this system of crushing the material to be operated upon can be crushed in a perfectly dry state or semi-damp or wet state, by injection with material being crushed of a jet of water regulated as required.

The machine can be made with many variations and modifications, according to the nature and quantity of material desired to be crushed in a given time. First, the diameter, depth, also number of cast-iron casings may be varied as required, and boiler-plate iron substituted for cast-iron. Second, the vertical shaft may be made to one or more revolving discs. Third, the number of arms attached to each revolving disc may be increased, their form and size modified. Fourth, the number of chilled triangular pieces of iron forming serrated circumference of cast-iron casing may be varied in number, form, and size.

The pulverizer is a cylindrical machine like a drum. The outside casing D is made of boiler-plate iron, fitted to two cast-iron heads. Each cast-iron head has an inner and outside rim cast upon it, the inner rim D¹ for securing the cylinder by bolts and screws; the outside rim has a spur wheel, D², cast upon it, also V-shaped friction-wheels, D³, which may be cast upon head any distance from circumference, thus allowing the cylinder to work in open tank of water, the depth best adapted according to work required. The cast-iron heads are faced and bored at the centre to receive and carry a hollow centre or cast-iron shaft, D⁴, firmly bolted and secured. The cylinder is made with a man-hole, D⁵, for receiving the material to be pulverized, is fitted with door and bar-door. The ends of cylinder are pierced with a number of holes round complete circumference, for the gradual discharge of the material as it is pulverized. The inside of cylinder, also the cast-iron ends, are fitted and covered with a number of chilled cast-iron plates,

Improvements in machinery for crushing, pulverizing, and amalgamating.

D⁵, secured in permanent place by headless screws with bolts through the ends and spur rim. The chilled iron plates are pierced with a number of holes, through which the pulverized material passes on to a fine wire gauze fitted between the inner chilled iron plates and outside casing, thus preventing the escape of any material not pulverized sufficiently fine. The turned and prepared friction-wheels revolve on four smaller V-shaped friction-wheels, E, fitted with gudgeons and brass bearings in two bed-plates, E¹, which have also fitted in centre between friction-wheels a driving shaft, F, fitted with cog-wheels, F¹, for giving revolving motion to the cylinder. This motion, with a number of chilled cast-iron balls placed inside of cylinder complete the pulverizing, which may be carried on in a perfectly dry state, in which case the cylinder should be perfectly covered in and a cold air blast introduced into it through the hollow centre or shaft. This will keep it and the material in it cool, and will also expel the material when pulverized. When the machine is required to work in connection with water, an open tank should be erected under cylinder, and depth of water regulated as required. The water, with revolving motion of cylinder, will draw the pulverized material from it, and may be taken from tank as it settles in the water. The water used in the tank should be preserved in another and special tank, and the water used again repeatedly after it has settled or for the purpose of amalgamating.

The machine may be made with many variations and modifications, according to the quantity of material to be pulverized in given time and nature of material to be operated upon. First, the length and diameter of cylinder can be varied; second, the size, weight, and form of chilled cast-iron plates of interior casing may be varied; third, the outer casing of boiler-plate iron may be dispensed with and complete casing or cover of wire gauze substituted. In this case the iron bands round body of cylinder will prevent the gauze from bulging and tearing away from bolt-holes in inner rim of cylinder cast-iron heads.

The amalgamator is a wood or plate-iron cylinder, G, fitted on each end with a cast-iron V-shaped rim or friction-wheel, G¹, and spur-wheel, G², for giving it motion. The V-shaped rims fit into the peripheries of four suitably shaped friction rollers, H. These friction rollers are fitted and turn upon two cast-iron bed plates, H¹. The said bed-plate is fitted with shaft, H², and cog-wheel, H³, in centre between friction wheels for giving it motion. The amalgamator is also fitted with a centre shaft, J—the centre of cast-iron head forming its bearing at each end. Said shaft carries driving-wheels, J². The centre shaft is fitted with a number of wrought-iron or copper arms, J³, with broad ends or fans. The cylinder is fitted with a bung-hole or orifice, G³, for admission and discharge of material. The orifice in the inside is protected or surrounded by a raised rim, G⁴, for retaining the amalgam when discharging waste material after amalgamation. Adjoining said rim are fitted two taps, G⁵, by which the amalgam may be withdrawn by itself from the amalgamator.

When the auriferous ore is pulverized it is passed to the amalgamator in quantities as desired, and the necessary quantity of quicksilver and water added. The cylinder or amalgamator should then be put in motion upon its friction-rollers, and continued till complete amalgamation has taken place, the arms of fans upon centre shaft assisting in this. When the amalgamation is completed, the cylinder should be turned with the bung or orifice downwards and the centre shaft set in motion. This will enable all amalgam or quicksilver to collect in the bottom around rim protecting the orifice. The waste mud or material may then be discharged by opening or withdrawing the bung. The mud or material should then be conducted to an open tank or machine and allowed to settle, and the water then drawn off to a tank or cistern specially reserved for this purpose, and the water should be used again in repeated amalgamation. The infinitesimal fine gold that is continually lost by floating away in a running stream of water is thus prevented, and any fine gold in the water used in amalgamation may be precipitated. When opportunity offers this may be effected by a solution of proto-sulphate of iron. This proto-sulphate of iron should be dissolved in warm water and added to the water used in amalgamation, well stirred, and allowed to settle, and any fine gold held by the water will be precipitated. The water should then be carefully drawn off, residue on bottom attached, and treated. The mud or used material should be run over quicksilver plates or blankets in ordinary use, to save any quicksilver or amalgam that may not have been collected from imperfect amalgamation.

Be it understood this amalgam barrel or cylinder may be made with many variations and modifications, as materials and quantities to be amalgamated in given time require. The arms or fans upon centre may be increased or decreased and their form varied.

Having thus described the nature of this invention and the manner of performing same, I would have it understood that I distinctly disclaim the invention of crushing machines which crush by throwing the material to be reduced with great velocity against the inner periphery of a stationary cylinder—the invention of pulverizers which pulverize by means of balls working inside a revolving drum or cylinder—and the invention of amalgamators which consist of revolving barrels or cylinders, but .

I claim only—

The several improvements in such machines which are set forth in the first three paragraphs of the descriptive portion of this specification.

By his Agent—

EDWD. WATERS.

RICHD. J. TONKS.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to Richard James Tonks, this fourteenth day of June, A.D. 1881.

AUGUSTUS LOFTUS.

Improvements in machinery for crushing, pulverizing, and amalgamating.

REPORT.

Sir,
The application of Mr. R. J. Tonks for Letters of Registration for "Improvements in machinery for crushing, pulverizing, and amalgamating" having been referred to us, we have examined the specification and drawings accompanying the same, and have now the honor to report that we see no objection to the issue of Letters of Registration as prayed for.

Sydney, 7 May, 1881.

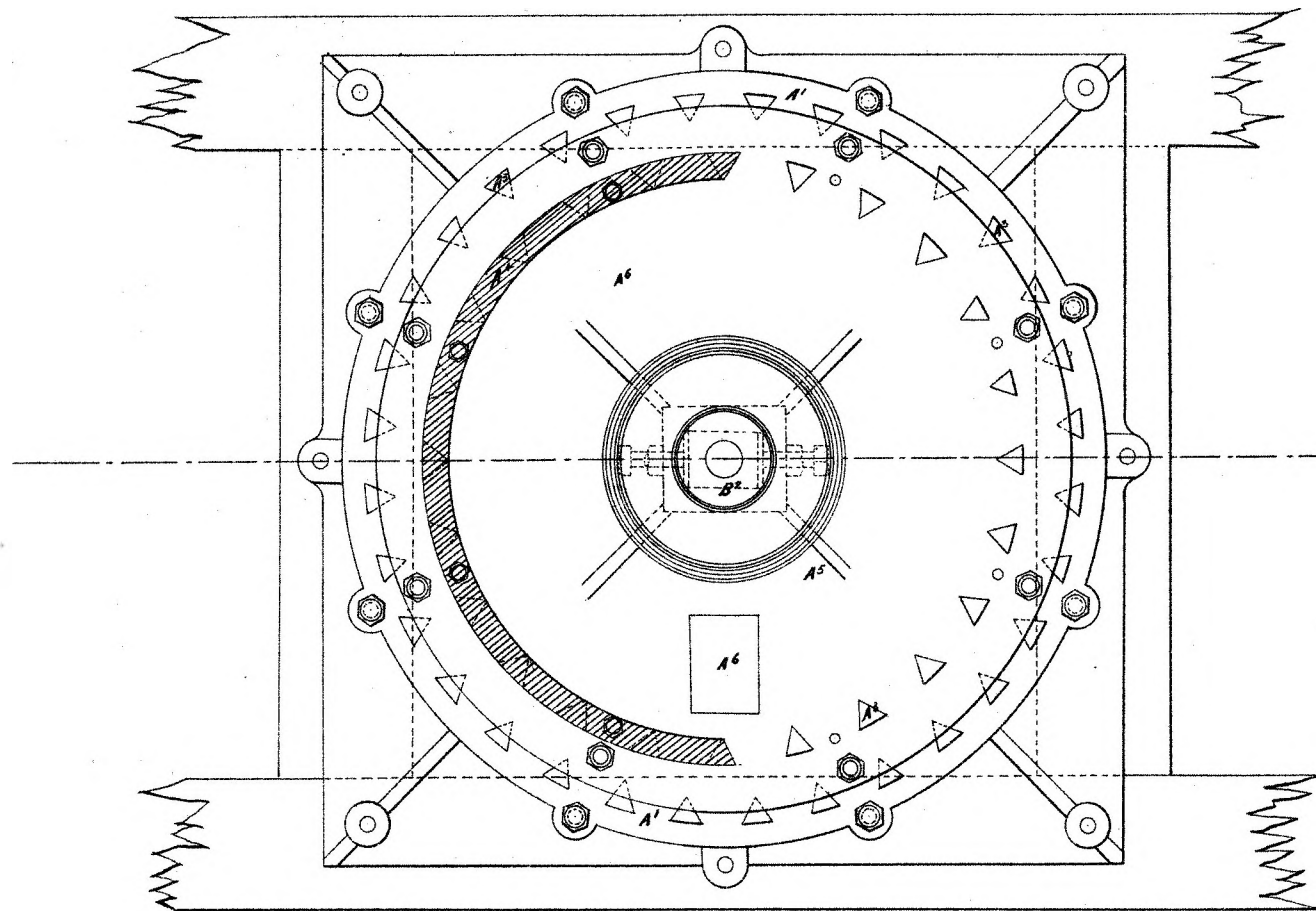
We have, &c.,
J. SMITH.
CHAS. WATT.

The Under Secretary of Justice.

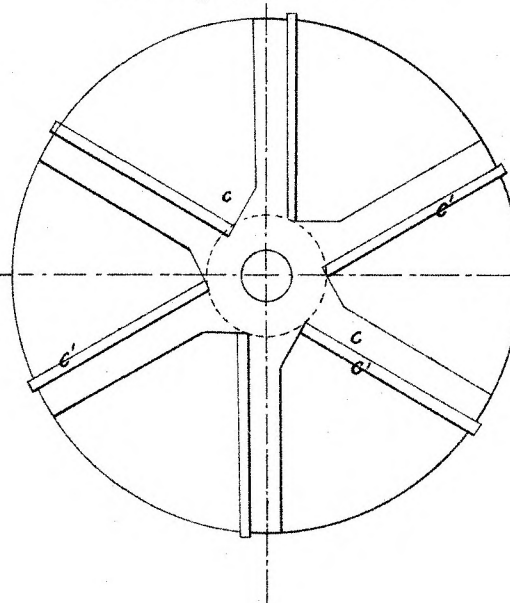
[Drawings—three sheets.]

DISINTEGRATING MACHINE

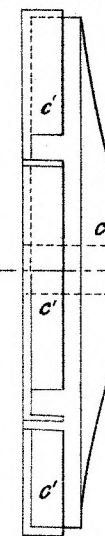
Ground Plan



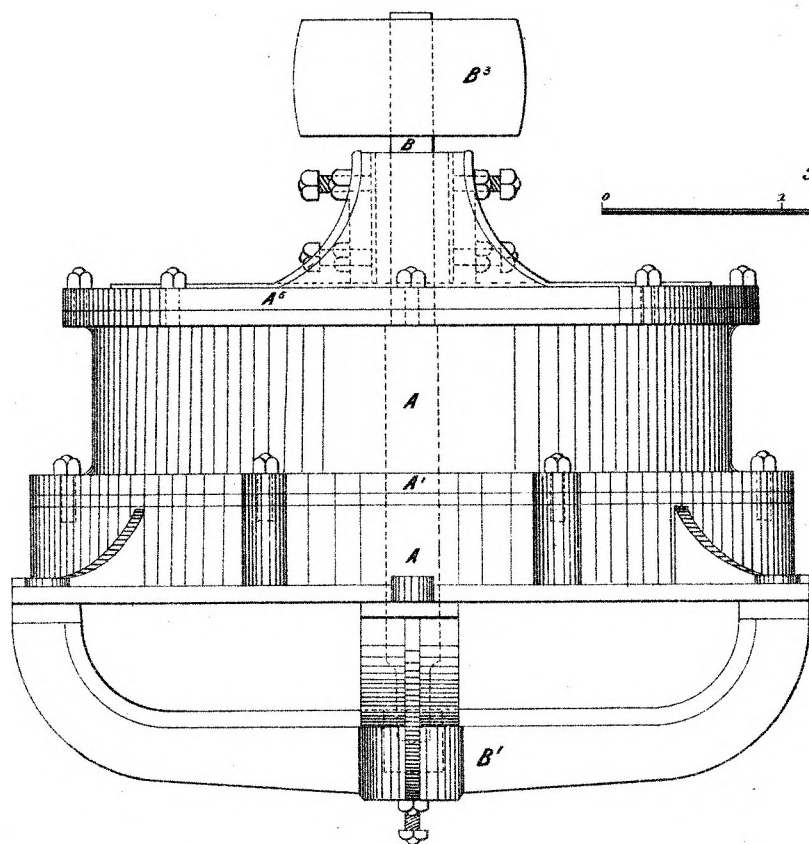
Revolving Sphere or Disc



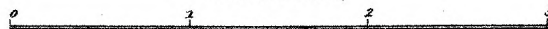
Section



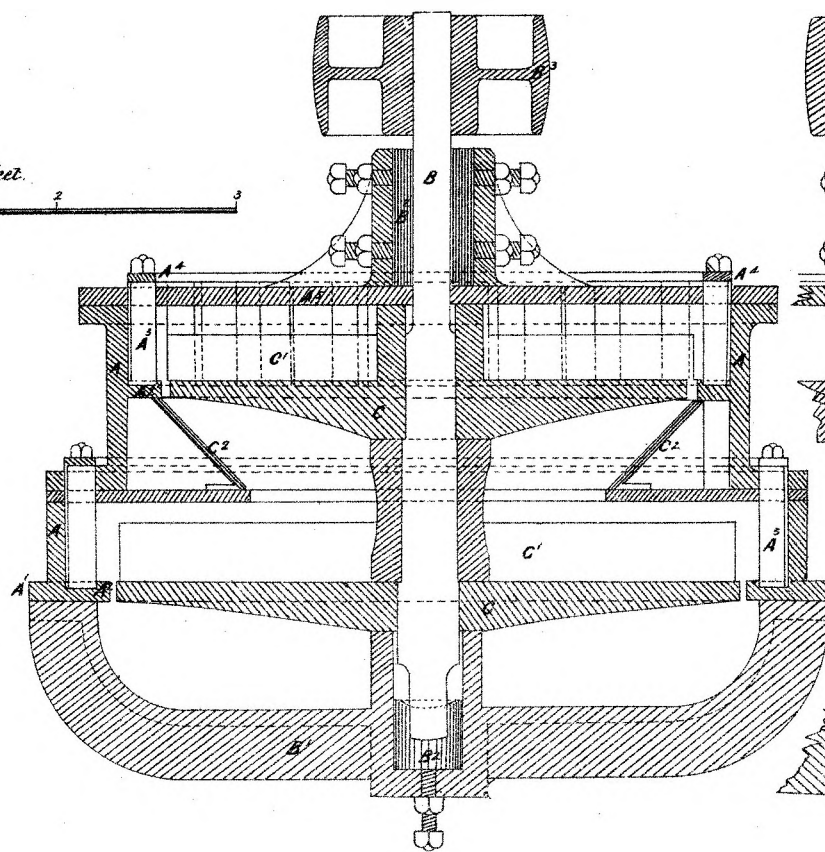
Elevation



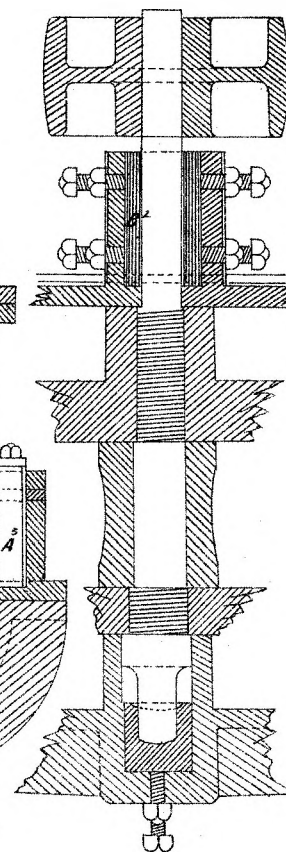
Scale of Feet



Section



Section of Vertical Shaft



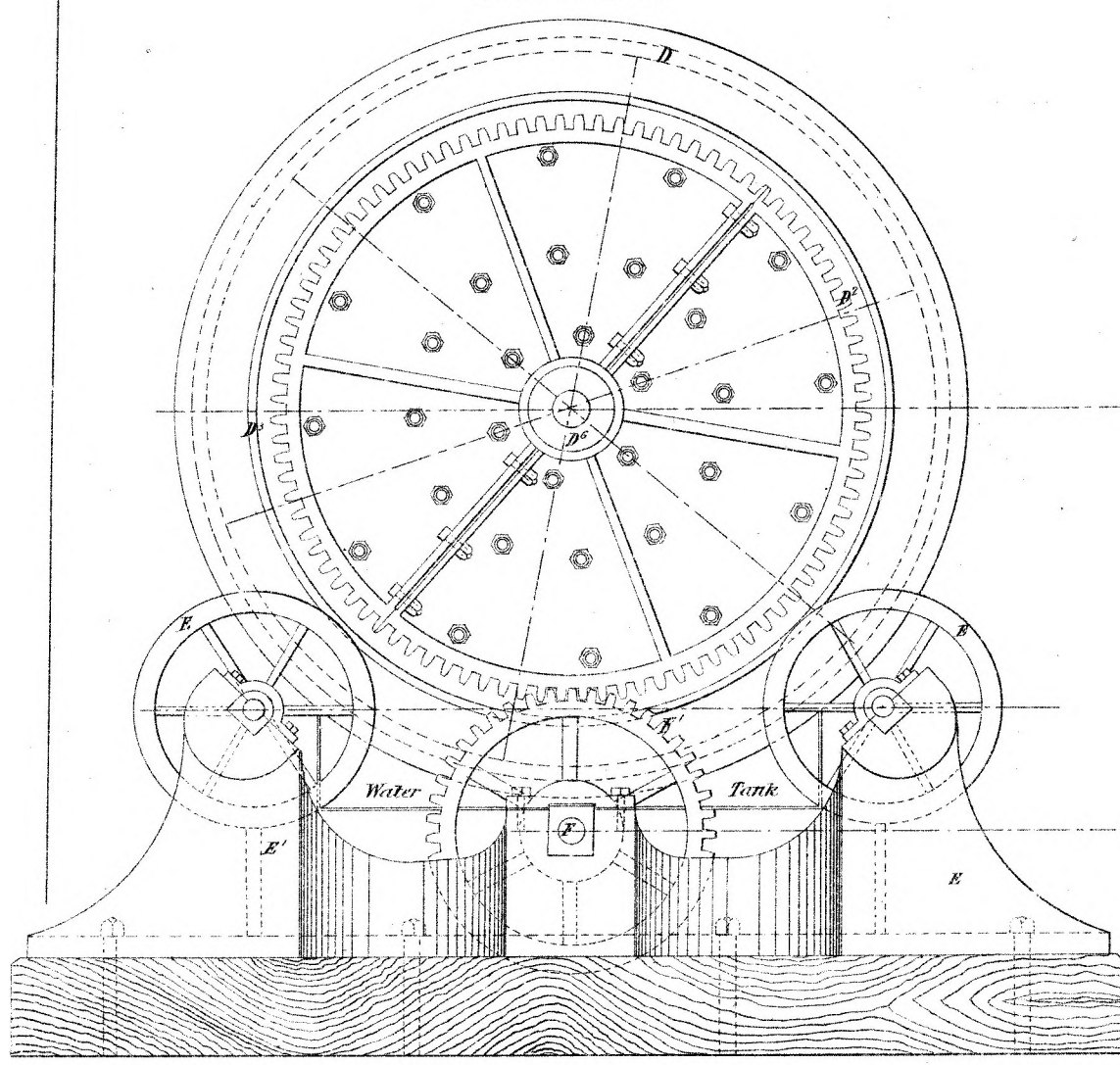
This is the Steel of Drawings marked B. referred to in the annexed Letters of Registration granted to Richard James Tonks, this fourteenth day of June A.D. 1881.

Augustus Loftus.

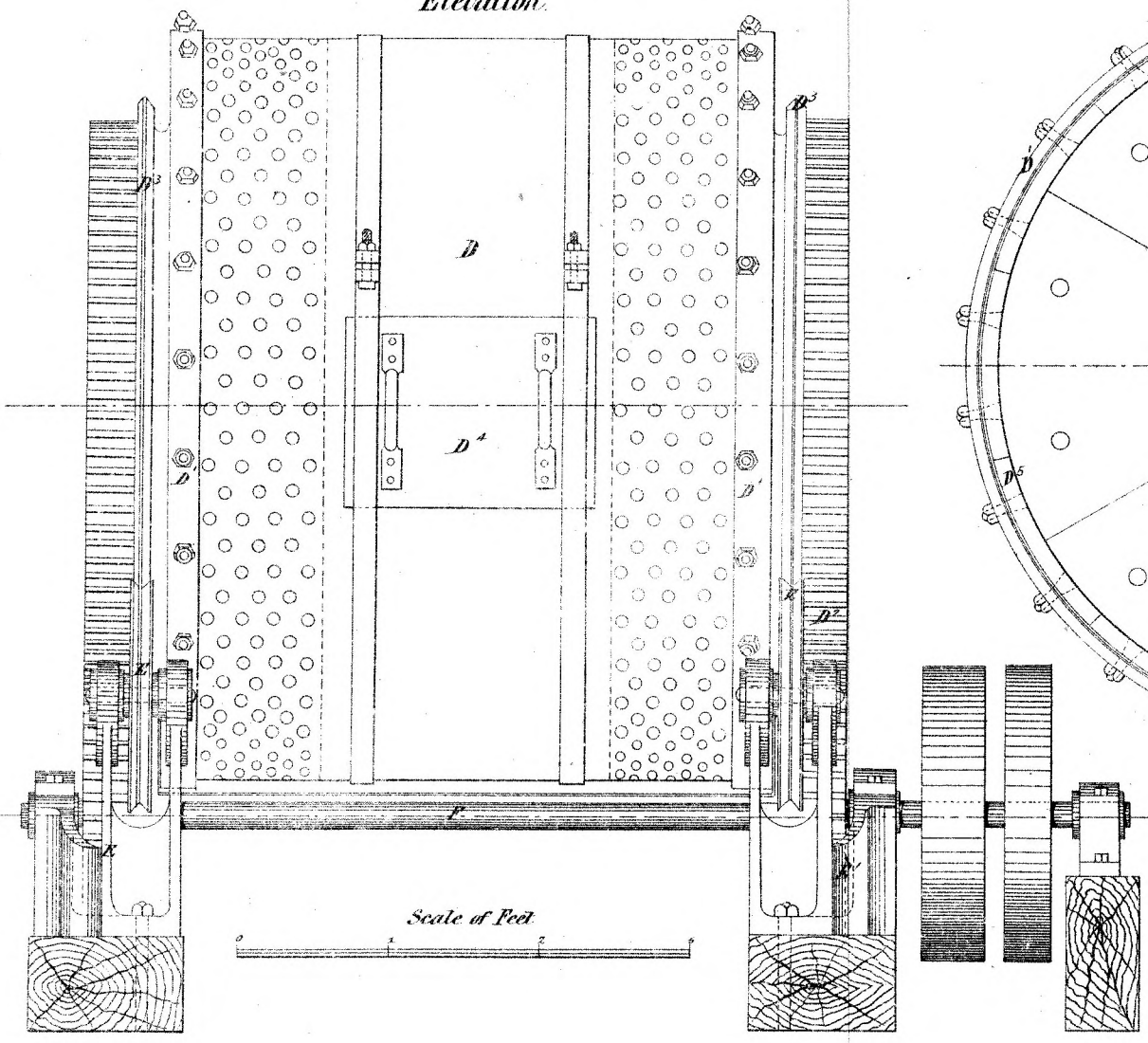
Rich. J. Tonks.

PULVERISING MACHINE

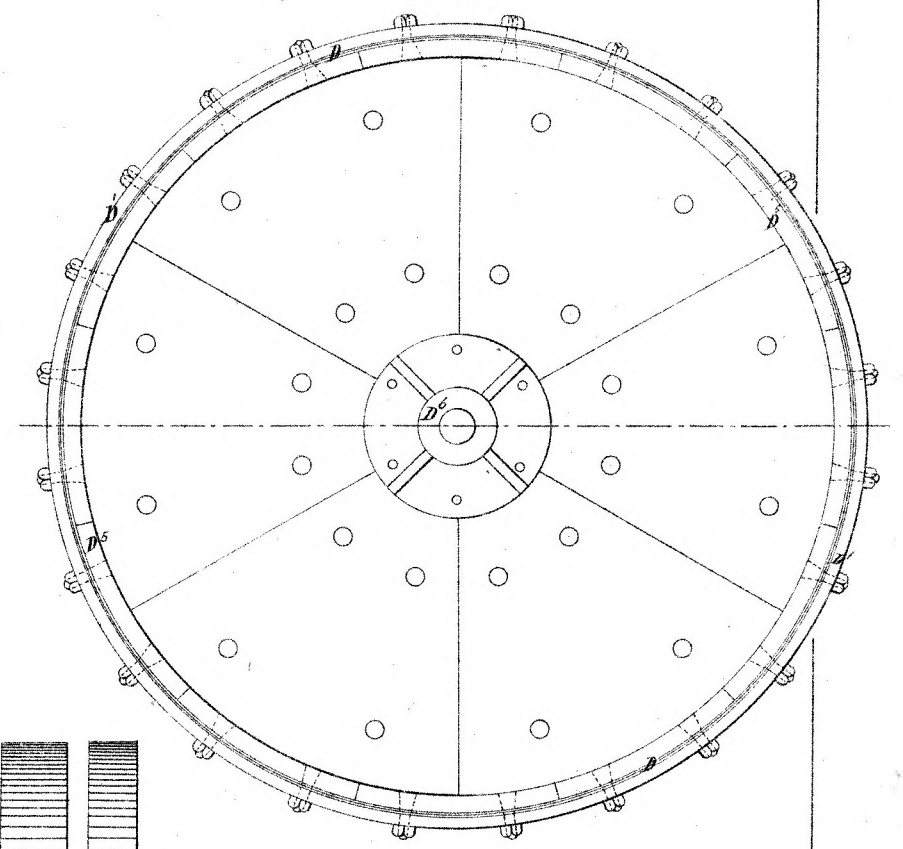
End Elevation.



Elevation.



Section

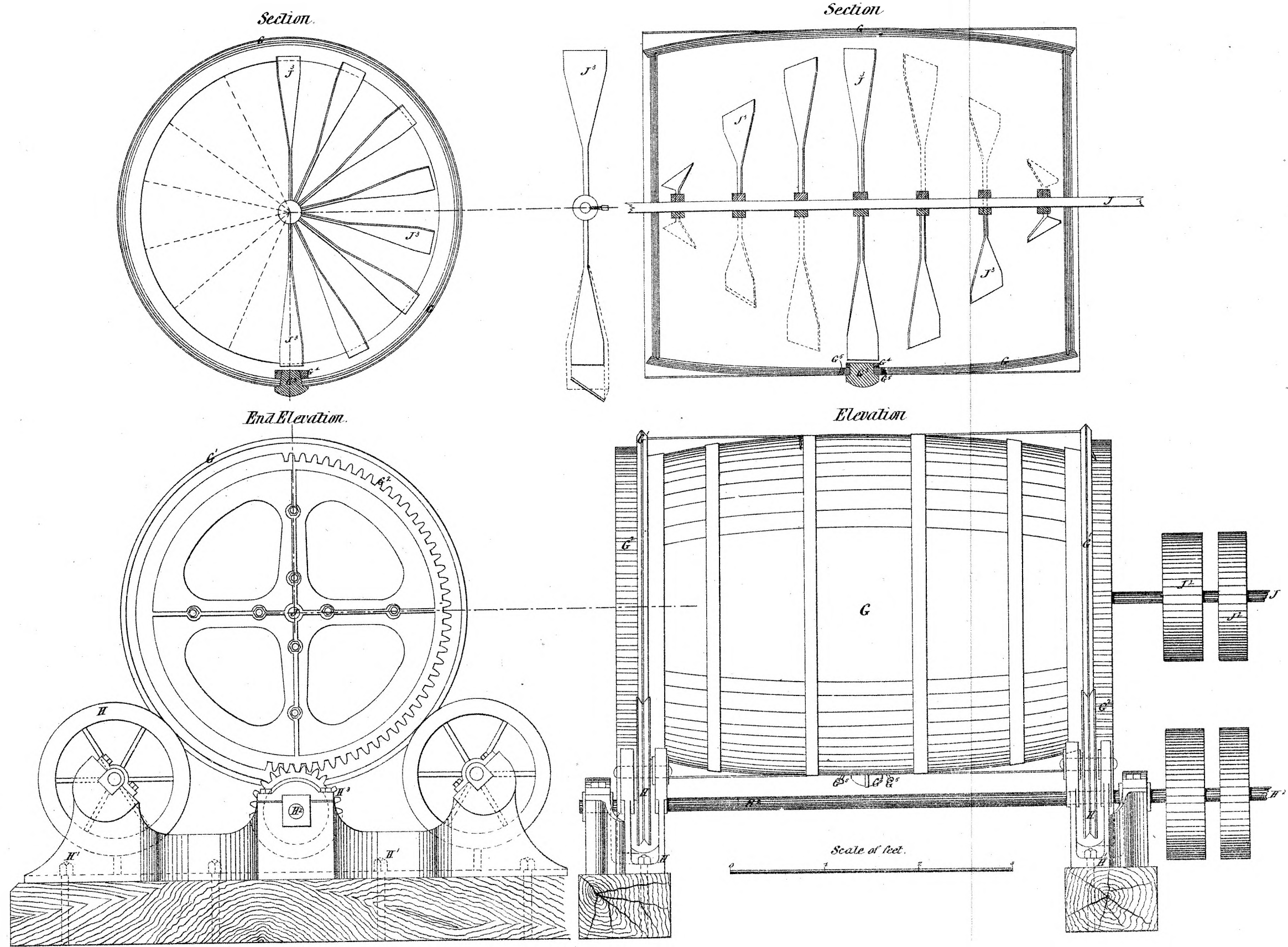


This is the Sheet of Drawings marked C. referred to in the annexed Letters of Registration, granted to Richard James Tonks, this fourteenth day of June A. D. 1881.

Augustus Loftus

Richard James Tonks

AMALCAMATING MACHINE.



This is the Sheet of Drawings marked D referred to in the annexed Letters of Registration granted to Richard James Tonks, this fourteenth day of June A. D. 1881.

Augustus Loftus.

Richard J. Tonks



A. D. 1881, 14th June. No. 940.

IMPROVEMENTS IN BURNERS.

LETTERS OF REGISTRATION to James Nicholas Douglass, for Improvements in Burners.

[Registered on the 15th day of June, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS JAMES NICHOLAS DOUGLASS, of Dulwich, in the county of Surrey, in England, civil engineer, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in Burners," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said James Nicholas Douglass, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said James Nicholas Douglass, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be completed and ended: Provided always, that if the said James Nicholas Douglass shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this fourteenth day of June, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Burners.

SPECIFICATION of JAMES NICHOLAS DOUGLASS, of Dulwich, in the county of Surrey, in England, civil engineer, for an invention entitled "Improvements in Burners."

THIS invention has for its object improvements in oil and gas burners having two or more rings or ring chambers when oil is used, and two or more perforated rings when gas is used, the ring chambers being connected with deflectors constructed and employed as hereinafter described, and the combination producing in each case a burner of a greatly improved character as compared with those hitherto used.

I am aware that what are termed deflectors have been before employed for the purpose of deflecting currents of air supplied to a burner, and in some cases the lip or edge of such burners has been made to project slightly over the upward stream of ignited gases as they issue from a burner, but such burners have not consisted of several concentric chambers, and in no case has there been effected such a convergence of the ignited currents as is caused by the use of deflectors in the manner which I have found to be necessary.

The invention consists in an arrangement of an outer deflector surrounding the burner and lower part of the flames, one or more of which it covers, and in connection with this deflector is a deflecting glass chimney, both deflector and chimney being so formed as to force the outer flame or flames on to the inner flame or flames in the manner illustrated in the accompanying drawings, and thus to condense the flames to the requisite extent, and deflect on to the internal and external surfaces of each of the flames the whole or nearly the whole of the ascending currents of air, and in such a manner as to invigorate the combustion of the flames and augment the intensity of their light.

The invention also includes the means of employing one or more of the rings of flame with perfect combustion, and thus decreasing or increasing the intensity of the light without any alteration in the external form or dimensions. This is a matter of great importance when the light is employed in combination with optical apparatus.

To decrease the intensity of the light of an oil burner without altering its external form or dimensions, one or more of the inner rings of flame are extinguished, by lowering their wicks within the wick chambers by the usual racks and pinions provided for this purpose, and to increase the intensity of the light thus reduced the wicks are raised to their required level and are ignited by the adjacent inwardly deflected outer flame or flames. To decrease the intensity of the light of a gas-burner without altering its external form or dimensions, one or more of the inner rings of flame are extinguished by shutting off the supply of gas by the usual cocks or valves provided for the purpose; and to increase the intensity of the light thus reduced, these cocks or valves are opened and the ascending gas is ignited—as before described for the wicks of the oil burner—by the adjacent inwardly deflected outer flame or flames.

In order that the method of constructing burners with my improvements may be fully understood, I will proceed to give a description of the drawings hereunto annexed, which illustrate the mode in which my improvements are employed.

DESCRIPTION OF THE DRAWINGS.

Figure 1, sectional view of my improved burner for six rings of flame. Figure 2, sectional view of same arrangement where three of the rings only are employed. Figure 3, modified form of burner as adapted for cylindrical chimney. Figure 4, sectional view as in figure 3, with one ring deflector.

In these figures the same letters indicate like parts.

A, concentric rings of oil or gas chambers. B, deflector which may be formed as in figure 4, with one ring or with two or more rings or partitions as in figures 1, 2, and 3. C, deflecting glass chimney. D, flames at full intensity (figure 1). E, flames at decreased intensity with the three alternate rings only employed in burner (figure 2).

The concentric hollow rings are those as ordinarily constructed, between which the air and oxygen passes to the interior and exterior of the inner flame or flames, and to the exterior of the outer flame, as shown in the drawings. By this my invention highly condensed and compressed flames are produced, differing in this respect from any burner hitherto used. The requisite condensation or compression is effected by having the deflector B constructed so as sufficiently to overlap one or more of the outer rings and flames of the burner A. This deflector B causes the maximum quantity of air and oxygen to be conducted up to the outer flames and forced on to them at the proper points of combustion, thereby condensing them as shown, and thus producing perfect combustion. The deflector B is formed of one or more rings or partitions, the number of such rings or partitions being increased or decreased when a larger or smaller number of rings forming the burner A is employed, so that by means of such deflectors acting in combination with the glass chimney C, air and oxygen are delivered to the flames at the proper points so as to cause them to converge and to condense and compress them as shown, and thus produce perfect combustion.

In figures 1 and 2 a curved deflecting chimney, C, is shown; in figures 3 and 4, a straight deflecting cylindrical chimney, which rests on lugs, projections, or brackets, formed or cast on the outer surface of the deflector B. A curved chimney could be used with the arrangement shown in figure 4.

It is to be observed that a very important advantage both as regards efficiency and economy is obtained by the use of my improvements in burners, because the temperature of the glass chimney is considerably less than with present burners, and thus, besides diminishing breakage of the glass chimneys, flames of greater intensity than hitherto employed can be advantageously used.

Having now particularly described and ascertained the nature and object of the said invention and in what manner the same is to be performed or carried out in practice, I hereby declare that what I claim is the use in burners having two or more rings for flame, of deflector B or deflectors B B, which are formed so as to overlap one or more of the rings of flame of the burner A, in combination with a glass chimney

Improvements in Burners.

chimney, C, whereby the rings of flame are made to converge, and the maximum quantity of air and oxygen is so conducted to and forced into the flames at the proper point or points that a highly condensed and compact light with perfect combustion, and of maximum intensity, is produced, substantially in the manner hereinbefore described, and shown in the drawings annexed.

In witness whereof I, the said James Nicholas Douglass, have hereunto set my hand and seal, this seventeenth day of February, 1881.

JAS. N. DOUGLASS.

Witness—

T. MORGAN, 21, Cockspur-street, London, S.W.

This is the specification referred to in the annexed Letters of Registration granted to James Nicholas Douglass, this fourteenth day of June, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 2 May, 1881.

We have the honor to report that we see no objection to the issue of Letters of Registration to Mr. James Nicholas Douglass, for his invention entitled "Improvements in Burners," in accordance with his Petition, specification, and claim, transmitted to us under your B.C. communication, No. 81/4102, of the 20th ultimo.

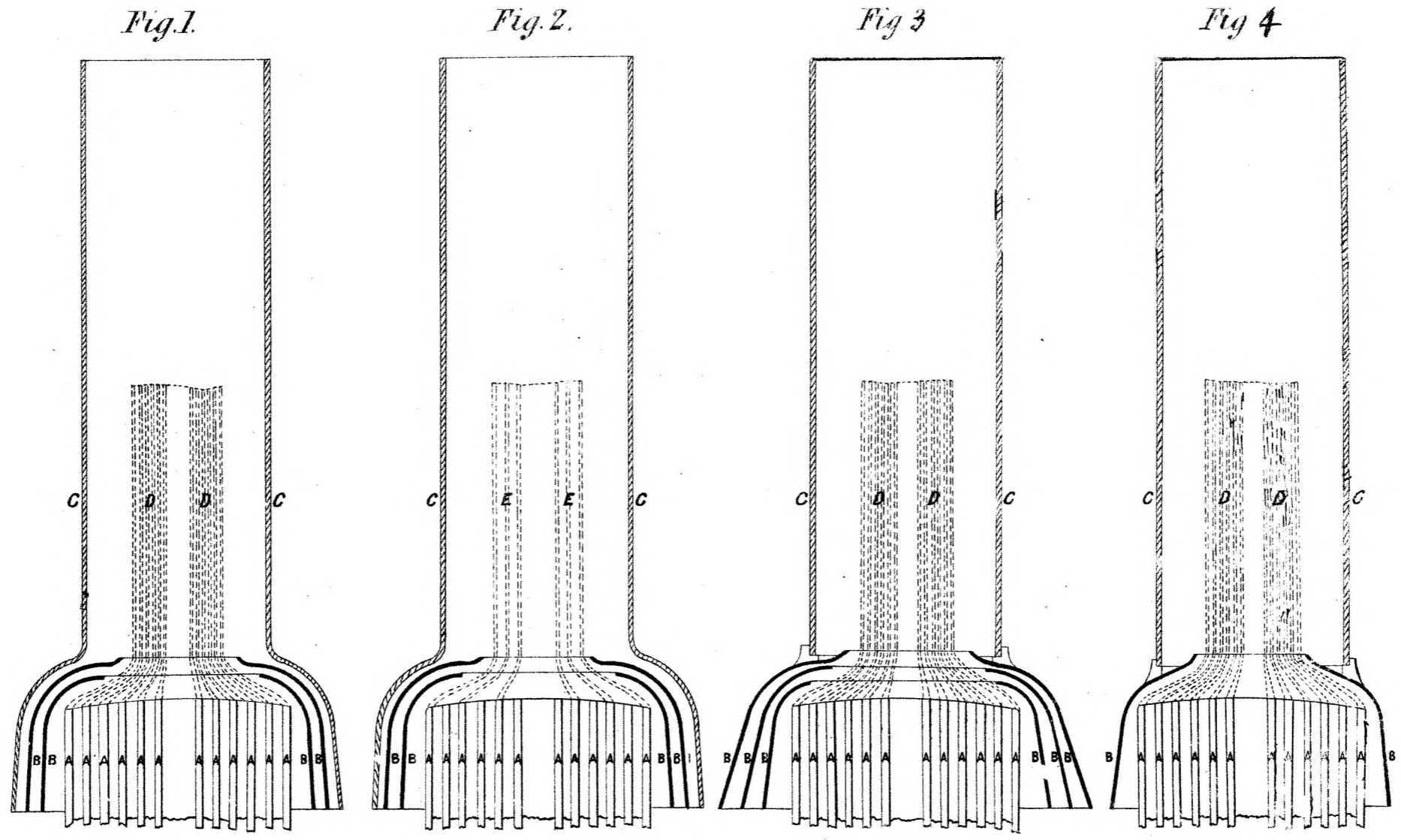
We have, &c.,

JOHN WHITTON.

WILLIAM C. BENNETT.

The Under Secretary of Justice.

[Drawings—one sheet.]



*This is the Sheet of Drawings referred to in the annexed
 Letters of Registration granted to James Nicholas
 Douglass this fourteenth day of June, A.D. 1881.
 Augustus Loftus.*

Sig. 3A.



A.D. 1881, 14th June. No. 941.

AN IMPROVEMENT IN TELEPHONIC APPARATUS.

LETTERS OF REGISTRATION to Frederic Allen Gower, for an Improvement in telephonic apparatus.

[Registered on the 15th day of June, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS FREDERIC ALLEN GOWER, of 9, Great Winchester-street, in the city of London and Kingdom of England, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or Improvement in manufactures, that is to say, of an invention of "An improvement in telephonic apparatus," which is more particularly described in the amended specification and the sheet of drawings which are hereunto annexed; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Frederic Allen Gower, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said Frederic Allen Gower, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said Frederic Allen Gower shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this fourteenth day of June, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

An improvement in telephonic apparatus.

SPECIFICATION of FREDERIC ALLEN GOWER, of 9, Great Winchester-street, in the city of London and Kingdom of England, for "An improvement in telephonic apparatus."

THE said invention relates to the combination of what is known as the Gower-Bell or other magneto-telephone with a microphone enclosed in the same case. This arrangement affords all the advantages obtained by the employment of a battery for the purposes of telephonic communication, without its accompanying objections, and without destroying the effect of the said telephone when it is employed as a transmitter in the case of the battery failing to act or becoming exhausted.

And in order that the said invention may be perfectly understood, I shall now proceed more particularly to describe the same, and for that purpose shall refer to the several figures on the annexed sheet of drawings, the same letters of reference indicating corresponding parts in all the figures.

Figure 1 of the accompanying drawings is a front elevation of the improved apparatus, a part of the front of the box being removed in order to show the position of the commutator. In this figure it will be observed that the commutator is not in contact with the binding post.

Figure 2 is a side elevation of the apparatus, partly in section, a portion of the side of the box being removed in order to show the communication between the microphone and the principal circuit.

Figure 3 is a plan, the microphone being removed in order to show clearly the arrangement of all the parts on the interior of the box.

Figure 4 is a plan of the under side of the microphone shown in figure 2. This microphone is connected with the principal circuit by means of wires, *a a'*, which are broken off in figures 3 and 4.

It will be readily understood that when the plate of the microphone is in the position shown in figure 2, so as to close the box, the wire *a*, figure 4, is joined to the wire *a*, figure 3, and the wire *a'*, figure 4, is joined to the wire *a'*, figure 3.

In constructing the apparatus according to this invention, a microphone, B, of any suitable construction (but by preference having at least six contact points, *b*), is attached to the upper part, K, of a box, A, the lower part of which box is provided with a Gower-Bell telephone, C, constructed in the form known as the chronometer telephone, or other magneto-telephone.

This telephone is provided with a bifurcated acoustic or speaking tube, D, having two branches, D', in order to enable the operator to listen with both ears, if required; commutators, E, are provided at the side of the box, for the purpose of interrupting the passage of the current from the battery and opening the circuit of the call bells.

After working the apparatus, the extremities, *d*, of the acoustic tubes D' D' are placed in holders connected with the commutators E, and the circuit is thereby interrupted, as shown in figure 1, in which figure the commutator E is shown out of contact with the binding post *e*.

An electric call bell, F, is provided underneath the box A, and a knob, G, for working the call bells, is placed at the upper part of the apparatus, but this arrangement is not essential to the working of the invention.

An induction coil, H, is placed inside the box, and the microphone B and the battery are connected to the primary circuit, whilst the Gower-Bell, or other magneto-telephone, and the line are connected with the secondary circuit.

In speaking against the upper part, K, of the box, which part may be of wood, iron, brass, or other suitable material, and near or upon the under surface of which the microphone is placed, either with or without attaching the microphone to the box top directly, the sound waves from the voice form electrical undulations in the primary circuit through the action of the microphone, and these undulations are reproduced in the secondary circuit by induction, and thus repeated in the Gower-Bell or other magneto-telephone at the receiving station.

And I call especial attention to the fact that the microphone in this combination is not necessarily attached to the box top, but that it may be carried upon a framework of wood, metal, or other suitable material, attached at any convenient point to the combined apparatus; and I regard such disposition of the microphone, in combination with a receiving telephone in or on the same box or piece of apparatus, as an element of novelty in this invention.

The undulations however, when so reproduced, are intensified to such an extent by the great power of the magnet in the Gower-Bell or other magneto-telephone, that they act upon the microphone in the same case with such effect as to set up corresponding undulations in the primary circuit at the receiving station, and these undulations are again reproduced in the Gower-Bell or other magneto-telephone with increased intensity.

Moreover, when the diaphragm of the telephone is provided with a vibrating reed, *x*, figure 3, as is usual in the Gower-Bell telephone, it is simply necessary to close one of the branches, D', of the acoustic tube and blow into the other branch in order to cause the reed to vibrate, and thus produce powerful vibrations of the plate before the magnet.

These vibrations not only produce currents in the coils or the poles of the magnet, but also act with great power upon the microphone, the sound being produced in the interior of the same box, and thus double the effect of the signal current on the line wire without exhausting the battery to any greater extent than when speaking in the usual manner through the apparatus.

By employing this combination of magneto-electric and electro-magnetic currents, it is possible to act with great power upon what is known as the "Ader" disc, or upon any other suitable receiving instrument at the distant station, as well as in the case of a system worked with a central office, and any suitable arrangement of the mechanical parts may thus be employed at the receiving station.

It also results from the employment of this combination that a failure of the battery will not stop the communication, the Gower-Bell (or other magneto-telephone) being always capable of working the apparatus whether employed as a receiver or as a transmitter, provided that the wire is not broken, whilst it is also possible, when the "Ader" signalling apparatus is employed at the central office or other receiving station, to transmit a signal without employing a battery, as in the case of the ordinary Gower-Bell telephone.

An Improvement in telephonic apparatus.

The employment of bifurcated or double acoustic tubes obviates the necessity for employing a separate instrument as receiver, and thus enables the flexible conducting wire to be dispensed with, which wire constitutes one of the principal objections to the use of telephones in practice.

I claim as my invention, the employment in the said telephonic apparatus of a flexible double tube for speaking and listening, substantially as hereinbefore described, and illustrated in the accompanying drawings.

In witness whereof, I, the said Frederic Allen Gower, have hereunto set my hand and seal, the eleventh day of January, one thousand eight hundred and eighty-one.

FREDERIC ALLEN GOWER.

Signed and sealed in the presence of—

ADAM SCOTT,
9, Great Winchester-street, London, electrician.

ARTHUR F. ST. GEORGE,
9, Great Winchester-street, London, electrician.

This is the specification referred to in the annexed Letters of Registration granted to Frederic Allen Gower, this fourteenth day of June, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 11 March, 1881.

We do ourselves the honor to return to you the documents transmitted for our report under your blank cover communication of the 2nd instant, No. 2,210, which have reference to Mr. Frederic Gower's application for the registration of "Improvement in telephones or telephonic apparatus"; and we have to state that we are of opinion that the only novelty in Mr. Gower's invention is the employment of a flexible double tube, as set forth in his second claim, and we recommend the registration of his specification to that extent only.

We have, &c.,

E. C. CRACKNELL.
GOTHER K. MANN.

The Under Secretary of Justice.

NOTE.—The amendment proposed by the Board having been accepted by Mr. Gower, Letters of Registration were issued accordingly.

[Drawings—one sheet.]

Fig. 1.

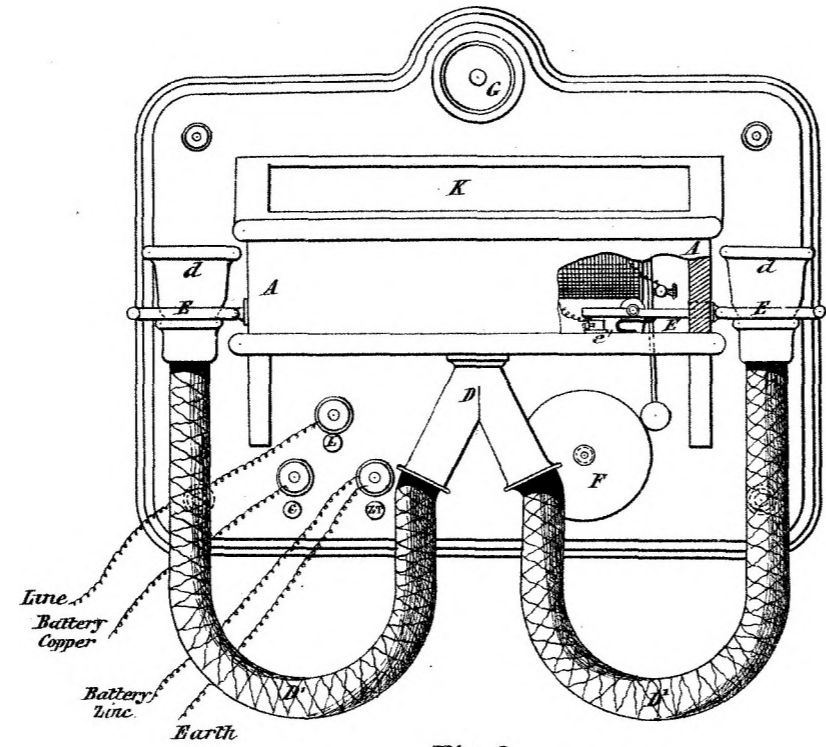


Fig. 2.

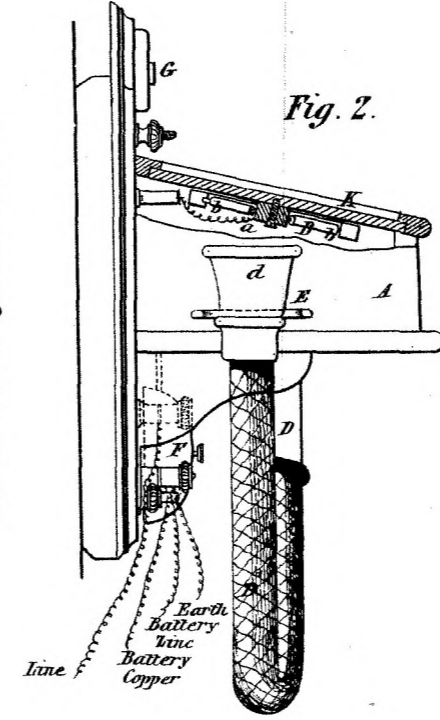


Fig. 3.

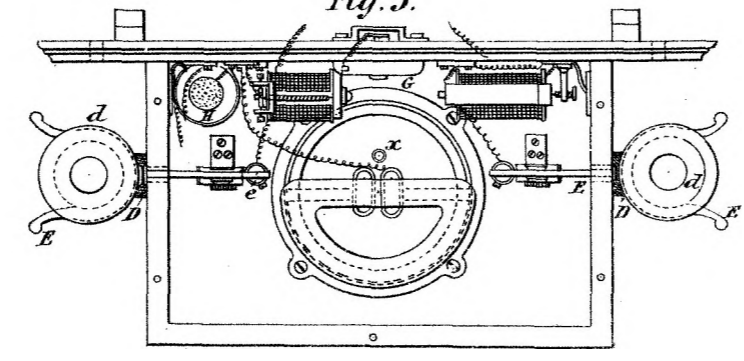
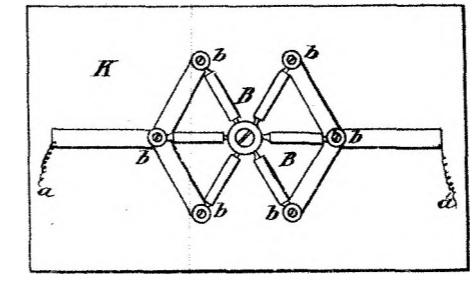


Fig. 4.



*This is the Sheet of Drawings referred to in the annexed
Letters of Registration granted to Frederic Allen Gower,
the day of June A. D. 1881.*

Augustus Loftus.



A.D. 1881, 14th June. No. 942.

**IMPROVEMENTS IN APPARATUS FOR FEEDING LOCOMOTIVE AND OTHER
STEAM BOILERS OR GENERATORS.**

LETTERS OF REGISTRATION to Edward Davies, for Improvements in Apparatus for feeding Locomotive and other Steam Boilers or Generators, applicable also for raising and forcing liquids for other purposes.

[Registered on the 15th day of June, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS EDWARD DAVIES, of Llandinam, in the county of Montgomery, England, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in Apparatus for feeding Locomotive and other Steam Boilers or Generators, applicable also for raising and forcing liquids for other purposes," which is more particularly described in the specification and sheet of drawings which are hereto annexed ; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four ; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years : And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Edward Davies, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof ; to have, hold, and exercise unto the said Edward Davies, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended : Provided always, that if the said Edward Davies shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this fourteenth day of June, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Apparatus for feeding Locomotive

SPECIFICATION of EDWARD DAVIES, of Llandinam, in the county of Montgomery, England, for an invention entitled "Improvements in Apparatus for feeding Locomotive and other Steam Boilers or Generators, applicable also for raising and forcing liquids for other purposes."

My invention relates to improvements upon that apparatus for the purposes abovenamed for which two several Letters Patent have been granted in England to myself and Edward Hamer and James Metcalfe, numbered 591, and dated the 14th February, 1876, and numbered 4,014, and dated the 29th October, 1877; and my invention refers to improved combinations and arrangements of parts, which consist mainly in arranging the moving part of the split cone (described in the specification of the said English Patent, No. 4,014, A.D. 1877) upon a hinge formed at one end, and in surrounding the split cone and overflow orifice or outlet with an air-tight casing or chamber, but so that movement can take place in or be imparted to the movable part of the split cone, and in closing this casing or chamber so that it will be air-tight, by causing the outlet from the overflow chamber to ascend and retain a column or head of water sufficient to seal it, or in combining with such arrangement of apparatus a valve to open from the overflow orifice. My improved combination and arrangement of parts above referred to allows the split cone to be self-acting, and this simplifies the construction and working of the injector.

Apparatus, according to my invention, is intended to be worked more particularly by exhaust steam as it is discharged from high-pressure steam-engines, but it is or may be worked by live steam taken direct from the boiler; and, if desired, is or may be arranged so as to be worked by exhaust steam when the engine is working, and by live steam direct from the boiler when the engine is not working.

When working with exhaust steam of about atmospheric pressure the apparatus will inject fluids against a pressure of 70 or 80 lbs. per square inch; and when it is to be used against higher pressures I find, after much experience, that the apparatus is most simple and economical when arranged and combined with injector apparatus worked by live steam direct from the boiler (as only a comparatively small quantity of live steam is required), instead of using exhaust steam, the steam acting on the exterior of the jet, and by the use of which live steam a split cone is not required in the additional apparatus. This supplementary injector is provided with an overflow or outlet for the fluid to start the apparatus, which outlet is closed when the injector is properly at work. In this case the live steam is or may be admitted or shut off, and the overflow or outlet is or may be opened or closed by a two-way cock, or by separate cocks or valves, which may be actuated by the same handle.

My invention further consists in closing the overflow outlet by a water seal or valve, as before described, when the apparatus is used without the casing or chamber above-mentioned, and is arranged as described in the specification of the said English Patent, No. 4,014, A.D. 1877.

The above-described improved apparatus is or may be used for elevating and injecting liquids, or for ejecting liquids or fluids, and for which latter purpose the improvements are applicable to that apparatus known as the ejector condenser for forming a partial vacuum in the cylinders of steam-engines.

Fig. 1 is a longitudinal section of an improved apparatus according to my invention, and that part formed in the casing marked *a* is intended to be worked by steam exhausted from an engine or engines, or by live or low pressure steam.

Fig. 2 is a cross-section at A—B, fig. 1; and fig. 3 a cross-section at C—D, fig. 1. Fig. 1 also represents the longitudinal section of a supplementary apparatus, which will be hereinafter more fully described. *a* is the casing of the injector, which is or may be made of cast-iron; it is provided with flanges for a junction, *a*¹, with the exhaust or other steam supply, a junction, *a*², for the water supply, and a junction, *a*³, for the pipe leading to the boiler or conveying the fluid away from the apparatus; *b* is the steam cone fitted in the casing *a*, as shown, and secured in it there is a disc, *b*¹, with arms or spaces to allow the steam to pass, which disc carries a central spindle, *b*², which I prefer to use, though it is not absolutely necessary. *d* is the combining cone, which has at its smaller end an arm, *d*¹, from one side, into which the receiving and discharging cone *e* is screwed. The larger end of the combining cone *d* is made a good fit, to slide in the casing *a*, and the end of the discharging cone *e* is a good fit, and slides in the bush or tube *e*¹, which also forms the facing for the stop-valve. *d*² is a short shaft fitted in the casing *a*, and made air-tight by a packing gland. Upon the end of the short shaft there is a crank-pin that fits a steel die which slides in a cross slot in the side of the combining cone *d*.

By means of the hand-wheel *d*³ secured on the end of the short shaft the combining cone is adjusted to increase or decrease the area for water. *d*⁴ is a pointer, which, with the index on the hand-wheel, shows the extent of the opening for water.

The combining cone is split or formed in two halves or parts; the movable part *d*⁵ is hinged at *d*⁶, as shown; the smaller end has a projection, *d*⁷, at each side (see fig. 2), to prevent lateral play and keep the parts correctly opposite.

In constructing the split cone the joining surfaces of the two parts of the cone are planed or otherwise prepared, and fitted accurately together, and are then clamped as if solid, while the internal cone is bored or formed.

Inside the casing there is a projection, *a*⁴, which limits the extent to which the moving part *d*⁵ of the cone shall open; *f* is a bush or tube secured in the casing which forms the guide for the spindle of the valve *f*¹ for preventing the return of the fluid. The outlet from the overflow is closed by a valve, *a*⁵ (see fig. 3), or it is arranged as shown, so as to hold and retain water sufficient to seal the chamber against the admission of air, which is liable, if it should leak through the joinings of the split cone, to interfere with the working of the injector.

By preference the position of the apparatus is arranged so that the weight of the movable part *d*⁵ of the split cone, when free, will bring it against the fixed part of the cone. If desired, a spring or weight is or may be arranged to cause the movable part to keep closed, except when the force in the interior of the cone (as at starting) acts to open it.

When the steam is admitted to the injector the movable flap *d*⁵ opens, and as soon as a vacuum is formed in the interior of the cone, and the jet is established, the external pressure of the atmosphere causes the flap to close, and it remains closed as long as the apparatus is working properly, and thus it will be seen that no more manipulation is required to start the apparatus than is necessary with the ordinary injector.

It

and other Steam Boilers or Generators.

It is not essential in supplying exhaust steam for working my improved apparatus to modify the outlet from the blast-pipe, especially in locomotive or other engines where the exhaust steam is used to create a draught for the boiler furnace, or to use any special reservoir for exhaust steam so long as it is conveyed from the side of the ordinary blast-pipe by means of a pipe of sufficient size, say 3 inches bore for engines of the power of ordinary locomotives, and for others in proportion. When the apparatus is arranged to be worked when required, either by exhaust or live steam, there is a valve in the pipe conveying the exhaust steam which is shut to close the communication with the exhaust when the live steam is turned on to act in place of the exhaust steam. If desired, the valve in the exhaust steam pipe and the cock for the live steam may be connected or combined, so that when one is turned on the other will be turned off, and *vice versa*. That part of fig. 1 included in the casing *a*, above described, is or may be worked separately with exhaust steam, and I term it the exhaust steam apparatus; but fig. 1, as a whole, is a longitudinal section of a compound injector to be worked by exhaust or low-pressure steam and live steam direct from the boiler; and I term this latter part within the casing *g*, to be hereinafter described, the supplementary injector or apparatus.

Fig. 4 is a cross-section at E—F, fig. 1; and fig. 5 is a cross-section at G—H, fig. 1. *g* is the casing of the supplementary apparatus of iron or other metal, provided with a flange, *g*³, so as to be united with the casing *a* of the exhaust steam apparatus, and with a flange, *g*², for the boiler or pipe to convey the fluid away from the apparatus, and with a junction for a pipe, *k*, to bring live steam, which passes through a cock, *k*¹, fitted in a bush in the casing, and then along a passage, *g*¹, in the casing *g* (see fig. 4), to the chamber, round a cone, *h*, secured in the casing, the live steam surrounding the jet and combining with it in the cone *i*.

The discharging part of the cone *i* carries on projections the ring or facing for the stop-valve *j*, which shuts against the return of the fluid. Between the ring for the valve facing and the end of the discharging cone *i*, there are spaces (see figs. 1 and 5), and a chamber is formed as an outlet for fluid when starting the injector, the fluid escaping through a passage in the two-way cock *k*¹ (see fig. 5). The passages in the cock are so arranged that the outlet passage is open when the steam is shut off, and the outlet is closed when the steam is fully turned on.

Fig. 6 illustrates a modification of the combined exhaust and supplementary apparatus. The only difference between the modification shown by fig. 1 and that illustrated by fig. 6 is that in the latter the stop-valve *f*¹, fig. 1, is not used, and the discharging tube *e* is constructed to act also as the cone *h*, fig. 1, of the supplementary apparatus.

I have now particularly described the nature of my said invention, and the mode of carrying the same into effect, and claim as my invention,—

Firstly—The combination and arrangement of apparatus for the purposes hereinbefore mentioned, which I term the exhaust steam apparatus, substantially as hereinbefore described, and illustrated by figs. 1, 2, and 3 of the drawings.

Secondly—The split cone, or its equivalent, when the movable part is so hinged or arranged as to be self-acting, dispensing with mechanism for actuating the movable part by hand when starting the apparatus, substantially as hereinbefore described, and illustrated by figs. 1, 2, and 3 of the drawings.

Thirdly—The sealing of the overflow orifice by a head of water or a valve, *a*⁵, opening outwards, when combined with apparatus having a split cone, *d* and *d*⁵, or its equivalent, substantially as hereinbefore described, and illustrated by the drawings.

Fourthly—The surrounding of the split cone *d* and *d*⁵, or its equivalent, with a casing which excludes the atmosphere when the overflow orifice is sealed or closed, substantially as hereinbefore described, and illustrated by the drawings.

Fifthly—The combination of apparatus actuated by exhaust steam, with a supplementary apparatus supplied with live steam, substantially as hereinbefore described, and illustrated by the drawings.

Sixthly—The use of the valve *f*¹ between the injector worked by exhaust steam and supplementary apparatus, substantially as hereinbefore described, and illustrated by the drawings.

Seventhly—The turning on of the steam and shutting off of the overflow, or *vice versa*, by the same cock or handle in the supplementary apparatus, substantially as hereinbefore described, and illustrated by figs. 1 and 5.

In witness whereof, I, the said Edward Davies, have hereto set my hand and seal, this fourth day of February, 1881.

Witness—

PETER J. LIVSEY.

EDWARD DAVIES.

This is the specification referred to in the annexed Letters of Registration granted to Edward Davies, this fourteenth day of June, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 25 April, 1881.

We have the honor to report that we see no objection to the issue of Letters of Registration to Mr. Edward Davies for his invention entitled "Improvements in Apparatus for feeding Locomotive and other Steam Boilers or Generators, applicable also for raising and forcing liquids for other purposes," in accordance with his Petition, specification, and claim, transmitted to us under your B.C. communication, No. 81-3,264, of the 29th ultimo.

We have, &c.,

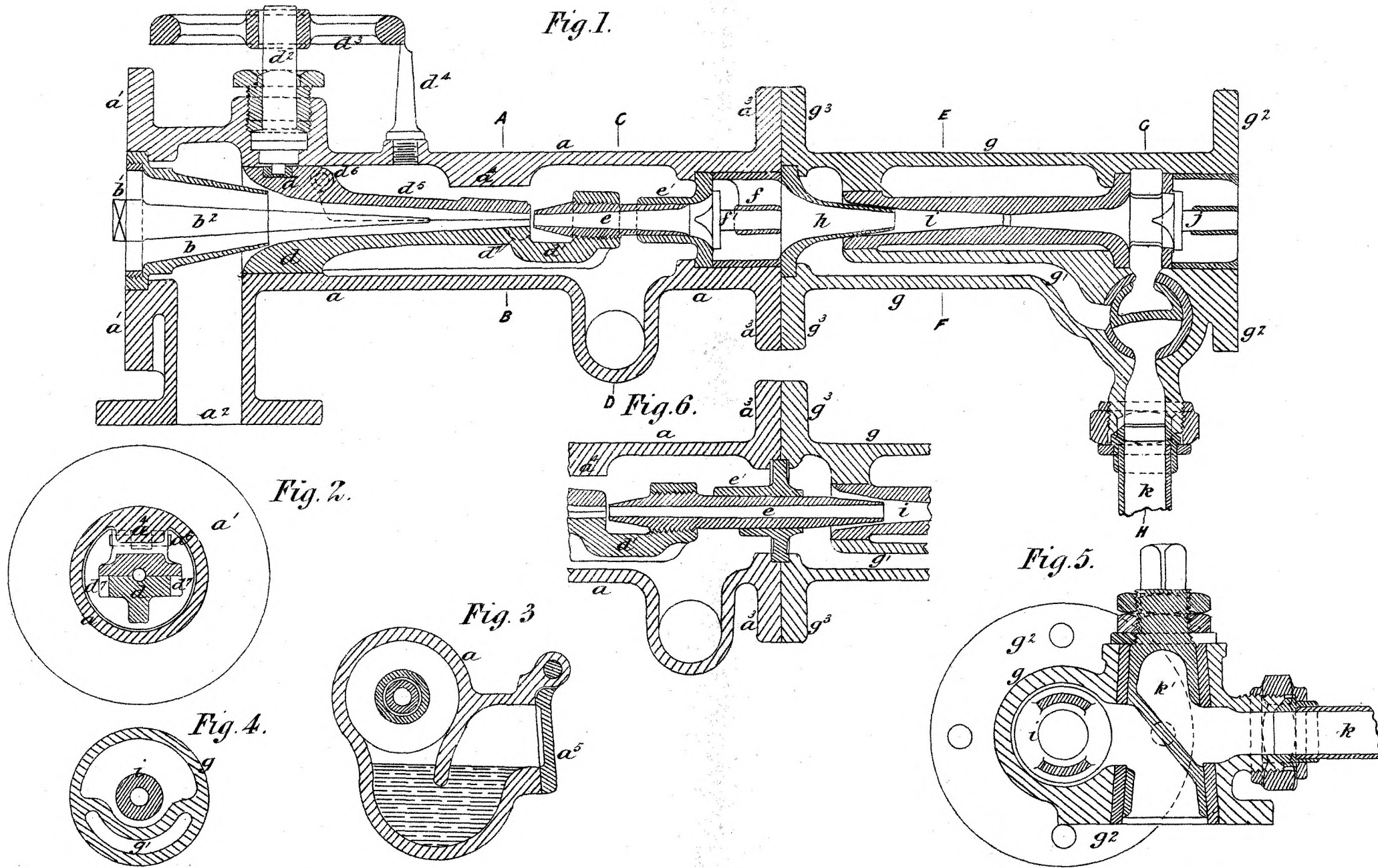
JOHN WHITTON.

WILLIAM C. BENNETT.

The Under Secretary of Justice.

E. Davies' Specification

(1. Sheet.)



This is the Sheet of Drawings referred to in the annexed Letters of Registration granted to Edward Davies, this fourteenth day of June A.D. 1881.

Augustus Loftus.



A.D. 1881, 17th June. No. 943.

IMPROVEMENTS IN MACHINERY FOR THE ARTIFICIAL PRODUCTION OF COLD.

LETTERS OF REGISTRATION to William Archer, William Atinar Fanning, George Fairbairne, Alexander Donald Macleay, Francis A. Gwynne, Alexander Caldcleugh Macleay, and Herbert Maguire Whitehead, for Improvements in machinery or apparatus for the artificial production of cold, for ice-making and other purposes.

[Registered on the 17th day of June, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting:

WHEREAS WILLIAM ARCHER, of 147, Fenchurch-street, in the city of London, merchant, WILLIAM ATINAR FANNING, of 23, Old Broad-street, in the city of London, merchant, GEORGE FAIRBAIRNE, of Melbourne, Australia, merchant, ALEXANDER DONALD MACLEAY, of 107, Victoria-street, Westminster, Esquire, FRANCIS A. GWYNNE, of 15, Bury-street, St. James, in the county of Middlesex, Esquire, ALEXANDER CALDCLEUGH MACLEAY, of Glasshayes, Lyndhurst, Hants, Esquire, and HERBERT MAGUIRE WHITEHEAD, of 1, Suffolk-place, Pall Mall, merchant, have by their Petition humbly represented to me that they are entitled, under an assignment from the assignee of the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in machinery or apparatus for the artificial production of cold for ice-making and other purposes," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed; and that they, the said Petitioners, have deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and have humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to them for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said William Archer, William Atinar Fanning, George Fairbairne, Alexander Donald Macleay, Francis A. Gwynne, Alexander Caldcleugh Macleay, and Herbert Maguire Whitehead, their executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said William Archer, William Atinar Fanning, George Fairbairne, Alexander Donald Macleay, Francis A. Gwynne, Alexander Caldcleugh Macleay, and Herbert Maguire Whitehead, their executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said William Archer, William Atinar Fanning, George Fairbairne, Alexander Donald Macleay, Francis A. Gwynne, Alexander Caldcleugh Macleay, and Herbert Maguire Whitehead shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this seventeenth day of June, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Machinery for the artificial production of cold, &c.

SPECIFICATION.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, ALEXANDER DONALD MACLEAY, Victoria-street, Westminster, in the county of Middlesex, England, send greeting:

WHEREAS I am desirous of obtaining Royal Letters Patent for securing unto me Her Majesty's special license that I, my executors, administrators, and assigns, and such others as I or they should at any time agree with and no others, should and lawfully might, from time to time, and at all times during the term of fourteen years to be computed from the day on which this instrument shall be left at the office of the make, use, exercise, and vend within the Colony of New South Wales and its dependencies, an invention for "Improvements in machinery or apparatus for the artificial production of cold for ice-making and other purposes"; and in order to obtain the said Letters Patent I must, by an instrument in writing under my hand and seal, particularly describe and ascertain the nature of the said invention and in what manner the same is to be performed, and must also enter into the covenant hereinafter contained:

Now know ye that the nature of the said invention and the manner in which the same is to be performed is particularly described and ascertained in and by the following statement, that is to say:—

This invention relates to improved machinery or apparatus for the economical artificial production of cold for ice-making and other purposes, by the expression and distention or expansion of the air without the old chemical production. It consists of a cylinder of compression secured to a foundation plate on the same level therewith. In the bottom of this cylinder is a valve opening outwards from the cylinder into a pipe leading to the refrigerator hereafter described. In the interior of the cylinder works a piston in which are two or more valves similar to that in the bottom of the cylinder, and opening inwards from the atmosphere above the cylinder (which is open without cover) to the interior of the cylinder beneath the piston. In the centre of the piston on its top side is fixed a rod or cross head working vertically through a guide or stuffing box mounted across the open top of the cylinder of compression, the said rod being acted upon by a forked connecting rod coupled to a crank keyed on the overhead shaft of the machine. This shaft is mounted in suitable bearings on the upper ends of two A or other suitably shaped frames forming parts of the foundation plate, and is provided with a fly-wheel by which motion is communicated to the machine, or the machine may be driven by any other suitable gearing.

The cylinder of distention or refrigerating motor cylinder is fixed to the foundation plate on a level therewith in a similar manner to the cylinder of compression, and is provided at its bottom end with two valves, one of which, or the admission valve, opens outwards from the cylinder of distention into a pipe leading from a compressed air reservoir, whilst the other, or escape valve, opens inwards to the cylinder of distention from a pipe which conveys the distended and freezing air from the cylinder of distention to be used in the numerous applications for which it may be required. These valves are actuated by a series of levers connected by rods with two double-crank levers carrying rollers working against cams fixed on the overhead shaft in such a manner that at each revolution of the shaft the admission valve is opened, whilst the escape valve is closed, and *vice versa*.

The piston of the cylinder of distention is solid and without valves, but in other respects its construction and mode of connection with its cranks on the over-head shaft are similar to those of the piston of compression above named.

The pipe leading from the bottom of the cylinder of compression as before mentioned terminates in a refrigerator formed of a bundle of thin flat tubes mounted in and surrounded by a cylindrical iron vessel, and through these tubes the compressed air passes in its passage to the compressed air reservoir. By means of a feed-pump worked by an eccentric on the overhead shaft a current of cold water is continually caused to circulate from the bottom of and through the said cylindrical vessel around or amongst the tubes to the top of the vessel, whence it is conveyed by a pipe leading to a casing or jacket surrounding the cylinder of compression round which the water circulates. On motion being given to the machine, the air passes from the atmosphere through the piston of compression during its upward stroke and being compressed during the downward stroke is forced through the valve in the bottom to the cylinder of compression through the refrigerator into the compressed air reservoir, whence it passes through the cylinder of distention in a freezing state to be used as before named.

The accompanying sheet of drawings illustrate the invention.

Figure 1 is a longitudinal section; figure 2, a plan; figure 3, a tranverse section on line *xy* in figure 2; and figure 4, a part sectional view to an enlarged scale of the piston seen in figure 1.

A represents the foundation plate of cast iron which supports the whole machine and rests strongly fastened down by bolts to the masonry or foundations B² B³, as shown.

The cylinder of compression C of cast-iron rests directly on the foundation plate A, to which it is secured on a level therewith by bolts. The upper end of this cylinder is open without a cover, and its bottom end supports the valve for retaining the air.

A sheet-iron casing, *a*, serves to maintain a circulation of water round the cylinder of compression C. The valve for retaining the air (seen in detail, figure 6) is enclosed in the brass box B, screwed into the bottom of the cylinder of compression C, and consists of a conically shaped disc, S, of very thin steel, which rests or takes its seat on the brass seating B, in a single line of contact, and is formed with a stem or shank hollowed in its interior and working through the brass cover C¹, which is strongly screwed on to the box B. The rebounding of the spiral spring R¹ constantly solicits the disc S on to its seat.

Holes, T², are formed through the thickness of metal surrounding the box B, for giving passage to the air forced through the valve S. The bottom of the cylinder of compression C may carry one, two, or more valves of this description, or if preferred, in lieu of the metal disc or valve S as here described, a disc of india-rubber may be used working round a central spindle or stud carrying a guard for regulating the lift of the disc which covers a series of holes formed through the valve seat.

E is a pipe by which the air, after having passed through the valve S, passes into the refrigerator R and reservoir M.

Improvements in Machinery for the artificial production of cold, &c.

In the interior of the cylinder of compression C works the automatic compression piston C³, which is of cast-iron and formed with a band or ring of india-rubber partly soft and partly hard let in a groove round the periphery of the piston. A number of small holes, T, allow the compressed air to penetrate into the groove or space behind the band or ring for expanding the latter and thereby producing absolute tightness of the rubbing surface.

The junction of the band or ring is made by a simple lap.

The piston C³ has these advantages:—Extreme softness in the rubbing; resistance to temperatures; reduced rubbing surface, rendering cent. per cent. of the compressed volume, or nearly so, and many others.

The compression piston C³ is directly acted upon by the forked rod F, jointed on the pivot *f*, and carries a stem or shank, *o*, of steel worked vertically through the guide G, which is fixed strongly across the upper end of the cylinder of compression C, as shown. The forked rod F receives its movement from the crank H, acted upon by the motion shaft O, which carries the fly-wheel V. I give the rod F a length eight times (more or less) the radius of the crank H. The frames U U, cast on the foundation plate A, support the whole system of rotation of the machine.

The compression piston C³ carries a special system of valves for the aspiration of air; each valve, which is enclosed in a brass box, D, screwed into the face of the piston of compression C³, consists of a very light steel disc, S¹, of conical shape, which rests or takes its seat on the brass seating D, in a single line of contact, and carries a stem or shank, S², of six sides (figures 7 and 8), the spiral spring R¹ being pressed against the top nut B¹, screwed on the shank S², constantly solicits the valve disc S¹ on to its seat. The brass box D is hollowed out and formed into a web or partition, T¹, through which holes are bored or cast to give passage to the air at the moment of its aspiration.

One, two, or more valves of this description may be fitted to the compression piston C³, according to the dimensions of the machine; or if preferred, in lieu of the metal discs or valves as here described, valves of india-rubber may be used similar to that above named as applicable to the valve at the bottom of the cylinder of compression G.

The cylinder of distention, expansion, or refrigerating motor cylinder G, rests directly on the foundation plate A, at the same level therewith, and secured thereto by bolts; its interior is perfectly smooth and its upper end without cover; its bottom end supports the boxes for the admission and escape of air.

In the interior of the cylinder C¹ works a piston, P, which is acted upon by the forked rod F¹, jointed on the pivot *f*, and carries a shank, O¹, which works vertically through the guide bracket G¹, strongly fixed across the upper open end of the cylinder of distention C¹.

The distribution of compressed air in the cylinder of distention or expansion C¹ is formed of two special valves controlled by cams fixed on the motion shaft of the machine. The admission valve A² (figure 1), which is of steel in one place turned on its edge, rests on a ring of leather or india-rubber let in a dovetail or other groove formed in a box. Its stem or shank works through the stuffing-box C², and is connected with a lever, B², acted upon by the rod D² and the cam G² fixed on the shaft of the machine. It thus becomes easy to understand that each revolution of the shaft the cam G² raises the valve A² from its seat to a height corresponding with that of the admission cam G². The box for admission of air enclosing the valve A² for its introduction into the cylinder of distention or expansion C¹, is directly fixed to the lower part of the said cylinder. The rebounding action of the spring R² constantly solicits the valve A² on to its seat.

The compressed air arrives from the reservoir M by the pipe L into the interior of the admission box. Its introduction into the cylinder of distention or expansion C¹ may be made to the $\frac{1}{2}$, the $\frac{1}{4}$, the $\frac{1}{8}$ or other portion of the stroke of the piston P. The steel valve A², resting on an elastic seat, makes no noise, and the india-rubber on which it rests being perfectly set or confined in a groove practically incompressible.

At the side of the admission box is a special valve designed for the passage of the freezing air produced by the distention or expansion of the air in the cylinder C¹; it rests on a metallic (or wood if preferred) seat in one line of contact and is called "cut snow" valve by the advantage it presents to cut or trench the snow accumulated on its seat.

The line of contact ensures the following advantages:—1. Perfect tightness. 2. Absolute security in the action of the machine, the frozen air produced in the cylinder C¹ being regularly trenched at each rising of the valve, and being thereby unable to accumulate in the cylinder.

The valve E² is connected with the lever S², acted upon by the rod N², and the cam P², fixed on the shaft of the machine. The action of the valves A² and E² is regulated in such a manner that when the admission valve A² opens the escape valve E² immediately shuts. Say, for example, an introduction of air during a third of the course of the piston P; during the two-thirds the air introduced is distended or expanded under the piston until reduced to atmospheric pressure. At the return of the piston P the escape valve E² opens during the whole of its course, thus allowing the distended and frozen air to escape by the pipe H².

For cooling the air heated by the compression, a bundle of thin flat tubes is surrounded by a cylinder of cast-iron or sheet-iron plates. A current of cold water continually sent by the feed-pump I circulates by the pipe J among the bundle of tubes flowing from the bottom to the top, the return being made by the pipe K, which conveys the water round the cylinder of compression C¹.

If any force whatever be put upon the fly-wheel V the compression piston C immediately compresses the air in the refrigerator R, and the reservoir M; this air being directly put in communication by the admission valve or valves, penetrates into the cylinder of distention or expansion C¹.

The air introduced into the cylinder restores in part the labour of compression in producing the cold corresponding to the mechanical labour restored. The relation of the respective volume of the cylinder, according to the conditions represented by figure 1, determines the maximum pressure which ought to be established in the reservoir, and which being acquired a perfect equilibrium is established between the expenditure and production and the normal work of the cooling machine is realized.

Having

Improvements in Machinery for the artificial production of cold, &c.

Having now described the nature of the said invention and in what manner the same has to be performed, I declare that I claim,—

First—The machine for producing cold air and ice, as hereinbefore described, and illustrated by the accompanying drawing.

Secondly—The special combination of the compressing apparatus, consisting in the arrangement of the compression piston with its band or ring of mixed india-rubber, partly soft, partly hard, and its valves for the aspiration of air formed of very light steel discs taking to or resting on their seats in a single line of contact, and the arrangement of the cylinder of compression with its valves for retaining the air, formed also of very light steel discs, resting on their seats in a single line of contact, substantially as and for the purpose hereinbefore described, and illustrated by the accompanying drawing.

Thirdly—The entire special arrangement of the apparatus for cooling the air passing from the cylinder of compression, the said apparatus causing the compressed air to circulate through thin flat tubes, whilst round about the said tubes the cooling water sent by the pump of the machine circulates from the bottom to the top of the vessel and back again round about the cylinder of compression thereby avoiding its heating, substantially as hereinbefore described, and illustrated by the accompanying drawing.

Fourthly—The special combination of the introduction of the air into the cylinder of distention or expansion, and especially the valve for the admission of the air, consisting of a disc, its circumferential edge resting at its flat side on a ring of india-rubber or leather forcibly set in a groove in the foot of the cylinders, and thus rendered practically incompressible; also the valve for letting out the cold distended or expanded air, or valve which by reason of its special and important design I name "cut snow," consisting of a disc of steel with conical edge which takes to or rests on its seating in a single line of contact, its driven or cutting edge having the effect of trenching the snow or ice which is formed at the foot of the cylinder.

Lastly—The mechanism for controlling the said valves by means of the cams described keyed on the motion shaft and the levers with the springs, substantially as and for the purpose hereinbefore described, and illustrated by the accompanying drawing.

In witness whereof I, the said Alexander Donald Macleay, have hereunto set my hand and seal, this twenty-fourth day of March, one thousand eight hundred and eighty.

ALEX. D. MACLEAY.

Witness—

H. GARDNER,
40, Fleet-street, London.

This is the specification referred to in the annexed Letters of Registration granted to William Archer, William Atinar Fanning, George Fairbairne, Alexander Donald Macleay, Francis A. Gwynne, Alexander Caldcleugh Macleay, and Herbert Maguire Whitehead, this seventeenth day of June, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

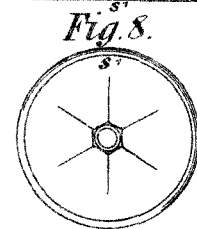
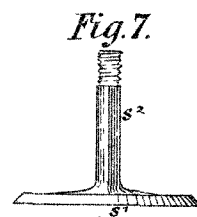
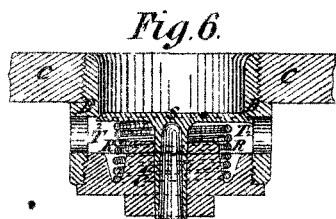
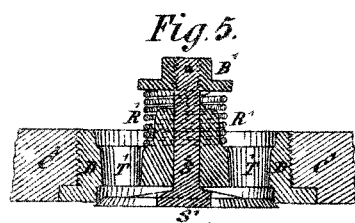
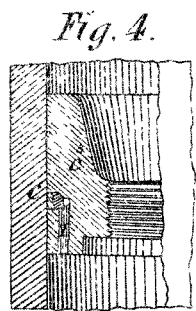
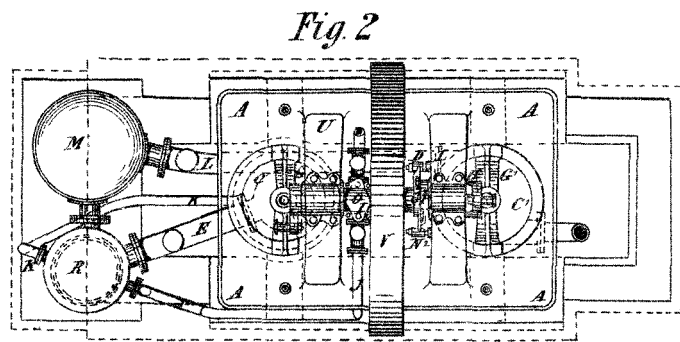
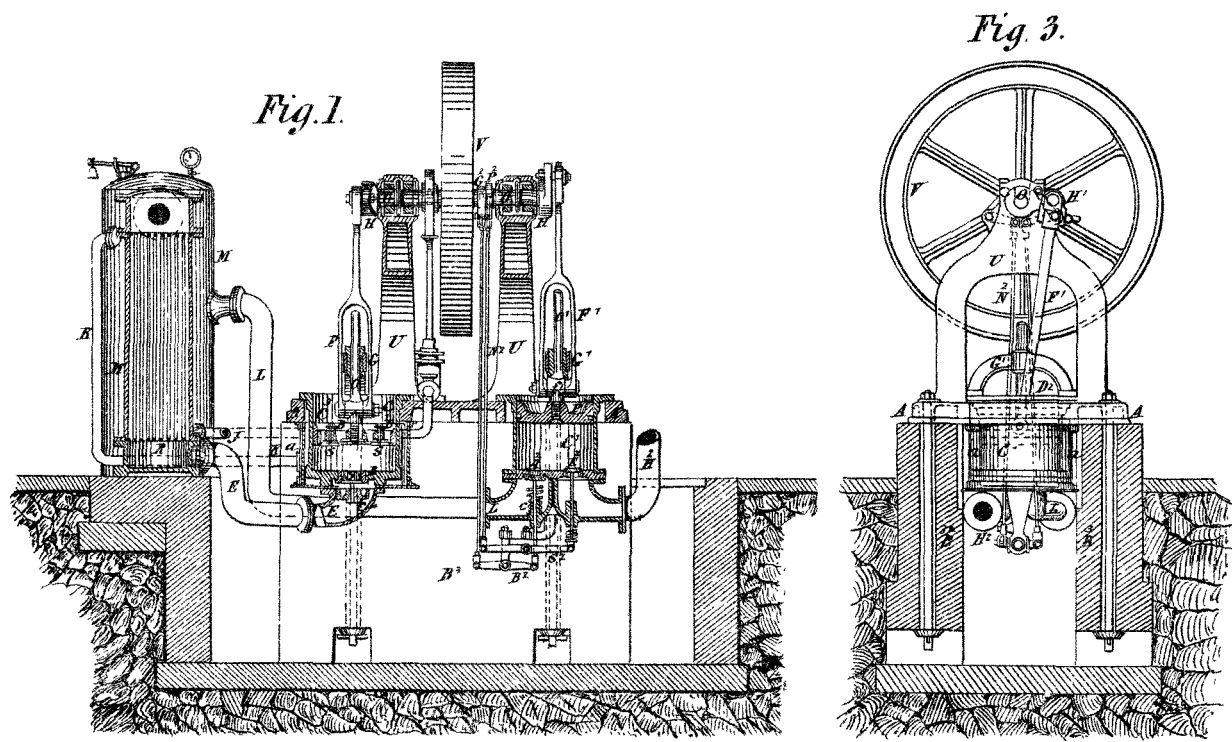
The application of Mr. A. D. Macleay for Letters of Registration for "Improved machinery for the artificial production of cold for ice-making and other purposes," having been referred to us, we have examined the specification and drawings accompanying the same, and have now the honor to report that we see no objection to the issue of Letters of Registration as prayed for.

We have, &c.,

J. SMITH.

CHARLES WATT.

The Under Secretary of Justice.



This is the Sheet of Drawings referred to in the annexed Letters of Registration granted to William Archer, William Ataur Fanning, George Fairbairne, Alexander Donald Macleay, Francis A. Gwynne, Alexander Caldwell Macleay and Herbert Maguire Whitehead, this seventeenth day of June A. D 1881
Augustus Loftus

Alm. D Macleay.



A.D. 1881, 25th June. No. 944.

IMPROVEMENTS IN MACHINERY FOR GRINDING WHEAT, &c.

LETTERS OF REGISTRATION to John Auguste Arnold Buchholz, for Improvements in Machinery for grinding Wheat and other Grain, and in the process of converting Wheat into Flour and Bran.

[Registered on the 25th day of June, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS JOHN AUGUSTE ARNOLD BUCHHOLZ, of Vauxhall, in the county of Surrey, in England, engineer, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in Machinery for grinding Wheat and other Grain, and in the process of converting Wheat into Flour and Bran," which is more particularly described in the specification, marked A, and the six sheets of drawings, marked B, C, D, E, F, and G, respectively, which are hereunto annexed; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said John Auguste Arnold Buchholz, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said John Auguste Arnold Buchholz, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said John Auguste Arnold Buchholz shall not, within three days from the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this twenty-fifth day of June, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Machinery for grinding Wheat, &c.

A.

SPECIFICATION of JOHN AUGUSTE ARNOLD BUCHHOLZ, of Vauxhall, in the county of Surrey, in England, engineer, for an invention entitled "Improvements in Machinery for grinding Wheat and other Grain, and in the process of converting Wheat into Flour and Bran."

THE object of this invention is, first, to reduce corn to flour, and to disengage the floury particles from the bran by a more simple arrangement of mechanism than has hitherto been employed for that purpose, and, secondly, so as to treat wheat that it may be converted by one continuous operation into marketable flour, and into clean compressed marketable bran.

According to the first part of this invention, I submit wheat or other grain to the action of two pairs of crushing or grinding rollers acting in succession, or preferably to their equivalent, viz., three rollers so combined as to form two pairs of crushing surfaces.

Sheet I of the accompanying drawings shows a novel arrangement of roller mill in which three crushing or grinding rollers are used in combination, the first and second rollers to operate on the grain as it is fed to the machine, and the second and third rollers to operate on the meal produced by the first crushing operation, such meal in its progress to the bite of the second and third rollers being subjected to the action of a sifting apparatus, which takes out the flour and then delivers the meal to the crushing or grinding action of these rollers.

The rollers I prefer to make of chilled cast-iron, the first and second rollers being grooved, and the third smooth or fluted more finely than the others. I have obtained a good result by the use of rollers, the first of which has twelve grooves to the inch, and the second twenty grooves to the inch, the third being a plain roller. A satisfactory result has also been obtained by grooving the first roller ten to the inch, the second roller fifteen to the inch, and the third roller thirty to the inch.

Fig. 1 is a side elevation, fig. 2 a front elevation, and fig. 3 a cross-section of my improved flour-mill; and fig. 4 is a plan of the same, showing the frame in section on a level with the middle roller.

It should be remarked that I use Mechwart's arrangement of three-roller mill with the direct application of pressure by means of adjustable rings, the English Patent of which is dated February 11th, 1878, No. 563.

AA are cast-iron standards forming the main framing of the mill, and B is a wooden casing enclosing the grinding or crushing rollers, which are shown at C D E, fig. 3. These rollers are arranged one above the other, so as to act like two pairs, and are otherwise fitted like Mechwart's patent ring-roller mill.

The middle roller D runs in bearings fixed in the standards A, which are bolted to the bed-plate and are braced together at top by a stay-bolt. The axles of the top and bottom rollers C and E rotate in bearings set a little out of line with the axis of the middle roller, and forming the extremities of pairs of rocking arms C¹ E¹, which are strung on transverse rods C² E² that have a horizontal adjustment in their standards. The object of thus mounting these rollers is to allow of their being swung away from the middle roller and of being readily brought into contact therewith, and held to their work by the adjustable pressure rings. The rods C² E² are adjusted by means of screws turning in bearings on the framing and lapped into the ends of the rods, as shown at fig. 3, for the purpose of ensuring the parallelism of the rollers C and E with the roller D.

The middle roller axle carries the driving-pulley G, and also a spur-wheel, H, which gears into spur-pinions I and K on the axles of the rollers C and E. The spur-wheel H has by preference three times the number of teeth of the pinions I and K, and makes (say) 200 revolutions per minute; the rollers I prefer to make at least 8½ inches in diameter. The axles of the rollers C and E are furnished outside the standards with friction wheels, over which a ring, L, is sprung for transmitting direct to the rollers the pressure required for reducing the grain, the pressure being adjusted by tension wheels projecting from carriers M, which slide on dovetailed projections from bracket-arms A attached to the standards. This arrangement for imparting adjustable pressure to the rollers I consider essential to the production of flour in the most efficient way according to my invention.

The roller E is balanced by counter weights placed under the bearings. N is the feed-hopper, fitted with a feed-roller in the usual manner.

Attached to this machine is an arrangement of sifting apparatus for receiving the meal or crushed corn from between the rollers C and E, sifting out the flour from the same, and then delivering the tailings of the meal to the action of the rollers D and E. This apparatus is best shown in the vertical section, fig. 3, where O and P are two rectangular inclined sieves, mounted in pairs of cast-iron cheeks, O¹ P¹, having lugs to receive transverse supporting rods, which are carried by two pairs of cranked rock levers Q Q¹. These rock levers are pivoted to stay-rods R R¹, which are made fast to the bracket-arms A¹.

Below the inclined sieves O and P the cheeks are fitted with horizontal trays or bottom plates O² P², for receiving the flour (both fine and middlings) as it is sifted out from the meal. These trays are so arranged with respect to each other that the upper tray O² will discharge its flour from the rear on to the tray P² below, which tray will in turn discharge its contents from its front edge into a receiver, S.

A reciprocating motion is imparted to the sieves and trays by means of a crank motion, in the following manner:—T is a crank shaft having its bearings in the bracket-arms A¹, and receiving a rapid rotary motion through a band and pulleys from the axle of the lower roller E. This shaft T is formed with a pair of cranks which are connected by rods T¹ to pendant extensions of the back pair of crank levers Q.

The result of this action is to cause the meal received on to the upper sieve O to travel towards its rear, and to fall over on to the sieve P below, to which it is guided by means of a spout, U, inclining slightly inwards and contracting laterally towards the lower sieve, in order to provide a space on either side thereof for passages V, which serve to conduct the flour from the upper to the lower tray.

The sieve O, it will be seen, is inclined upwards towards the rear, and the sieve P is inclined upwards towards the bite of the rollers D and E.

This inclination upwards in the direction the meal has to travel serves to intensify the action of the sieves, and thereby to economize sifting surface.

The

Improvements in Machinery for grinding Wheat, &c.

The action of the machine is as follows:—The grain as it leaves the hopper N is guided by inclined boards into the bite of the first pair of crushing surfaces, in passing through which it is reduced to meal, which contains a large proportion of fine flour. The meal thus formed falls on to the upper sieve O, where, by reason of the fineness of the gauge of the woven wire-cloth, most of the flour is sifted out, such product being a mixture of marketable flour and coarse flour, known usually as middlings, while the remainder, mostly in the form of rough bran, is jogged upwards, and dropping over the upper edge of this sieve falls down the spout U on to the lower sieve P, which sifts out the flour particles that have escaped the action of the upper sieve O. The amount of flour thus sifted out will be found to equal (say) from 50 to 60 per cent., according to the degree of hardness or mellowness of the wheat, of which about two-thirds will be fine flour, and the remainder middlings. The removal of the flour at this stage will greatly facilitate the treatment of the tailings. This residue of the meal, chiefly coarse bran, is led between the rollers DE, by which it is finally crushed, and thus cleared of flour particles. The fluting of the rollers most suitable for the above purpose will depend on the nature of the grain to be operated upon; but the examples given above sufficiently illustrate the variations of gauge which I have found it desirable to make in the crushing rollers. The result is not however essentially modified, whether the fluting be made a little coarse or a little finer.

In cross-section the fluting must be so as not to form sharp edges, and I use by preference fluting such as that shown in the diagram, fig. 1^a. Or ratchet toothed shaped fluting may be used; this will answer when worked back to back, as shown in the diagram, fig. 1^b, the size of the arrows indicating the difference of speeds.

The object of the fluting is not to cut but to increase the grip of the roller surfaces on the bran, and to form vents for the flour severed from the bran under pressure imprisoned between the crushing surfaces.

In fig. 5 I have shown a modification of the mechanism for imparting a reciprocating motion to the sieves. In this arrangement the motion is taken directly from the axle of the top roller, that is without the intervention of a crank-shaft, as above described. Fitted to the axle of the roller C is a pair of eccentrics, *c*, which through eccentric rods *c*¹, connected with the upper ends of the cranked levers Q¹, impart a reciprocating motion to the sieves.

Sheet II shows a modification of the machine first described, being in fact a double mill, provided with sifting apparatus common to the two groups of crushing rollers. Fig. 1 is a side elevation, and fig. 2 a cross-section of this arrangement of roller mill.

Two complete machines, the first with three rollers, C D E, the second also with three rollers, F G H, are bolted to a common bed-plate, and connected by two cast-iron bridge pieces, to which the double shifting arrangement O P is attached. This apparatus is operated in a precisely similar manner to that described with reference to sheet I, but the course of the meal through the sifting apparatus differs, inasmuch as it is intended to receive the meal formed from two feeds of corn, and to sift the same and transfer the tailings in opposite directions simultaneously. The upper sieve O removes the flour from the wheat crushed between the first pair of rollers C D in the first machine, which flour falling through the sieve, is received on to the trays O² (shown detached at fig. 3), and it is discharged thence by spouts O³, at opposite sides of the machine. The sieve O conveys the tailings or residue to the second pair of rollers F G in the second machine, to be there finally ground, while the lower sieve P receives the crushed wheat from the first pair of rollers G H in the second machine (here the lower pair), and removing the flour therefrom delivers it on to the tray P², which discharges it at one side of the machine into the receiver S. The sieve P, while sifting out the flour, conveys the tailings to the rollers D E of the first machine, to be there also cleared of flour particles. In order to prevent the meal crushed by the rollers F G from mixing with the wheat which is being conveyed to the rollers G H, a feed-divider, W, is employed. As the construction of this feed-divider is well known, it need not be here explained. By its use the second feed of grain is conducted through the meal as it leaves the second pair of top crushing rollers to the rollers G H.

Sheet III shows a modification of my improved mill, in which two pairs of crushing rollers are used, in place of three rollers set one above the other. C D and E F are two pairs of rollers placed side by side; the rollers D E are mounted in bearings rigidly fixed to the cast-iron framing A, while the rollers C and F turn in bearings carried by the swinging levers C¹ F¹.

For ensuring the proper grip of the rollers, they are fitted at their opposite ends with adjustable pressure rings L, arranged on the principle of Mechwart's Patent above referred to.

In order, however, to adapt this principle to pairs of rollers I have found it requisite to adopt the following contrivance:—L¹ L¹ are pairs of anti-friction rollers, carried by radius arms L² on the axles of the fixed rollers D E. These radius arms are connected together adjustably by links and coupling screws, the turning of which screws will draw the rollers L¹ together, or thrust them apart, as required. These rollers are interposed between the rings L and the anti-friction wheels D¹ E¹ respectively, so that by drawing the rollers L¹ together the rolling pressure put upon the crushing rollers may be increased to any desired extent, and thereby afford to this arrangement of mill the like grinding facilities presented by the first-described arrangement. The wheat crushed between the roller C D drops on to the upper sieve O, which conveys the tailings to the second pair of rollers E F, to be there acted upon to detach the flour particles from the bran. The action of the sieve O is also to sift out the flour particles, which falling on to the tray O¹ are discharged by side shoots into suitable receptacles. The crushed tailings delivered from the rollers E F fall on to the lower sieve P, which sifts out the flour particles and discharges the residue into the receiver S. The flour is received on to a tray P², which delivers it by side shoots, as above explained, into suitable receptacles.

I would here remark that a second sifting arrangement may, if desired, be attached to the mills, illustrated on sheets I and II, in order to receive and sift the meal crushed by the second pair of crushing surfaces; thus in sheet I the sieve will be applied to receive the meal delivered by the rollers D and E and in sheet II to receive that delivered by the rollers F and G and D and E respectively.

In some cases I may keep apart as a special grade of flour that which is yielded by the wheat after the first crushing operation, instead of, as before mentioned, discharging the whole yield into one common receptacle.

Improvements in Machinery for grinding Wheat, &c.

In carrying out the second part of my invention I use a series of machines the principle of action of which are well known in the milling trade, but which I now combine in such a manner as will enable me to carry on the process of crushing, sifting, dressing, and rolling simultaneously in an efficient and economical manner without the production in any appreciable quantity of bran specks, which once formed are extremely difficult of removal from the flour.

In sheets IV, V, and VI of the accompanying drawings, I have shown by three sample diagrams the system which I employ in carrying out the object of my invention. The order in which some of the machines are arranged it will be presently seen varies somewhat, to suit the varied requirements of the miller, or the character of the wheat under treatment, but the principle of the continuous process is strictly adhered to throughout in dealing with the fine middlings and the offals. Other modifications, however, of these arrangements will suggest themselves to the experienced miller, according to the combined requirements of quality of flour and quality of available wheat, as the advantages of the system of the continuous operation become more fully appreciated.

Referring now to diagram I, sheet IV, I will proceed to explain the course of working, so as to produce in an economical manner satisfactory results.

In converting wheat into flour, and obtaining also a clean compressed bran, I use three roller mills of the Mechwart type, which are indicated at A A¹ and A²; I also employ a bolting or stripping reel, B, of the ordinary construction, and other reels, C C¹ C² C³, for dressing and stripping of the ordinary construction. Besides these, I provide four sizing sieves, D D D D, and in connection with these five of Thompson's or other efficient purifiers, E¹ E² E³ E⁴ E⁵.

The wheat I first subject to the action of a crushing or grinding machine, A, by preference that which forms the subject of the first part of this invention. The products from both the first and second pair of crushing surfaces I lead to the bolting or stripping reel B, as indicated by the red line *a*. This reel is covered with silk or fine wire gauze, and by its action the flour, whether coarse or fine, is separated from the bran. The flour delivered from the stripping reel I lead to the finishing reel C, as indicated by the red line *b*. The first portion of this reel is covered with No. 11 silk, for dressing out the second quality flour; the yield of this quality of flour will equal about one-half the original weight of the wheat. A small portion of the tail end of the reel is covered with No. 6 silk, for the purpose of dressing out the finest middlings, or the smallest particles of the incompletely ground flour particles. The coarsest portions of the flour which cannot pass through the silk I convey to the set of sizing sieves D D D D, as indicated by the red line *c*, where they are assorted into five qualities. The assorted product thence drops, according to size, into the five purifiers, the tailings from the upper and lower sieves falling respectively into the purifiers E¹ E³ E⁵, and the sifted portions into the purifiers E² E⁴. By the action of these purifiers the branny impurities, consisting of fine disintegrated portions of the bran in the form of stive, will be removed, the main portion of the bran having been kept back by the first stripping reel B. The purified middlings, either assorted according to quality or not, are collected from the several purifiers, as indicated by the red lines *d d*. I now subject to the action of the roller mill A¹, containing a group of three rollers, set one above the other to act as two pairs, and being in this case smooth rollers.

The purified middlings I pass between the upper pair of crushing surfaces, the surface speeds of which will slightly vary, one roller making 180 revolutions per minute to (say) 144 of the other, and I lead the product to the second finishing and dressing reel C¹, covered like the first, which separates the flour from fine middlings, as before explained, the flour which is the first quality forming some 18 or 20 per cent. by weight of the wheat under treatment.

The fine middlings obtained from the finishing reel C I submit to a second crushing action between the lower pair of crushing surfaces of the smooth roller mill A¹, as indicated by the red line *e*, adding thereto the second quality of flour or fine middlings obtained from the second finishing reel C¹. The product from these lower rollers I lead back to the stream which passes from the first mill A into the first bolting or stripping reel B, as indicated by the red line *f*. This returning of the finest particles of middlings when crushed between smooth rollers into the whole wheat meal is a leading feature of the process, because it not only ensures the proper dressing and mixing of the whole of the flour, but also materially advances the production of a full yield of flour.

Having disposed of the flour, I now proceed to finish the offals by subjecting them to the squeezing action of smooth rollers working at rather a higher speed than that adopted for crushing middlings. I have found 200 and 250 revolutions per minute, or 200 and 400, according to the hardness or mellowness of the wheat, do excellent work with a pair of rollers each 8½ inches in diameter.

The bran, which is delivered from the tail of the first stripping reel B, is conveyed as shown by the red line *g*, to the lower pair of rollers of the mill A², which is fitted with smooth rollers working with the speeds above indicated. By means of this mill the bran is rolled out into thin smoothly polished flat flakes.

I would have it understood that unless the bran is well cleared of flour in the first process, *i.e.*, by my patented wheat-crushing roller mill, the action of the smooth rollers on the bran will fail to be satisfactory.

The small bran particles not dressed through the second finishing reel C¹ I lead to the upper pair of compressing surfaces of the mill A², the lower pair of which operates on the main bulk of the bran, as above mentioned.

The whole of the compressed bran as it is delivered from the mill A², passes to a second stripping reel, C², as indicated by the red line *h*, which dresses out the flour particles contained therein, and delivers the same to another reel, C³, as indicated by the red line *i*. This reel separates the flour into fine and coarse "sharps" and third quality flour, the proportion being fine sharps, 5 lbs.; coarse sharps, 6 lbs., with the middlings stive mixed in; and third quality flour, 5 lbs. or thereabouts,—for every 100 lbs. of wheat passed through the first mill A.

I may remark that I prefer to use the reels known as centrifugal reels, because of the tendency to caking when smooth rollers are used.

The bran obtained by this process is free from dust, and is bright and smoothly polished, a matter of some importance particularly where dry feeding is adopted, and the bran being condensed by this treatment will pack closely for transport, which is also a material advantage.

The

Improvements in Machinery for grinding Wheat, &c.

The blue lines shown in the diagram indicate the points of delivery of the flour, and of the bran and sharps, which may be received into separate convenient receptacles.

Diagram II, sheet V, shows a modification of the course of working for the production of a flour holding an intermediate position in equality between the first and second quality flour of the preceding diagram, and one other holding an intermediate position between the second and third flours of diagram I. The apparatus is the same as that indicated in diagram I, with the exception that three groups of Haggemacher's No. 4 small purifiers, four divisions or sizes in each group, or similar mechanism, marked $D^1 D^2 D^3$, are used, each group being connected with a Thompson's or other efficient purifier. In this arrangement also the flour removed by the automatic sifter of the mill A passes directly to an additional finishing or dressing reel, C^* , which delivers it as first quality flour, the yield being 60 lbs. for every 100 lbs. of wheat ground in the mill. The middlings sifted out by this reel are passed to the upper pair of crushing surfaces of the roller mill A^1 , and the product is led thence to join in the stream of flour which passes to the reel C^* ; the tailings from the reel C^* are conducted to the two groups of purifiers $D^2 D^3$. The purified middlings collected from these purifiers are led, as indicated by the red line d , to the bottom pair of crushing surfaces of the roller mill A^1 . In other respects the manufacture proceeds as described with reference to diagram I. Diagram III, sheet VI, shows an arrangement for attaining three qualities of flour, each superior to that obtained by the arrangement shown at diagram I, by the aid of more complete purifying apparatus. Here also, in place of the sizing sieves and five Thompson purifiers, we have three groups of Haggemacher's purifiers, one group of No. 4 small and two of No. 4 large purifiers, with each of which groups a Thompson or other efficient purifier is connected. The product of the roller-mill A passes off in two separate streams, as in No. 2 in diagram—the first flour by b to the reel C^* , the second by a to the bolting reel B. The flour delivered from the cylinder C^* will in this case be second quality flour, its yield being about 40 lbs. to the 100 lbs. of wheat.

The middlings and the tailings from the reel C^* follow the course described with reference to diagram II. The flour delivered from the bolting reel B is conducted to the finishing reel C; the yield of flour from this reel, and from C^3 , as hereafter mentioned, will be about 13 lbs. to the 100 lbs. of wheat, and will be third quality flour.

The fine middlings delivered from the reel C are conducted, as indicated by the red line d^* , to the top pair of crushing surfaces of the mill A^1 , and the flour there produced passes by the line b to join the stream which passes to the reel C^* .

The tailings or coarse middlings from the reel C pass to the first group of purifiers, D^1 , and when purified join the stream indicated by the line d^* .

The purifiers $D^2 D^3$ yield two qualities of purified product, viz., first and second quality middlings. The second quality, indicated by the line f^* , joins the stream from the purifiers D^1 , but the first quality, indicated by the line g^* , is led to the second pair of crushing surfaces in the mill A^1 , and passing thence it reaches the finishing reel C^1 , which delivers it as firstly flour, the yield being about 20 lbs. to the 100 lbs. of wheat.

The fine middlings dressed through the end silk of this reel C^1 , following line d^2 , are ground in connection with the first quality middlings g^* . In some cases it may be advantageous to run the second quality coarse middlings f^* and the fine middlings d^* , which join at h , when crushed into the wheat a , instead of causing them to unite with b , or they may be dressed still more advantageously on a separate reel. The above will illustrate how the principle of dealing with the crushed fine middlings for dressing must be adhered to.

The tailings from the reel C^1 pass to the pair of crushing surfaces of the mill A^2 , and the product is led thence to the second stripping reel C^2 . The siftings from this reel are led to the finishing reel C^3 , whence they are led into the stream of flour delivered from the reel C, and go to make up the before-mentioned yield of 13 lbs. of third quality flour.

It will be understood that the bran and the sharps are obtained and delivered in the same manner as explained with reference to diagram I, the stive joining the fine sharps as before.

The course of all the products is clearly indicated by coloured lines in this as in the preceding diagrams.

From the above description it will be understood that my improved mode of working embraces the following features, viz. :—

First—By removing the finest middlings at the tail-end of the silks means are provided for returning those particles of middlings which have been incompletely ground between the smooth rollers to the grinding apparatus in a form comparatively free from bran mixture.

Second—By the above provision the coarser middlings sent forward to the purifiers are absolutely free from dust, while the whole process of dusting the middlings and redressing the flour is made at once unnecessary.

Third—None, except the very last grindings, treat low-grade intermediate products, consequently the rollers are but slightly in contact with bran particles.

Fourth—By treating every description of offal on smooth rollers provision is made against the escape of unground middlings through any disturbance in the mill, or a change in the adjustment of the machinery, or negligence on the part of the attendants. All the products here treated are almost free from flour, and there will be accordingly only an inconsiderable proportion of inferior flour.

Having now set forth the nature of my invention, and explained the manner of carrying the same into effect, I wish it to be understood that I claim—

The arrangements of machinery above described with reference to sheets I, II, and III of the drawings, whereby I am enabled to reduce the wheat and other grain to flour, by the operation of two pairs of grinding rollers, or three rollers acting as two pairs of grinding surfaces.

Improvements in Machinery for grinding Wheat, &c.

The reduction of wheat to flour of various qualities, and the conversion of the bran obtained therefrom into clean flat flakes by a continuous process, in which well known or approved crushing, bolting, dressing, and purifying apparatus is used, as explained with reference to sheets IV, V, and VI of the accompanying drawings.

London, 28th October, 1880.

J. A. ARNOLD BUCHHOLZ.

This is the specification marked A referred to in the annexed Letters of Registration granted to John Auguste Arnold Buchholz, this twenty-fifth day of June, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

We do ourselves the honor to report, in reply to your blank cover communication of the 12th instant, that on examination of Mr. John Auguste Arnold Buchholz' specifications, drawings, and claim for improvements on Mechivert's English Patent of the 11th February, 1878, No. 563, in the process of converting Wheat into Flour and Bran, we are of opinion that the prayer of Mr. Buchholz' Petition may be granted.

Sydney, 17 May, 1881.

We have, &c.,

GOTHER K. MANN.
EDMUND FOSBERY.

The Under Secretary of Justice.

[Drawings—six sheets.]

B.

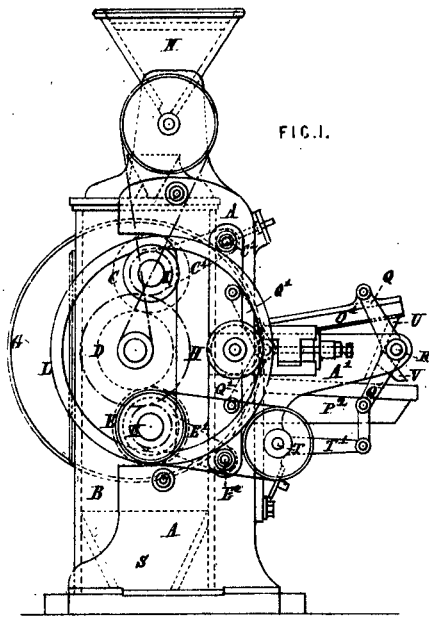


FIG. 1.

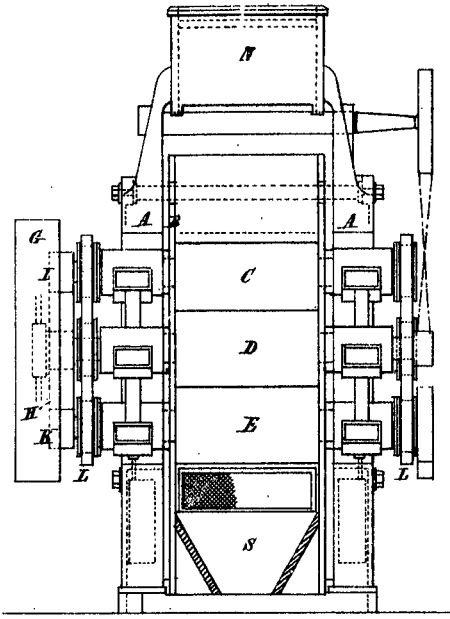


FIG. 2.

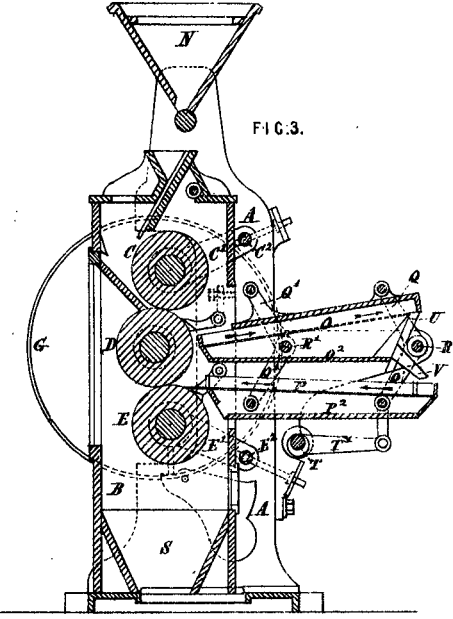


FIG. 3.

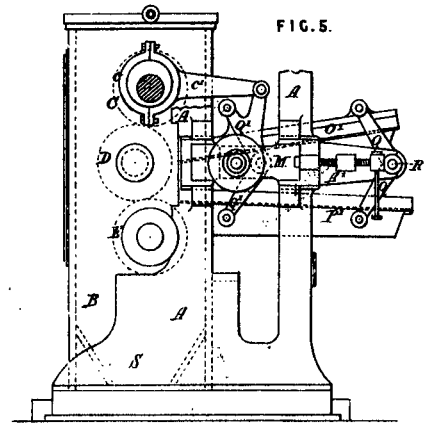


FIG. 5.

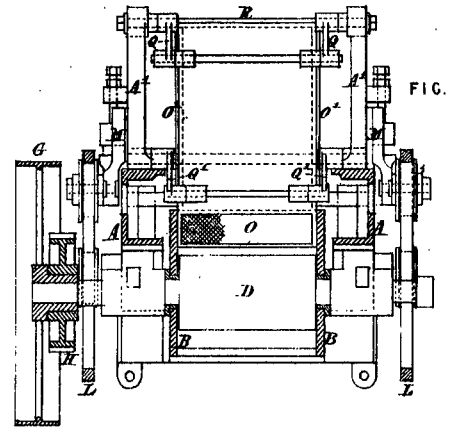


FIG. 4.

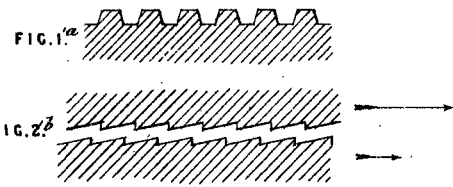


FIG. 1^a

FIG. 2^b

*This is the Sheet of Drawings marked B referred to in the annexed
Letters of Registration granted to John Auguste Arnold Buchholz,
this twenty-fifth day of June, A.D. 1881. Augustus Loftus.*

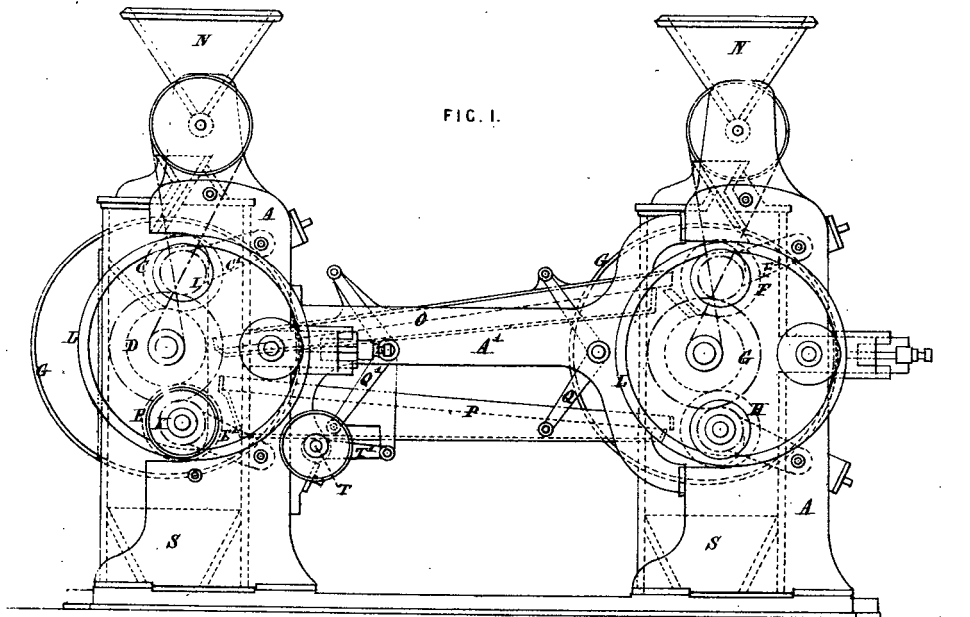


FIG. 1.

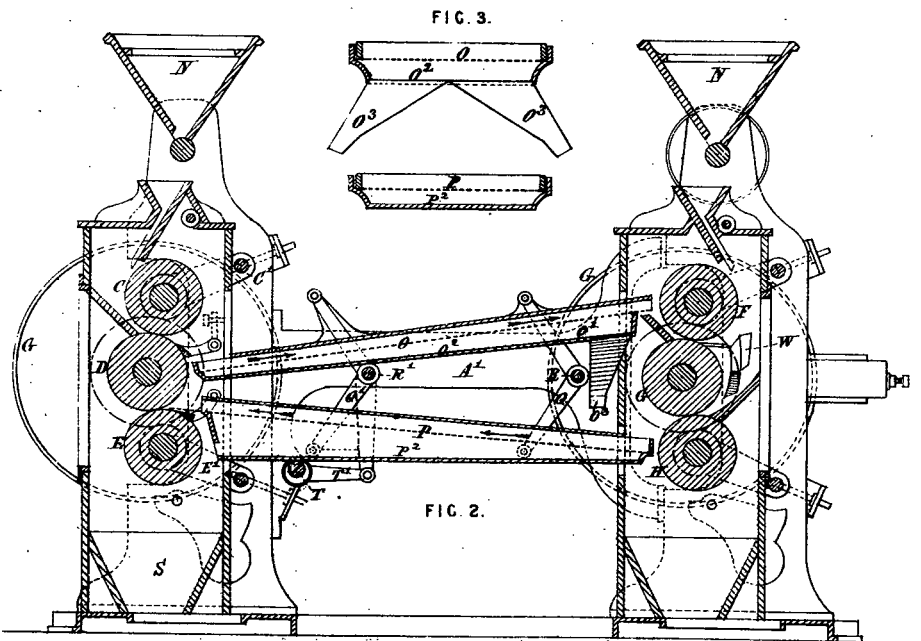


FIG. 3.

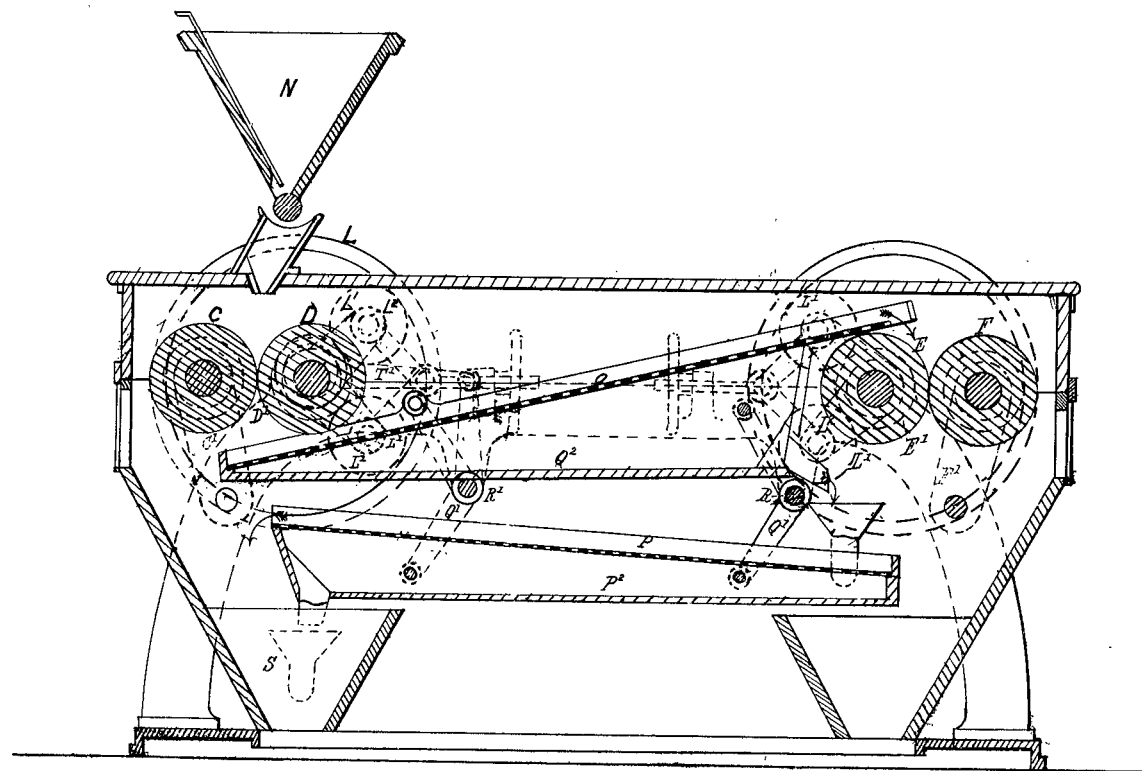
FIG. 2.

*This is the Sheet of Drawings marked C referred to in the annexed
Letters of Registration granted to John Auguste Arnold Bachhöly, this
twenty-fifth day of June, A.D. 1881.*

Augustus Loftus.

D.

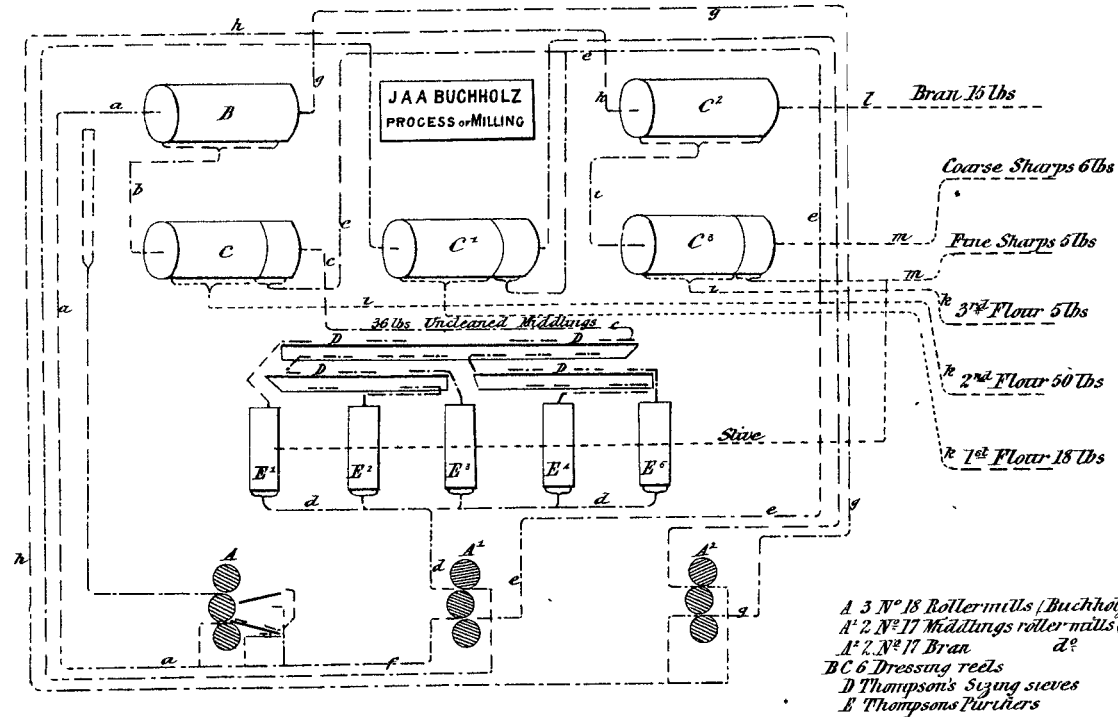
[944]



*This is the Sheet of Drawings marked D referred to in the annexed
Letters of Registration granted to John Auguste Arnold Buchholz,
this twenty-fifth day of June, A.D. 1881*

Augustus Lofhus.

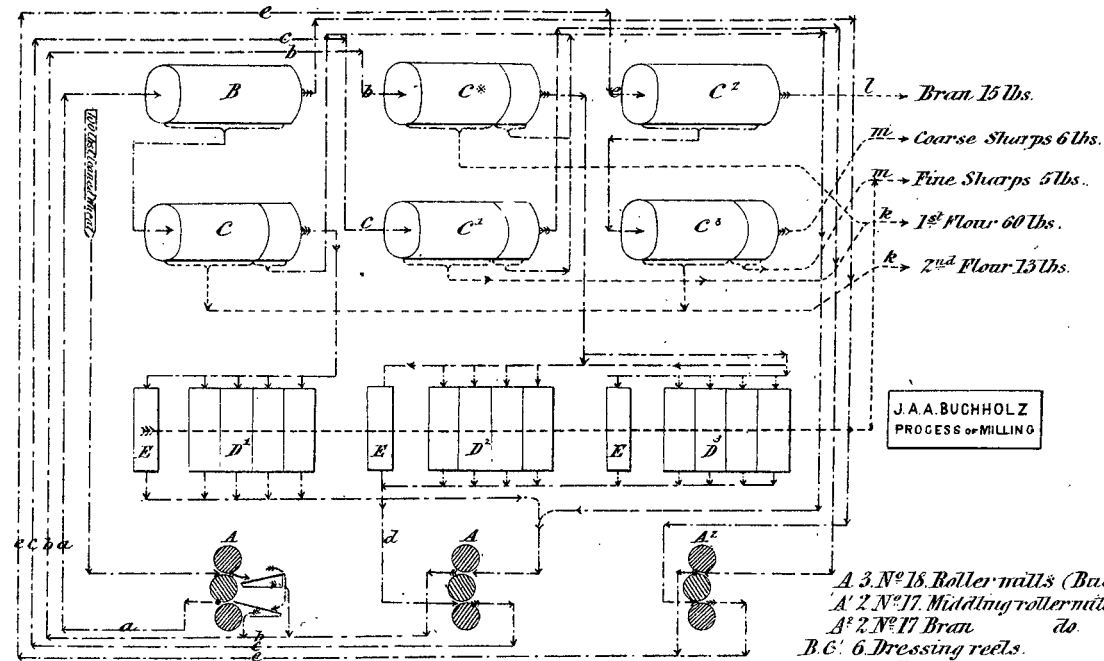
(Sig 34-)



Unfinished products through *MU* shown thus -----
 Finished produce -----

This is the Sheet of Drawings marked E. referred to in the annexed Letters of Registration granted to John Auguste Arnold Buchholz, this twenty fifth day of June A. D. 1881.

Augustus Loftus.

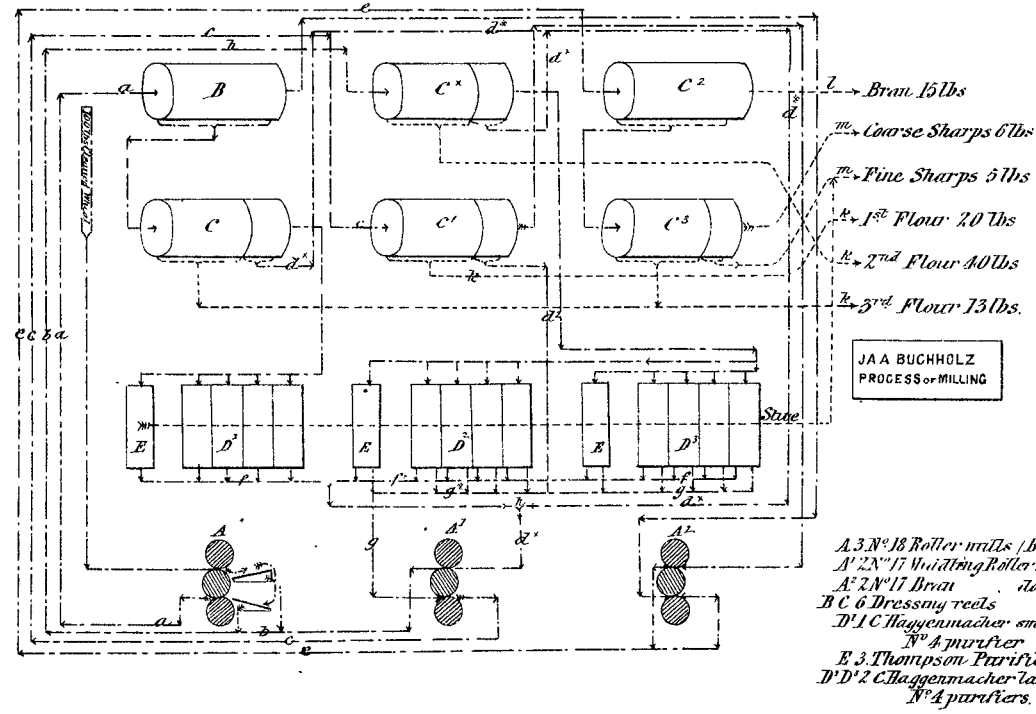


- A 3 N° 18 Roller mills (Buchholz)
- A' 2 N° 17 Middling roller mills (Mehlwürts)
- A" 2 N° 17 Bran do do
- B, C: 6 Dressing reels
- D, D' 3 C Haggermacher small N° 4 Purifiers
- E 3 Thompson's Purifiers

Unfinished products through Mill (shown thus) - - - - -
 Finished produce. _____

This is the Sheet of Drawings marked F referred to in the annexed Letters of Registration granted to Jolav Auguste Arnold Buchholz, the twenty fifth day of June A. D. 1881.

Augustus Loftus.



- A. 3 No 18 Roller mills (Buchholz)
- A' 2 No 17 Vordring Roller mills (Mecklenburg)
- A'' 2 No 17 Draht roller mills do do
- B C 6 Dressing reels
- D' 1 C Haggenmacher small No 4 purifier
- E 3 Thompson Purifier
- D' D' 2 C Haggenmacher large No 4 purifiers.

Unfinished products through Mill (shown thus) ————
 Finished produce do do - - - - -

*This is the Sheet of Drawings marked G referred to in the annexed
 Letters of Registration granted to John Auguste Arnold Buchholz,
 the twenty fifth day of June A D 1881*

Augustus Loftus.



A.D. 1881, 25th June. No. 945.

**IMPROVEMENTS IN APPARATUS FOR PRESERVING ALIMENTARY SUBSTANCES
BY MEANS OF COLD.**

**LETTERS OF REGISTRATION to Leon Ribourt, for Improvements in Apparatus
for preserving alimentary substances by means of cold.**

[Registered on the 25th day of June, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS LEON RIBOURT, of Paris, in the Republic of France, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in Apparatus for preserving alimentary substances by means of cold," which is more particularly described in the specification and sheet of drawings which are hereunto annexed ; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four ; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years : And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Leon Ribourt, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof ; to have, hold, and exercise unto the said Leon Ribourt, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended : Provided always, that if the said Leon Ribourt shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this twenty-fifth day of June, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Apparatus for preserving alimentary substances by means of cold.

SPECIFICATION of LEON RIBOURT, of Paris, in the Republic of France, for an invention entitled "Improvements in Apparatus for preserving alimentary substances by means of cold."

THIS apparatus relates generally to the preservation of alimentary substances by means of cold, but more particularly to the transport by sea of fresh meat from South America and other countries to Europe.

As regards more especially the transport of fresh meat on board ship; in order to counteract the heating effects due to the contact of the sea with the sides of the ship, to the contact of the external air, and to the radiation from the sun, in the tropics, it is necessary to construct around the mass of the cargo a kind of envelope which is powerfully cooled, and even to insert cold surfaces into the very mass itself, for the purpose of maintaining therein the low temperature necessary for the perfect preservation of the meat.

The usual source of cold, or rather the apparatus which absorbs the heat is an ice-making or cooling machine.

The intermediate vehicle employed between the mass of meat to be cooled and the ice-making or cooling machine is preferably an aqueous solution of chloride of magnesium, which has the advantages of being absolutely neutral (which affects the preservation of the metal of the apparatus), of not leaving a deposit, and of being very fluid; it may be dissolved in the proportion of fifty per cent. by weight in water, and makes a liquid incongealable at 30° Centigrade.

The apparatus constituting the cold surfaces are the refrigerating cylinders which form the special feature of this invention, they are distributed near each other in the between decks of the ship. They are connected to the ice-making or cooling machine by pipes so arranged that the delivery and return of the incongealable cold liquid can be regulated from the deck above, so as to place the temperature of the space containing the meat under complete control at all points.

The meat is stowed inside and outside these cylinders, and there may be left between the side of the ship (which is lined with a bad conductor of heat), and the cylinder nearest to this side, a space or passage sufficient for a person to pass along for the purpose of inspection. This small space of passage may be left in any other suitable position, and there may be one or more such passages, but preferably so arranged as not to leave too much space unoccupied.

A refrigerator is formed of two concentric cylinders of sheet or plate iron, of from three to five millimètres thickness according to circumstances.

In the drawing annexed hereto, figure 1 is a longitudinal section, and figure 2 a transverse section of a refrigerator shown in place between the decks of a vessel.

These two cylinders, A and B, of three mètres length for example, have between them an annular space C, of say, fifty millimètres width, the external diameter of the largest cylinder-A, being for example about two mètres. They are connected together at their two ends by two U-shaped iron rings or channel irons, D D, to which the sheet or plate-iron cylinders are riveted in order to make watertight the said annular space C, in which the circulation of the cold incongealable liquid takes place.

To secure a proper circulation of the cold incongealable liquid, and to obtain a uniform exchange of heat at all points of the surface of the refrigerator, there are placed between the two sheet or plate-iron cylinders wooden partitions, E E E, of say fifty millimètres square. Supposing there are eight of these partitions, the first, E¹, will be of the full internal length between the two rings or channel irons D D; the others will be shorter, and placed so as to touch alternately one ring or channel iron, and then the other, forming a circuitous passage, illustrated by arrows in figure 1 of the drawing. The inlet pipe F, for the incongealable liquid, is placed in the inside of the cylinder B, between the first and second partitions, and the outlet pipe G, for the liquid, is also placed inside the cylinder B, between the eighth and the first partitions.

These wooden partitions, besides forming the circuitous passage for the incongealable liquid, maintain the distance of the inner and outer cylinders from each other, and strengthen the apparatus, distributing the shocks and pressures to which the outside or inside of the cylinders may be subjected.

As regards the internal pressure of the liquid which determines the circulation, the cylindrical form resists it naturally without change of form, and the thickness of the sheet or plate iron is more than sufficient for this relatively small pressure.

In respect of economy, of first cost, and of space occupied in the ship, this kind of apparatus is specially advantageous; it allows also of a sufficiently active circulation of the cold liquid for securing the maintenance of the low temperature necessary to the perfect preservation of the meat.

In order to reduce to a minimum the space occupied by the cylindrical refrigerators when they are not required for the preservation of meat or other substances, they may be made of various diameters, so as to admit of being packed inside one another like the tubes of a telescope; the central space which remains empty in the smallest after they are thus packed together, may be used for the stowage of various products, such as skins or other matters. The apparatus thus arranged telescopically, will occupy about a tenth part only of the space that the cold chamber occupies in the ship, leaving the remaining nine-tenths available for any purpose for which it may be suitable.

Having now described the construction and operation of my invention, I would have it understood that what I claim as my invention is:—

The refrigerating apparatus, consisting of an outer cylinder, A, and an inner cylinder, B, with an annular space, C, between them, such annular space being closed at both ends, and fitted with partitions, E E, forming a circuitous channel to the two ends of which are connected the inlet and outlet pipes F and G for the circulation of incongealable liquid, the whole constructed, arranged, and operating substantially as hereinbefore described, and illustrated in the drawing, and for the purposes herein set forth.

In

Improvements in Apparatus for preserving alimentary substances by means of cold.

In witness whereof, I, the said Leon Ribourt, have hereunto set my hand and seal, this seventh day of June, in the year of our Lord one thousand eight hundred and eighty.

LEON RIBOURT.

Witnesses,—

MAURICE SAUTTENY, Paris, rue de l'Oratoire, 6.

EDOUARD SCHMIDT, Paris, 5 quai Volney.

This is the specification referred to in the annexed Letters of Registration granted to Leon Ribourt, this twenty-fifth day of June, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

The application of Mr. L. Ribourt, for Letters of Registration for "Improvements in Apparatus for preserving alimentary substances by means of cold" having been referred to us, we have examined the specifications and drawings accompanying the same, and have now the honor to report that we see no objection to the issue of Letters of Registration as prayed for.

We have, &c.,

J. SMITH.

CHARLES WATT.

The Under Secretary of Justice.

[Drawings—one sheet.]

Fig. 1.

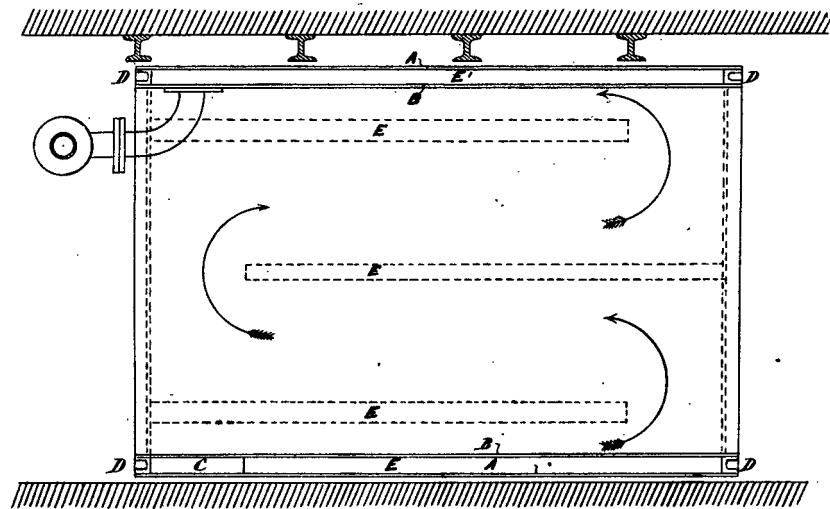
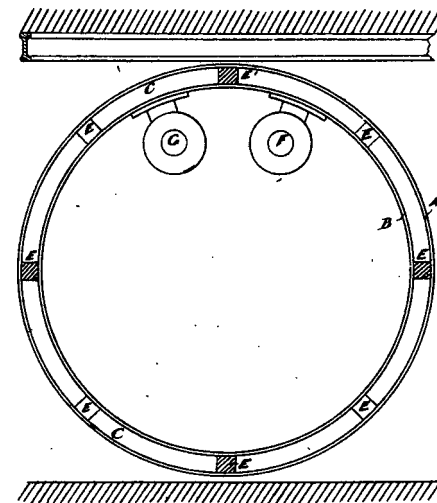


Fig. 2.



*This is the Sheet of Drawings referred to in the annexed
 Letters of Registration granted to Leon Ribourt, this twenty
 fifth day of June A.D. 1881.*

Augustus Loftus.



A.D. 1881, 25th June. No. 946.

AN IMPROVEMENT IN TINS OR CANS FOR PRESERVING MEAT.

LETTERS OF REGISTRATION to Alfred Lee, John Alston Wallace, and Robert Wright Knox, for an Improvement in Tins or Cans for preserving Meat.

[Registered on the 25th day of June, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS ALFRED LEE, of No. 26, Brunswick-street, Fitzroy, in the Colony of Victoria, meat preserver, JOHN ALSTON WALLACE, of No. 52, Bourke-street East, in the city of Melbourne and Colony of Victoria, a Member of the Legislative Council of the said Colony, and ROBERT WRIGHT KNOX, of Melbourne aforesaid, gentleman, have by their Petition humbly represented to me that they are the authors or designers of a certain invention or improvement in manufactures, that is to say, of an invention entitled, "An Improvement in Tins or Cans for preserving Meat," which is more particularly described in the substituted specification which is hereunto annexed; and that they, the said Petitioners, have deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council sixteenth Victoria, number twenty-four; and have humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to them for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Alfred Lee, John Alston Wallace, and Robert Wright Knox, their executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said Alfred Lee, John Alston Wallace, and Robert Wright Knox, their executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said Alfred Lee, John Alston Wallace, and Robert Wright Knox shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court at Sydney, in the Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this twenty-fifth day of June, in the year of our Lord one thousand eight hundred and eighty-one.

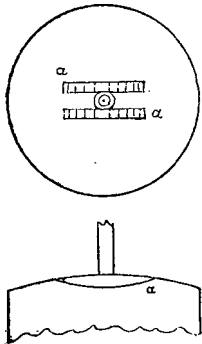
[L.S.]

AUGUSTUS LOFTUS.

An Improvement in Tins or Cans for preserving Meat.

[SUBSTITUTED.]

SPECIFICATION of ALFRED LEE, of No. 26, Brunswick-street, Fitzroy, in the Colony of Victoria, meat preserver, JOHN ALSTON WALLACE, of No. 52, Bourke-street East, in the city of Melbourne and Colony of Victoria, a Member of the Legislative Council of the said Colony, and ROBERT WRIGHT KNOX, of Melbourne aforesaid, gentleman, for an invention entitled "An Improvement in Tins or Cans for preserving Meat."



In preserving meats according to certain processes it becomes necessary to provide for a free escape of steam from the tin or can containing it, and for the free discharge of any liquid therein when the tin or can is turned upside down.

For these purposes we construct tins or cans with a grating over the orifice, through which the steam escapes or the liquid is discharged as the case may be. This grating is shown in the sketch on the margin hereof, where it is marked *a*. We also prefer to dish the inside of the top of such cans or tins. The object of the grating is to prevent the opening being blocked up by the solid contents of the can or tin.

We claim the construction and use of tins or cans for preserving meat in which the escape or discharge opening is covered with a grating as herein described and as marked *a* in the sketch hereon.

ALFRED LEE.
JOHN A. WALLACE.
R. W. KNOX.

This is the substituted specification referred to in the annexed Letters of Registration granted to Alfred Lee, John Alston Wallace, and Robert Wright Knox, this twenty-fifth day of June, A.D. 1881.

AUGUSTUS LOFTUS.

REPORTS.

Sir,

With reference to the application of Messrs. Alfred Lee, John Alston Wallace, and Robert Wright Knox, for Letters of Registration for "Improvements in the process and in contrivances used for the preservation of Meat," we have the honor to report that we fail to see anything in the specification to which the applicants can claim exclusive right, we are therefore unable to recommend the issue of Letters of Registration.

We have, &c.,
CHARLES WATT.
GOTHER K. MANN.

The Under Secretary of Justice.

Sir,

The papers having reference to the application of Messrs. Lee, Wallace, and Knox, for Letters of Registration for "Improvements in the process and in contrivances used in the preservation of Meat," having been returned to us for reconsideration, we have the honor to report that we have again given them a careful perusal, and have also been furnished with a personal explanation by one of the applicants.

We have now to state that we withdraw, but not without some hesitation, our objection so far as it relates to the first portion of the second claim, which has reference to the construction of the tins, but we are unable to modify our previous report with reference to any other portion of the claim.

We have, &c.,
CHAS. WATT.
GOTHER K. MANN.

The Under Secretary of Justice.

Sir,

We have the honor to return herewith the papers having reference to the application of Messrs. Lee, Wallace, and Knox, for Letters of Registration, and to report that we see no objection to the registration of their substituted specification for "An Improvement in Tins or Cans for preserving Meat," in accordance with our letter of the 20th ultimo.

We have, &c.,
CHAS. WATT.
GOTHER K. MANN.

The Under Secretary of Justice.

Sydney, 25 March, 1881.

Sydney, 20 April, 1881.

Sydney, 17 May, 1881.



A.D. 1881, 25th June. No. 947.

IMPROVEMENTS IN PAINTING, VARNISHING, AND WHITEWASHING.

LETTERS OF REGISTRATION to Henry Ferdinand Ihlee and William Cullen Horne, for Improvements in Painting, Varnishing, and Whitewashing.

[Registered on the 25th day of June, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS, (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS HENRY FERDINAND IHLEE and WILLIAM CULLEN HORNE, trading under the style or firm of "Ihlee and Horne," of 31, Aldermanbury, London, in England, have by their Petition humbly represented to me that they are the assignees of the executrix of the will of William Henry Balmain, deceased, late of Eversley, Steephill Road, Ventnor, in the Isle of Wight, the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in Painting, Varnishing, and Whitewashing," which is more particularly described in the specification which is hereunto annexed; and that they, the said Petitioners, have deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and have humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to them for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council to grant, and do by these Letters of Registration grant unto the said Henry Ferdinand Ihlee and William Cullen Horne, their executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said Henry Ferdinand Ihlee and William Cullen Horne, their executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if they the said Henry Ferdinand Ihlee and William Cullen Horne shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this twenty-fifth day of June, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Painting, Varnishing, and Whitewashing.

SPECIFICATION of HENRY FERDINAND IHLEE and WILLIAM CULLEN HORNE, trading under the style or firm of Ihlee and Horne, at 31, Aldermanbury, London, in England, merchants, for an invention entitled "Improvements in Painting, Varnishing, and Whitewashing."

THE said invention relates to a method of rendering paints, whitewashes, and temperings luminous, and consists in introducing into ordinary paints, varnishes, or washes a phosphorescent substance or substances, either alone or in conjunction with colours, or with white substances as a body, by which means the object or article to which such paint or varnish or wash is applied is itself rendered visible in the darkest place, and more or less capable of imparting light to other objects so as to render them visible also.

The phosphorescent substance which has been found most suitable for the purpose is a compound obtained by simply heating together a mixture of lime and sulphur, or carbonate of lime and sulphur, or some of the various substances containing in themselves both lime and sulphur, such, for example, as alabaster, gypsum, and the like, with carbon or other agent to remove a portion of the oxygen contained in them, or by heating lime or carbonate of lime in a gas or vapour containing sulphur.

The phosphorescent substance obtained in this or in any equivalent manner may be applied in various proportions and with different paints, varnishes, or washes, according to the object in view or the effect which it is required to produce, the exact nature of the mixture and proportions of the ingredients used being determined by the judgment and experience of the artisan employed to carry out the work. The best results have been found to be obtained by mixing the phosphorescent substance with a colourless varnish made with mastic or other resinous body and turpentine or spirit, making the paint as thick as convenient to apply with a brush, and with as much turpentine or spirit as can be added without impairing the required adhesiveness. Good results may however be obtained with drying oils, spirit varnishes, gums, pastes, sizes, and gelatine solutions of every description, the choice being varied to meet the object in view or the nature of the article in hand. The mode of applying the paint, varnish, or wash will also depend upon the circumstances of the case. For example, it may be applied by a brush, as in ordinary painting, or by dipping or steeping the article in the paint, varnish, or wash, or a block or type may be used to advantage, as in calico printing, ordinary printing, and the like.

For outdoor work, or whenever the surface illuminated is exposed to the vicissitudes of weather or to injury from mechanical contingencies, it is found desirable to cover it with glass; or if the article will admit of it, to glaze it over with a flux, as in enamelling, or as in ordinary pottery, and this may be accomplished without injury to the effect even when the flux or glaze requires a red heat for fusion.

Among other applications of the said invention which may be enumerated it is particularly advantageous for rendering visible clock or watch faces and other indicators, such, for example, as compasses and the scales of barometers or thermometers during the night, or in dark places during the day-time.

In applying the invention to these and other like purposes, either phosphorescent grounds with dark figures may be used, or dark grounds and phosphorescent figures or letters, the former being preferred.

In like manner there may be produced figures and letters for use on house-doors and ends of streets wherever it is not convenient or economical to have an external source of light, sign-posts, and signals, and names or marks to show entries to avenues or gates and the like.

The invention is also applicable to the illumination of railway carriages by painting with phosphorescent paint a portion of their interior, thus obviating the necessity for the expense and inconvenience of the use of lamps in passing through tunnels.

It may also be applied externally as warning lights at the front and end of trains passing through tunnels, and in other similar cases; also to ordinary carriages, either internally or externally. As a night light in a bedroom, or in a room habitually dark, the application has been found quite effectual, a very small proportion of the surface rendered phosphorescent affording sufficient light for moving about the room or for fixing upon and selecting an article in the midst of a number of complicated scientific instruments or other objects.

The invention may also be applied to private and public buildings in cases where it would be economical and advantageous to maintain for a short time a waning or twilight, so as to obviate the necessity for lighting earlier the gas or other artificial light.

It may also be used in powder mills and stores of powder, and in other cases where combustion or heat would be a constant source of danger, and generally for all purposes of artificial light where it is applicable.

In order to produce and maintain the phosphorescent light, full sunshine is not necessary, but on the contrary, is undesirable.

The illumination is best started by leaving the article or surface exposed for a short time to ordinary daylight, or even artificial light, which need not be strong, in order to make the illumination continue for many hours, even twenty hours, without the necessity of renewed exposure.

The advantages of the invention consist in obtaining for the purposes of daily life a light which is maintained at no cost whatever, is free from the defects and contingent dangers arising from combustion or heat, and can be applied in many cases where all other sources of light would be inconvenient or incapable of application.

Having now described and particularly ascertained the nature of the said invention, and the manner in which the same is or may be used or carried into effect, we would observe in conclusion that what we consider to be novel and original, and therefore claim is—

The employment in paints, varnishes, or washes of phosphorescent substances, either alone or in conjunction with other substances, in order to render such paints, varnishes, or washes luminous, substantially as and for the purposes hereinbefore described.

Improvements in Painting, Varnishing, and Whitewashing.

In witness whereof, we, the said Henry Ferdinand Ihlee and William Cullen Horne, have hereto set our hands and seals, this seventeenth day of December, 1880.

H. F. IHLEE.
W. C. HORNE.

Witness—

F. J. BROUGHAM,
7, Whitehall Place, London, S.W.

This is the specification referred to in the annexed Letters of Registration granted to Henry Ferdinand Ihlee and William Cullen Horne, this twenty-fifth day of June, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

The application of Messrs. Ihlee and Horne, for Letters of Registration for an invention entitled "Improvements in Painting, Varnishing, and Whitewashing," having been referred to us, we have examined the specification accompanying the same, and have now the honor to report that we see no objection to the issue of Letters of Registration as prayed for.

Sydney, 22 March, 1881.

We have, &c.,
JAMES BARNET.
THOS. RICHARDS.

The Under Secretary of Justice.



A.D. 1881, 25th June. No. 948.

IMPROVEMENTS IN ELECTRO-MAGNETIC RAILROADS, &c.

LETTERS OF REGISTRATION to Thomas Alva Edison, for Improvements in the construction of Machinery and Appliances for Electro-magnetic Railroads, and in the generation, distribution, and translation of electricity for working the same.

[Registered on the 25th day of June, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting:

WHEREAS THOMAS ALVA EDISON, of Menlo Park, in the State of New Jersey, United States of America, electrician, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in the construction of Machinery and Appliances for Electro-magnetic Railroads, and in the generation, distribution, and translation of electricity for working the same," which is more particularly described in the specification, marked A, and the two sheets of drawings, marked B and C respectively, which are hereunto annexed; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Thomas Alva Edison, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said Thomas Alva Edison, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said Thomas Alva Edison shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this twenty-fifth day of June, in the year of our Lord one thousand eight hundred and eighty-one.

[L.s.]

AUGUSTUS LOFTUS.

Improvements in Electro-magnetic Railroads, &c.

A.

TO ALL WHOM IT MAY CONCERN: Be it known that I, THOMAS ALVA EDISON, of Menlo Park, in the State of New Jersey, United States of America, electrician, have invented certain "Improvements in the construction of Machinery and Appliances for Electro-magnetic Railroads, and in the generation, distribution, and translation of electricity for working the same," of which the following is a specification:—

THE object of this invention is to furnish an economical and reliable system of electro-magnetic railways or tramways, which, while useful in any locality, shall be particularly adapted to regions where the traffic is too light for ordinary steam railways, or where the main bulk of the traffic is limited to certain seasons, or where the difficulties or expense of grading render ordinary steam roads impracticable.

To this end the invention consists in a complete electro-magnetic railway system, embracing the generation, distribution, and utilization of electric currents as a motive-power, and in the novel devices and combinations of devices therefor, as more particularly hereinafter described and claimed.

In carrying my invention into effect the rails of the track are electrically connected, so that each line of rails forms one-half of a circuit. The road is divided into sections, where from its length this is desirable, each section forming substantially a small, independent railroad. For each section a central station is provided, at which is located any suitable motor, for giving motion to one or more magneto or dynamo electric machines connected thereto. At each central station, and also at other points where necessary, a portion of a section is electrically cut off from the remainder, which portion, being connected with a siding there laid, enables trains to pass each other. Movable switches or shunts are formed in the ends of the main track adjacent to the sidings. The switches are operated by mechanism, set in motion by electro-magnetic motors, having connection to the central section. From each end of each rail section connections are made to series of electrical switches at the central stations, by which means the engineer there in charge is enabled to put the current off or on, or reverse the same on any particular track or switch section, and to operate any particular switch.

For the travelling motor or locomotive an electro-magnetic engine is mounted upon a suitable frame, supported upon the axles of the driving and other wheels. In order that the circuit from one line of rails to the other be not directly through the wheels and axles, but be through the motor, each car is, so to speak, electrically cut in two by the interposition of insulating material somewhere in its structure, the poles of the motor being connected, one to each division. A seemingly preferable method is to form the hub and flange of a wheel of separate metallic parts, uniting them by bolting each to a wooden web, which insulates the two, whereby the body of the car and the axles are insulated from the track.

Contact springs bear against the flanges, or, preferably, against hubs secured thereto by cross-bars or "spiders," whose outer ends are bolted to the flanges.

These contact springs are connected to the commutator springs of the motor, one to each respectively, through the reverser and governor-controlled contacts hereinafter spoken of.

As in a central system the motive-power is constant, irrespective of the conditions of the trains, it seems requisite that the motive-power should be connected directly and inflexibly to the driving wheels, but in some such manner as will enable the force to be gradually applied to or withdrawn therefrom; therefore a friction wheel is mounted upon the shaft of the motor, and one upon the main driving axle, the two being disconnected, so that motion is not communicated from one to the other. In a swinging frame, pivoted at one end and provided at the other end with a handle, is mounted another or connecting friction wheel, which, on depression, shall take upon both the friction wheels before named and transfer the force from one to the other. Of course the amount of this transferring is dependent upon the perfection of the frictional bearing of the intermediate upon the other two friction wheels, and may be varied between the limits of the minimum and maximum frictional contact.

To accomplish the same result a motor pulley and a driving pulley may be connected by a loose belt, to be tightened by a swinging pulley-belt tightener; or the same result may be accomplished in several other ways.

As the motive-power sufficient to move a load upon a level with great speed is totally inadequate to move it with the same speed upon incline, and often fails to move the load at all, means (extra amount of steam generative capacity, &c.) are generally used for furnishing a large excess of power over the amount usually required, adding largely to the dead-weight to be carried. In this system, however, I propose to use at all times for a load or train only the amount of power normally required under favourable conditions, providing means by which speed is automatically exchanged for power when necessary. This is to be accomplished by a governor, which, upon speed falling upon reaching an incline, shall automatically operate to alter the leverage either of belts, friction gear, or clutches through which the motor acts upon the driving wheel. As the devices for this purpose are applicable to other than electro-motor systems they are not further herein described or illustrated, but will form the subject matter of a separate application for a Patent.

Upon each engine is located a reversing key, through which the circuit passes to the motor, which may be used as a brake in case of emergency, the reversing of the current acting to reverse the direction of the motor, and therefore more rapidly stop it. The operative lever of this reverser is so combined with a spring that it may be held in a central position without any of its contacts infringing on other contacts, and so act also as a mere circuit closer or breaker. A centrifugal governor, driven from the driving axle, is used connected to a series of contacts, as fully explained in a prior application, so as to break the circuit at a number of points simultaneously upon a certain pre-determined speed being reached.

Provision is made to dispense with the necessity of much grading, enabling the engine to ascend ordinarily impracticable grades, as follows:—Upon one or both sides of the engine car, a wheel, having a grooved face, adapted to clasp the head of the rail, is mounted in a bearing, so combined with a screw or other lifting device that it may be depressed into or elevated from contact with the rail. Upon its axle is fixed a rag or sprocket wheel. Upon the main driving axle is loosely mounted a friction wheel, having attached to it a rag or sprocket pinion. To this loose wheel, when necessary, motion is communicated from a friction wheel on the motor shaft through an intermediate friction wheel mounted in a swinging
frame,

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frame, as before described; a sprocket chain connects the sprocket wheel in the axle of the grooved wheel and the sprocket pinion. Under ordinary circumstances this friction wheel in the main axle has no motion communicated to it, and the grooved wheel is not in contact with the track.

When necessary the grooved wheel is depressed, and the intermediate friction wheel so applied as to cause the loose wheel on the main driving axle, with its rag or sprocket pinion, to be rotated, the motion being communicated to the grooved wheel, which, grasping and biting upon the rail-head, pulls the load up without danger of slipping.

In figures 1 to 15 of the accompanying drawings is shown more in detail how this portion of the invention may be carried into effect. It is to be remembered, however, that these details may be varied, or equivalents used, and that therefore I do not limit myself generally in such cases to the precise details therein illustrated.

In these drawings figure 1 is a view showing the general arrangement of a central station and the track connections; figure 2, a portion of the frame of a car; figure 3, a perspective of an engine car; figure 4, a perspective view of the rail-gripping devices for ascending grades, with a section of the grooved wheel and rail; figure 5, a perspective of the reverser, governor, and multiple circuit breaker; figure 6, a bottom view of the reverser; figures 7 and 8 are views of different mechanical means for operating the track switches; figure 9 is a perspective view of the electrical switches at central stations; figure 10 is a perspective view showing means of electrically connecting the rails; figures 11 and 12 are sectional views showing different ways of electrically dividing the car, so as to insulate one flange from the other; figure 13 is a diagram showing several sections, and a side road or feeder; figure 14 is a diagram showing connections, when desired, at a bridge or other short section; figure 15 is a diagram showing the method of connecting the electrical devices in multiple arc.

A is a central station, at which are located a steam boiler and engine, as shown, although the motor may be a water or any other suitable form of motor; B is any suitable magneto or dynamo electric machine connected with and operated by the motor engine. From the generator connections 1 and 2 are made to the switches 3 and 4, one series being connected to one commutator, the other series to the other commutator.

MT MT' MT'' are the main line of track. The rails of each line of rails are electrically connected by means of copper wires or strips, E (figure 10), under the fish-plate EP, and held thereby against the ends of two adjacent rails. A portion, MT, of sufficient length to accommodate one or more trains is electrically separated from the remainder of the section, MT' and MT''; at the side thereof, and of same length, is a siding, SW. The parts of MT' and MT'' adjacent to the ends of MT are made movable, so as to constitute switches, by which trains may be switched or shunted from MT' or MT'' to MT or SW, or *vice versa*. For each track switch is arranged an electro-motor, SM, a circuit, 5 5, leading from one series of switches, 3, through both switch motors to the other series of switches, 4. From 5 a connection, 6, is made to one of the series of switches, in order that, when desired, one alone of the switch motors may be used.

By this means trains are enabled to pass each other at a station. For instance, two trains have arrived at the station, one motor alone is operated, and a train (say from MT') is run on to MT. The other motor is then operated, and a train passes from MT'' on to SW, thence to MT', while the first train is passed from MT to MT''.

The switch motors are geared to the switch lever SL, so that when the circuit is closed through a switch motor its motion is communicated to the switch. In figure 7 is shown one means of so communicating motion to the switch, in which SL is the switch lever, connected to a double rack in which works a wheel, toothed for somewhat less than half its periphery, which connects by a crank rod, CR, either directly or through intermediate gearing with the shaft of the switch motor.

Figure 8 shows another way in which the switch lever SL is connected to a frame, D, sliding in suitable ways. In this works a cam, *d*, whose shaft carries a gear, into which takes a pinion on the shaft of the switch motor. The gear and pinion, being well known, are not shown. When so needed these switches may be located at a distance from the central station, and operated automatically by the train, instead of by the engineer, at the central station. In such case a circuit is led to and some distance beyond the switch to be operated, containing at the switch a switch motor, moving the switch in one direction, the reverse movement being by a spring. At a little distance, on each side of the switch engine, are located circuit closers, arranged to be hit by an arm projecting from the train. If a train be started which it is intended shall go off upon a switch or branch the arm on the train is set. On coming to the first circuit closer the arm strikes it, closing circuit, moving and holding the switch. The train passes on to the switch, strikes the second circuit closer, opening it. The circuit being now broken, the spring restores the switch. Where there are several switches, a permutation arrangement, driven from the running gear of the train, will be upon the train, capable of being set so that it shall project or lower the arm for operating the circuit closers only as it approaches the proper switch.

In figure 9 is shown in detail the switches used in the series 3 4. Levers *a a a* are pivoted in suitable supports upon the base G, springs *a' a'* pulling the lever to the rear. Upon the base are located springs *b b*, with their inner ends turned up so as to form a catch for the lower ends of the levers, as shown. From the springs *b b* of the electrical switch series 3 4 are made to each line of rails of each track section and track switch, and also to the switch motors; for instance, from MT' wires 7 7 lead, one to 3 and one to 4; 8 8 lead in same way from one end of MT; while 11 11 lead from the other end. In same way 9 9 and 10 10 connect 3 and 4 and SW. By simply throwing the proper switches so that they catch on their respective springs the circuit is closed to any desired section, and the current thrown therethrough.

The circuit through any particular section being closed, and it forming the conductors for the current, a circuit is formed from one line of rails to the other, and the current utilized as a motive agent by an engine constructed as shown in figure 3, in which F is any suitable frame-work suspended from the main driving axle and placed upon the other axle.

The wheels used under the engine car and all other cars are constructed as shown in figure 11, in which the flanges F l are made separately, and connected by a wooden web, *o*, to which they are bolted; the wheel then consisting of a metallic hub, a metallic flange, and an intervening wooden or insulating web.

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web. By this means the axles and body of the car are insulated from the flanges and track, and the current cannot pass therethrough from one rail to the other. Although both wheels in figure 11 are shown as of this construction, it is evident that those on one side of a car only need be so constructed, as thereby the formation of a circuit direct from one line of rails to the other would be prevented. The same purpose may be subserved by the construction shown in figure 12, in which ordinary wheels are used, the axle being cut in two and united by a sleeve, Q, insulated therefrom by P, and bolts insulated from but passing through the halves of the axles.

On the engine car a spider or frame, N (figures 3 and 11) is secured to the flange F l, so as to be in electrical contact therewith, but not touching or forming contact with the hub M. Upon the centre of N is a boss or spindle, n, on which bears a commutator brush, held by arm p. The current then passes from one line of rails through one flange, F l, frame N, boss or spindle n, commutator p, to the reversing key (figure 5), the contact points 13, 14, 15, 16, to the electric engine, thence by the other arm, p, spindle, frame, and flange to the other line of rails.

The reversing key is shown in figures 5 and 6, in which U and V are elbow levers, pivoted at Q and Q' respectively, the springs s and s' tending to cause them to close circuit normally in r and r'. V is connected to P' and U to P''; r and r' are connected to the series of spring contacts, and thence to one pole of the motor engine. Between the levers U and V is placed the operating lever T, pivoted at o, and connected to the other pole of the motor engine. Upon the under side of T is a pin, z, taking into a slot, y, in a cam-plate, w, pivoted at x. The cam-plate w is moved as the lever T is moved, by the action of the pin z in the slot y. It is of such a breadth that when standing in a neutral or untilted position its opposite sides shall take against pins u v on levers U V and force them from their contacts, leaving the circuit open. A movement to either side, however, allows one of the levers U V to make contact with r or r', the other being kept from contact therewith by its contact with lever T. Upon the engine is mounted a centrifugal governor, G r, driven from the main driving axle of the car. The lower end of the rod, which is reciprocated by the governor balls, takes upon a lever, 17, pivoted at 18, whose outer end takes under a series of contact springs, 13, 14, 15, 16, placed in the circuit. The governor is adjusted to break the circuit whenever a predetermined rate of speed is reached, breaking it in a number of places simultaneously, so as to greatly reduce, if not practically eliminate, the spark due to the breaking of the circuit of a large current.

The circuit being now completed through the motor, and it being in operation, motion is communicated to the main driving axle, as follows: reference being had to figure 3, in which g is the main driving axle, upon which is mounted a friction wheel, G. Upon the shaft c of the magnetic engine is a friction pulley, e, the pulleys e and G not being in contact. In a swinging frame, f, pivoted at h, is mounted a friction pulley, i. The frame f being depressed bears upon e and G, and communicates motion from e to G, the percentage transferred being proportional to the frictional contact i upon e and G. As giving a better traction, to avoid slipping on grades, a device shown in figure 3, or the device shown in figure 4, may be used singly or together. In figure 3, E M is a pair of ordinary electro magnets, there being one or more pairs on each side. These magnets are suspended from the frame so that their poles are over and in immediate contiguity to the rails. From them a circuit extends to the arms p, so that they are in a multiple circuit to the track. In their circuit is placed a key, which may be operated by hand, or which may be operated by the governor automatically, under the arrangement hereinbefore mentioned. Upon coming to a grade the circuit is closed and the magnets immediately exert their attractive influence upon the track, tending to hold the car firmly and to prevent its slipping.

In figure 4, in addition to the devices already described as mounted upon shaft c and axle g, H is a friction pulley loosely mounted upon the main driving axle g; to H is secured a rag or sprocket wheel, I. Upon the shaft c is placed a friction wheel, z; and in a frame similar to frame f is mounted the friction wheel l; upon depressing the frame motion is communicated from z to H and I, which rotate upon the shaft g. A wheel, L, having a grooved face is secured to an axle which is mounted in a box adjustably secured to the frame by a screw, s. A sprocket chain, m, connects I and K. Upon reaching a grade, by turning the screw s the wheel L is depressed, and grips the rail as shown, motion being communicated thereto as before described, by which arrangement the engine can climb a grade impracticable in common steam railroads.

It should be stated that all the devices using current are arranged upon the multiple arc system, the rails forming the main conductors and all the electrical devices being in derived circuits thereto. This is diagrammatically shown in figure 15, in which R A is the rotating armature, F M the field magnets, E M the electro-magnets for increasing traction on track, and I p an electric lamp for lighting the car, or for a head light. As here represented, each is connected in a derived circuit from the line of rails of the track M T. In practice, however, all the derived or multiple arc circuits are completed to the track and to the arms and flanges of the wheels.

In figure 13 are shown two sections, M T 1 and M T 2, each with a central station, A. The section M T 2 is shown divided at the station, electrical connection between the two divisions being completed, when desired, by electrical switches at the stations. From M T 2 a side road, S R, branches, supplied with motive current from the same station, the divisions and side road being connected to the generator at the central station on the multiple arc system.

In figure 14, B g represents a short section of track on a bridge, or in any other locality where it is desired to slow up. This section is insulated from its neighbours, but connected thereto by wire conductors, as shown at b' b'', so that upon such section the current is reversed, slowing the motor, the current being again reversed at the other end of the bridge section, restoring the speed.

In lieu of this arrangement very short sections may be disconnected entirely electrically, connection being made between the sections adjacent to the cut-out section by wires passing around such section, so that the motive-power is withdrawn entirely on such sections.

At the central station it is advisable to place an electrometer in circuit, as the deflection of its needle gives a good indication of the relative position of a train upon a section. As at times it may be necessary to keep the track clean, free from snow or other impediments, to a good conduct between the flange and track, it is preferable to mount in front of the engines brushes rotating at right-angles to the rails, and driven by a small motor on the engine car specially set aside for the work.

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In using electro motors the best results are attained where the speed of the rotating armature is maintained uniform and at a very high rate.

In railway motors a large excess of power over that required for a given speed upon a level is provided, in order that even a very much diminished speed may be maintained upon an up-grade, the speed of the motor being diminished proportionately.

One object of this invention is to so arrange a motor in relation to the driven mechanism that the speed of the motor shall always remain unchanged, not being affected by changes in the speed of the driven mechanism, and that power may be exchanged for speed, or *vice versa*, as circumstances may demand, without the speed of the motor being affected. Another object is to furnish a method of propulsion of trains analogous to the action of a quadruped in drawing a load, especially applicable as means for climbing a grade, or assisting therein.

To accomplish these objects a thread is mounted upon the shaft of the rotating armature, meshing into a worm upon a shaft at whose opposite end is a bevel gear, taking into a bevel gear upon a shaft parallel to the shaft of the engine.

Upon this latter shaft are two gear wheels, one having several times as many teeth as the other, both being loosely mounted upon the shaft, on which and between the two gears is fixed a suitable clutch, in order that one or the other may be caused to rotate with the axle upon the clutch being thrown to or near to the extreme limit of its motion, but that when the clutch is in an intermediate position neither shall be locked into the shaft. In order to prevent the clutch being moved too rapidly it may be operated by a screw-threaded lever passing through the free end of the lever.

Upon the main driven axle two gear wheels are rigidly fixed, one large and one small, the larger one gearing with the smaller one loose upon the shaft last noted, while the small one gears with the larger one loose upon such shaft.

It is evident, then, that whether speed be converted into power, or power into speed, will depend on whether motion be communicated from the shaft driven from the armature shaft to the main driven axle through the smaller or through the large gear thereon.

For use upon grades a device which may be called a creeper is used somewhat as follows:—

Upon the front of the engine is mounted a vertical shaft, carrying a worm gearing into the thread upon the armature shaft. This vertical shaft is mounted in adjustable bearings, so that the worm may be thrown into or out of gear with the thread as desired. Upon the lower end of the vertical shaft is a bevel gear, meshing into a bevel gear upon a horizontal shaft, to whose ends, by crank arms or pins, are attached rods, each carrying at its opposite end a box or casing provided with a central wheel, which rides upon the rail. In the box or casing, so as to take upon the sides of the rail, are eccentrically pivoted two wheels, one on each side. These side wheels, being eccentrically pivoted, allow the box to be pushed forward along the side of the rail, but prevent retrograde motion by closing together and grasping the rail. The arms carrying the grippers or creepers are mounted so that they may be let down upon or removed from the track as occasion requires. Hence, as a rod is reciprocated from the motor through the gearing described, it pushes forward through one-half revolution the box or casing which slides upon the rail. Upon the commencement of the other half of the revolution, by the action of the eccentrically pivoted wheels or rollers, the box or casing is locked to the rail, and the engine is pulled up.

One only being used, the action would be a series of pulls and pauses, and if desired one only may be used, taking upon either rail, or upon a central rail laid especially for this purpose.

In practice, however, it is desirable to use at least two, one for each rail, with cranks so arranged relatively to each other that while one is being slid forward the other is holding, so that a continuous motion may be produced. Additional grippers or creepers may also be placed at the rear of the train, so that a continuous pulling and pushing action is produced.

Instead of rollers within the box or casing referred to, another form of device may be used in order to give a larger gripping surface.

Within the box or casing are two bars parallel to the rail, one on each side. These bars are attached to the casing or box by loose toggle-joints, in such way that upon motion forward of the box or casing the bars recede from the rail, but upon retrograde movement they approach and grip the rail.

The operation of these devices will be better understood by reference to figures 15*a*, 16, 17, and 18 of the drawings, in which figure 15*a* is a perspective view of an engine embodying both the motor and the creeper; figures 16 and 17 are details of the creeper; figure 18 is a perspective view of the motor gearing.

A is the rotating armature of the electric motor, mounted on shaft *a*, secured in suitable bearings. Upon the shaft *a* is the worm or screw B gearing into the worm gear C, on shaft *c*, upon whose lower end is the bevel gear D meshing with bevel gear E on shaft *e*, upon which are mounted loosely the gears F H, H having a much larger number of teeth than F.

Between F and H is mounted, so as to rotate with *e*, the clutch-sleeve C', upon which is mounted a suitable clutch controlled by clutch-lever L, pivoted at *l*. The preferable clutch is the one known as Mason's clutch. As such clutch is well known, it has not been thought necessary to encumber the drawings with a detailed view of it.

As hereinafter stated, provision is made for the constant rotation of A without imparting motion to F or H. In order, then, to bring either into operation gradually, avoiding jar or shock, I sometimes pass a screw-threaded rod through the free end of L, and at right-angles thereto, one end of the rod ending in a crank or wheel, by which the rod may be turned, each revolution moving the clutch only the width of one screw thread.

The gears F and H mesh into gears G and I, on shaft *g*, which is the main driven axle, carrying wheels, not shown, at its extremities.

The gear G bears the same relation to F in number of teeth as H bears to I.

It is desirable that the rate of rotation of *g* should always be much less than that of A. The relation existing between B and C and H and I insures this, the speed of *g*, however, remaining such as to give a very high, or as high as desirable, rate of progress to the car, the provision being such that only the power required for the maximum rate of speed and load upon a level is furnished, the clutch being thrown so that the motion is communicated to *g* through H and I.

Upon

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Upon reaching an up-grade the clutch is thrown so that motion is communicated through F G; the speed consequently is diminished by the ratio existing between the two, with a corresponding increase of force.

It should be noted that the relation between the clutch and the gears F H is such that when the clutch is in a central position no motion is communicated to either gear, so that when the train may be stopped, the motor still rotating at its best effective rate, ready for instantaneous work, without the delay incident to bringing its speed up from zero to an effective rate.

From this it can readily be seen that the rate of rotation of armature may be kept constant, while the rate of speed of the train may be varied to suit the various requirements of change of grade or load, ensuring full utilization, under all conditions, of the prime motor force supplied.

Upon the front end of the engine car is a shaft, *h*, on which is a sleeve supporting the lower end of a shaft, *n*, whose upper end is secured in a bearing, J, which permits of a slight movement of the shaft *n*.

Upon *n* is mounted a worm gear, N, which may be made to mesh with the worm or screw B, on the armature shaft *a*.

Upon and near the lower end of *n* is the bevel gear O, meshing into a bevel gear, P, upon shaft *h*, to whose outer ends are attached the arms R by means of cranks Q. These arms, R, are arranged with any simple lifting device, so that they can be let down upon or removed up from the rails.

Pivoted to R is a box or casing, S, in whose upper portion is a wheel, *u*, riding upon the top of the rail.

Within S, and upon each side of the rail, wheels, *s*, are mounted, eccentrically pivoted as shown, the opening between them at the widest point being just enough more than the width of the rail to permit its passage therethrough. From this it is evident that if a body the width of a rail be slid between them in the direction of the arrow, figure 2, it will push them apart, but that if the motion be in the opposite direction it will cause the rollers *s s* to approach each other, gripping the body between them.

When necessary the worm N is thrown into gear with B, motion being communicated thereby to the arms R. Upon the forward half of the movement the arm R pushes the box S along the rail. Upon the commencement of the latter half of the movement the rollers *s s* approach each other, gripping the track and locking the box or casing to it, whereupon the car is pulled up toward S.

Where the rails are light, and might possibly be injured or indented, an alternative device, shown in figure 17, may be used, which gives a long grip upon each side of the rail head.

In this figure 4 is a box or frame, connected pivotally to R, and having the wheel *u*, as in the other form.

Connected to 4 by toggle-joints, 3 3, are the gripping bars 1 2, one on each side.

As seen, upon motion of the box or frame in one direction, on account of the toggle used, the bars 1 2 recede from the rail, but upon motion in the opposite direction approach the rail, gripping it and locking the box or frame thereto.

Springs may be applied to the rollers *s s* or bars 1 2, so as to normally hold them to the rail with a light pressure, not sufficient to interfere with their sliding in one direction, but causing them to act instantly upon attempted motion in the opposite direction.

By the use of the creepers described the effect of great traction may be obtained with little weight, so that the dead-weight of engines and cars may be reduced to a minimum.

Another object of this invention is to produce a simple and effective electro-magnetic brake, adapted for use on any style of railroad vehicle, but more especially intended and adapted for use in the system herein described.

It consists in placing an electro-magnet in such relation to some rotating metallic portion of the running gear of the vehicle to be stopped that the magnetic circuit shall be through such rotating metallic portion, the electro-magnet being furnished with mobile heads, which may move toward and clasp the rotating portion whenever the circuit of the magnet is closed.

Upon the axle and at or near its centre is rigidly fixed a disc of iron, which rotates with the axle and between the polar extremities of an electro-magnet, suitably fastened to or supported from the bottom of the car.

The cores of the electro-magnet are extended beyond the coils, forming a spindle, which is reduced in size when necessary, the ends being screw-threaded to receive nuts. Upon each spindle is placed a block of iron or other magnetic metal, forming a polar extension, secured in place by a nut.

The orifices in the blocks into which the spindles pass are elongated, so that the blocks or polar extensions may have a movement to or from the fixed disc upon the axle rotating between them. The polar extensions are normally held away from the disc by suitable springs of low resilience.

When it is desired to use the brake, a circuit from any suitable source of electricity is closed through the coils of the electro-magnets, whereupon the polar extensions mutually attract the disc. It, however, being fixed, while they are movable, the attractive force causes them to move to the disc and grasp it between them, causing a retardation or stoppage of its rotation, and so acting through it as an effective brake upon the wheels.

Upon breakage of the circuit the springs restore the polar extensions to their normal position.

When desired, for the purpose of throwing the brakes off instantly, a momentary reverse current may be thrown into the circuit just after breaking, causing a momentary but instantaneous repulsion from the disc, and assisting the springs in removing the polar extensions. It is evident that, instead of one, several sets of such brakes may be applied to each axle when desired.

This brake is illustrated in figures 19 and 20 of the drawings, in which figure 19 is a perspective view of a portion of the bottom of a car, showing a brake. Figure 20 shows the polar extension and spindle of the core in detail.

A is the bottom of a car resting upon the framing E E; B is an axle extending from wheel C to wheel on other side, not shown.

Upon this axle is rigidly secured the iron disc F, rotating between the polar extensions *d d* of electro-magnet D, suitably secured to the framing E E.

Each of the cores of the magnet extends beyond the coils, forming a spindle, *g*, on each core, whose end is screw-threaded to receive a nut, *h*. Each

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Each polar extension, *d*, is formed with an elongated slot, *e*, so that it may be fitted upon the spindle, and be free to move thereon in one direction, viz., to and from the disc F.

A spring, *k*, which may be any of the well-known forms, is combined with each polar extension, and serves normally to hold it away from the disc.

It is evident that the electro-magnet D may be mounted so that the flange or a portion of the web of the wheel C shall rotate between *d d*, and they operate directly thereon, instead of upon a disc; the vital principle of the invention being that the magnetic circuit of the electro-magnet shall be closed through some moving portion.

In such a system of electro-magnetic railways as this, where the tracks themselves are used as the conductors, it is desirable to make some provision guarding against cessation of effect of the current at crossings, switches, frogs, &c., or other places where it may be desirable to cut out a portion of the track from the circuit.

This may be accomplished by connecting the ends of the tracks in circuit adjacent to the opposite ends of the cut-out section, by wire or other conductors, so that a circuit is formed around such cut-out portion.

As the greatest length of any section necessary to be cut out will never exceed the average length of a train, or even the length of the shortest trains, I prefer to accomplish the result in the following manner:—

As before described, wheels having their flanges and hubs insulated from each other are used, commutator brushes being arranged to take the current from hubs electrically connected to the flanges, such commutator brushes being used only with the wheels of the engine.

I now propose to use such commutator brushes with the wheels of several cars of a train, one of which cars should always be the last one in the train; all the commutator brushes used on either side of the train being connected by a conductor to the appropriate commutator on the engine, the conductors being so arranged on the cars that they may be readily connected.

By this arrangement the cut-out section is electrically bridged over on the train itself, instead of by wires attached directly to the portions of the track in circuit.

Upon roads already built and equipped for steam transportation, but where it is desirable to use this system of locomotion, it may be preferable to make the change from one system to the other gradually.

To admit of gradual change, arrangements must be made permitting of the use of both systems. To do this a third or central rail or conductor is required, electrically connected in sections of suitable length, and thoroughly insulated from the bed. To the cars are attached arms carrying rollers or auxiliary wheels, taking upon the third rail, and carrying the current therefrom through the motor upon the train, the ordinary rails being used as the return circuit.

This is illustrated in figures 21, 22, and 23; in which figure 21 is a perspective of the running gear of two cars, each provided with means for taking the current from the track, the cars being connected together; figure 22, a perspective showing the third or central rail and arrangements of circuits on the cars; figure 23, a side view of an engine and car properly arranged, and a cross-section of three rails with circuit connections.

In figure 21, A and B are two rail sections, B being an electrically connected section, while A is cut out from the circuit at *a*, the section A representing a frog, a switch, or other place where it is necessary or desirable to cut out electrically a part of the track; C D is the frame of two cars, C being the engine or motor car, the wheels of which are constructed as before described—that is, with the hub and flange insulated from each other, a frame and hub, *b*, insulated from the hub of the wheels, being connected to the flange or commutator brush *c*, taking upon *b*, and completing circuit to the engine.

Wheels of the same construction are used with the car D, which is the last of the train, any number of cars, all or some of which are similarly constructed, being supposed to intervene between C and D.

Preferably the frame and hub upon ordinary cars is upon the inside of the wheels, as shown at *e* and *f*.

Conductors 1 and 2 run the length of the train, connecting all the commutators, 1 upon one side and 2 upon the other.

It is apparent, then, that when the engine car has passed upon the cut-out section there will be no cessation of action thereon, as the current will pass from the conducting section B, through the wheels and commutators of car D, by conductors 1, 2, to the engine.

In the ordinary electrically connected sections this arrangement has the advantage of making contact with the rails in many places, ensuring perfect continuity of circuit, and lessening the spark due to any imperfect contacts consequent upon oxidized spots on the rail.

In figure 22, E E' are the rails of an ordinary railroad which it is desired to gradually change to an electro-magnetic system; F is a third rail, laid preferably between the ordinary rails, and laid in chairs which thoroughly insulate it from the ties.

From the one pole of the generator, at the station or source of electricity, a conductor, 5, leads to the central rail F, while a conductor, 6, from the other pole leads to both the rails E E', as shown in figure 23.

To the frame of the car is attached, but insulated therefrom, an arm, G, carrying a roller or wheel, *g*, taking upon the central rail F. Connected to this arm and wheel is a conductor, 4, which leads to the motor, from which a conductor, 3, completing the circuit therefrom through the iron or metallic parts of the car to the rails E E', which form the return circuit.

In practice *g* will be an extra wheel, in order to have weight sufficient to always insure good contact even where the extra rail is oxidized, it by its weight however serving to prevent any oxidization, and to keep the surface of the rail bright. In the figures it is shown as more of a roller than a wheel, as to have shown it full size would have obscured other portions.

It is preferable to use a rail for the extra conductor, inasmuch as a large mass of conductor, with little resistance, is given thereby at less cost than to use a copper conductor, or one specially prepared for the service, and as they are generally easy to obtain.

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By using ordinary rails for *F* and ordinary wheels for *g* no special appliances need to be prepared while the change is going on, the method shown demanding in its carrying out only the materials usually on hand or easy of obtainment, and capable of use for their ordinary functions when their use in this connection is no longer needed.

When it is attempted to use the rails of a railroad track, as herein set forth, as the conductors for an electric current, there is always more or less surface conduction, the amount depending on the hygrometric conditions of the adjacent soil, the ties, &c.

To largely reduce or prevent entirely this surface conduction, I prefer to use means substantially as follows:—

Between the rail and tie is placed a piece of felt, papier-mâché, or other flexible insulating material, preferably so treated as to make it waterproof, which piece extends upward on the web on both sides of the rail to the head, forming an insulating shoe.

Between it and the spike is placed a piece of metal, of the general configuration of the foot of the rail, upon which the head of the spike takes and bears, so that the insulating material is protected from abrasion or damage by the spike.

Instead of this metal piece a much heavier piece of wood may be used, forming a shoe, fastened down by the spike, and in turn securing the rail.

The foot and web of the rails are covered with some elastic insulating composition—for example, a rubber paint, or a paint of which the base is pure linseed oil; the ties for a space of say one-half foot to a foot on each side of the rails being similarly painted.

In order to most thoroughly insulate the third or central rail before referred to, it may be placed on the ties in a chair of glass or other insulating material, only mortised into the tie, or laid on the tie and spiked thereto; or an insulating shield of glass may be interposed between the rail and a metallic chair.

While this chair of glass or other insulating material is here spoken of in connection with the third or central rail, it may be used with any rails forming an electric circuit.

These various forms of insulation are shown in figures 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, and 36.

In figures 24, 25, and 27, *A* is a piece of felting, papier-mâché, vulcanized fibre, or other flexible insulating material, placed under and around the rail *B*, and extending up the neck *a* to about the head of the rail, forming an insulating shoe.

C, figures 24, 26, and 27, is a washer-piece of metal, which is placed between *A* and the spike *c*, protecting *A* from injury by the spikes.

In place of the piece *C*, wooden pieces, *D*, figure 28, may be used.

The foot *b* and web *a* of the rails are covered with some elastic insulating composition, leaving only the head of the rail exposed, or in condition to form a connection for conduction of current.

This composition may be a rubber paint, or a paint having a base of pure linseed oil, or any other oxidizable oil.

Figures 29, 30, 31, 32, 33, 34, 35, and 36 show the form of insulation referred to as especially applicable to the third or central rail, though well adapted for the insulation of any rail.

In figure 29 the rail is placed in a chair of insulating material, either glass or wood, the base *K* of the chair being of one piece, the rail resting in a recess, in which it is secured by wedges, *L*, of insulating material.

In figures 30 and 31 the chair is of an insulating material, say glass, made in two longitudinal halves, each having a recess the shape of half the foot of the rail, each half being slipt upon the foot. In figure 30 the chair has outwardly bevelled sides, which take into mortises in the tie; while in figure 31 the chair rests upon the tie and is spiked thereto.

In figures 32 and 33 the foot of the rail rests upon a piece, *m*, of insulating material, while pieces *nn* of the same material are laid upon the top of the foot, half-chairs, *o*, being placed to hold the whole together, and then spiked to the tie, directly in figure 32, while a metallic base-plate, *P*, is placed underneath, in figure 33.

In figures 34 and 35 an insulating bed-plate, *r*, of the width of the foot of the rail is used, pieces *R* being used over the top of the foot, the whole held together in position by metallic half-shoes, *Q*, spiked to the track. In figure 34 the bed-piece *r* lays upon the tie, while in figure 35 it fits into a bevelled mortise therein.

In figure 36 a metallic shoe, in one piece, is used, in which is a large recess with bevelled sides in which the insulating shoe composed of base *V* and side-piece *T* is placed, and secured therein by the wedge *U*.

These plans are all unitary, in that in all the foot of the rail is so surrounded by insulating material as to completely avoid the surface conduction due to contact with damp ties, &c., and differ mainly in the forms given the metallic shoe, which protects the insulation and serves to fasten the rail and insulation together, and both firmly to the tie.

While any insulating material may be used, the best results are attained with glass, toughened by any of the known processes for toughening it. Such glass stands any jar or shock well, not breaking or cracking under any ordinary wear or tear.

What I claim as my invention is—

1st. A system of electrical railroading in which a road is divided into electrical sections, the rails forming the conductors, each section provided with a central station, at which is located a suitable engine, a generator of electricity, and means for controlling and completing the circuits to trains and to switches, cars which are electrically divided so that the motors thereon are insulated from the track, and means for completing the circuit from line of rails through the motor, substantially as set forth.

2nd. The combination with a track switch of an electric-motor and circuit for operating the switch, substantially as set forth.

3rd.

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- 3rd. The combination with a car frame insulated from the track, of an electric motor, an electric traction device, and lamps, or of any two of them when they are arranged on multiple arc or derived circuits, substantially as set forth.
- 4th. The combination with a car frame, of an electric engine for actuating the car, and having its inducing and field of force magnets in separate derived or multiple arc circuits, substantially as set forth.
- 5th. The combination with an electric-engine mounted upon and actuating a car, of a circuit reverser, and means for operating the reverser from a distant station, substantially as set forth.
- 6th. The combination with an electric-engine mounted upon and actuating a car, and the main driving-axle, of a governor receiving motion from the latter and operating to break the circuit of the engine upon the attainment of a predetermined rate of speed, substantially as set forth.
- 7th. The combination with a main electrically connected rail section, of a short section connected to the main section by conductors arranged to change the polarity of the current traversing each line of rails, substantially as set forth.
- 8th. A car wheel constructed of a metallic hub and a metallic centre, united by a wooden or insulating web, substantially as set forth.
- 9th. A car in which an insulation is so applied that the body is electrically insulated from the flanges of the wheels, substantially as set forth.
- 10th. The combination with an electric-engine mounted upon and actuating a car, and the main driving axle, of a loose or flexible connection for conveying motion from one to the other, substantially as set forth.
- 11th. The combination with a car, of a magnet or magnets operating upon closure of circuit to increase the traction of the car upon the track by their magnetic influence, substantially as set forth.
- 12th. The combination with the insulated flange and the contact spring for conveying the current therefrom, of several multiple arc circuits, each containing a device used in running, controlling, or lighting a car, substantially as set forth.
- 13th. The combination with a car, of an additional grooved-faced wheel mounted in an adjustable bearing, means for elevating or depressing the wheel and its bearing, and a loose or flexible connection therefrom to the main driving axle, substantially as set forth.
- 14th. The combination of a loose friction pulley on the main driving axle, a friction pulley on the motor shaft, and a swinging or movable pulley for connecting the two, a sprocket wheel on the loose pulley, a sprocket wheel on the shaft of the grooved wheel, and a sprocket chain, substantially as set forth.
- 15th. The combination with the operating lever of a circuit reverser, of a cam-plate normally holding the swinging levers of the reverser out of contact with their anvils, and always opening one circuit before closing another, substantially as set forth.
- 16th. The combination upon one car, of an electric-engine for actuating the car, circuit reverser, a centrifugal governor acting to make or break the circuit, and a magnet or magnets operating to increase the traction of the car upon the track, substantially as set forth.
- 17th. The combination with main driving and ordinary wheels of a car, of a wheel adapted to grasp the track and to be brought into operation as desired, substantially as set forth.
- 18th. The combination with the main track section, of the section *MT* and *Sw*, and circuit connections and switch motors, whereby trains may be passed by each other, substantially as set forth.
- 19th. In an electro-magnetic railway engine, the combination with the motor and the driven axle, of a series of variable gears, and a clutch for varying the relation of speed and power as desired, substantially as shown and described.
- 20th. The combination with an electro-magnetic railway engine, of a creeper or creepers propelled along the track in one direction by the electric-motor, and locking against movement in the other direction, substantially as shown and described.
- 21st. The combination with an arm reciprocated from the prime motor, of a frame or casing and gripping devices therein, capable of sliding along a rail in one direction, but gripping and locking thereto in the opposite direction, substantially as shown and described.
- 22nd. The method of propulsion substantially as shown, consisting in first sliding forward a mobile portion of the gear, then locking the same to the track and causing the load to approach such portion, substantially as set forth.
- 23rd. The method of obtaining increased traction without increase of weight, consisting in positively locking the motor to the track, substantially as set forth.
- 24th. The combination with an electro magnet, of polar extensions mounted upon or attached to the cores of the magnet so as to have movement thereon to and from each other, substantially as shown and described.
- 25th. The combination of a disc rigidly mounted upon an axle, and an electro-magnet with movable polar extensions between which the disc rotates, substantially as shown and described.
- 26th. An electro-magnetic railway brake, consisting of an electro-magnet constructed to grasp between its poles a rotating portion of, or attached to, the running gear, substantially as set forth.
- 27th. The combination of a series of insulated wheels and commutator brushes on different cars of a train, and circuit connections through all upon each side respectively to the motor, substantially as set forth.
- 28th. The combination of an extra rail connected electrically in sections, and an extra wheel or wheels upon the car frame or car frames, but insulated therefrom, for completing the circuit, substantially as set forth.

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- 29th. The combination of an extra insulated rail, electrically connected in sections and connected to one pole of the source of electricity, with the ordinary or traffic rails, one or both connected to form the other terminal of the source of electricity, or ground, or part of the return circuit therefor, substantially as set forth.
- 30th. The combination with the rail of a glass or insulating shoe, substantially as set forth.
- 31st. The combination with the rail and a metallic shoe, of glass insulating plates interposed between the rail and shoe, substantially as set forth.
- 32nd. The combination with the rails of a track forming an electric circuit, of an insulating cushion or shoe placed between the rails and ties, substantially as set forth.
- 33rd. The combination with the insulating cushion or shoe, interposed between the rails and ties, of a solid washer or piece placed between the spike and cushion or shoe for protecting the latter, substantially as set forth.
- 34th. A line of rails electrically connected to form a circuit or part of a circuit, and having the foot and web of the rails covered with an elastic insulating composition, substantially as set forth.

Signed by me, this 24th day of February, A.D. 1881,—

THOMAS ALVA EDISON.

Witnesses—

CHAS. H. SMITH.

GEO. T. PINCKNEY.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to Thomas Alva Edison, this twenty-fifth day of June, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 14 May, 1881.

The application of Mr. Thomas A. Edison for Letters of Registration for "Improvements in the construction of machinery and appliances for Electro-magnetic Railroads, and in the generation, distribution, and translation of electricity for working the same," having been referred to us, we have examined the specification and drawings accompanying the same, and have now the honor to report that we see no objection to the issue of Letters of Registration as prayed for.

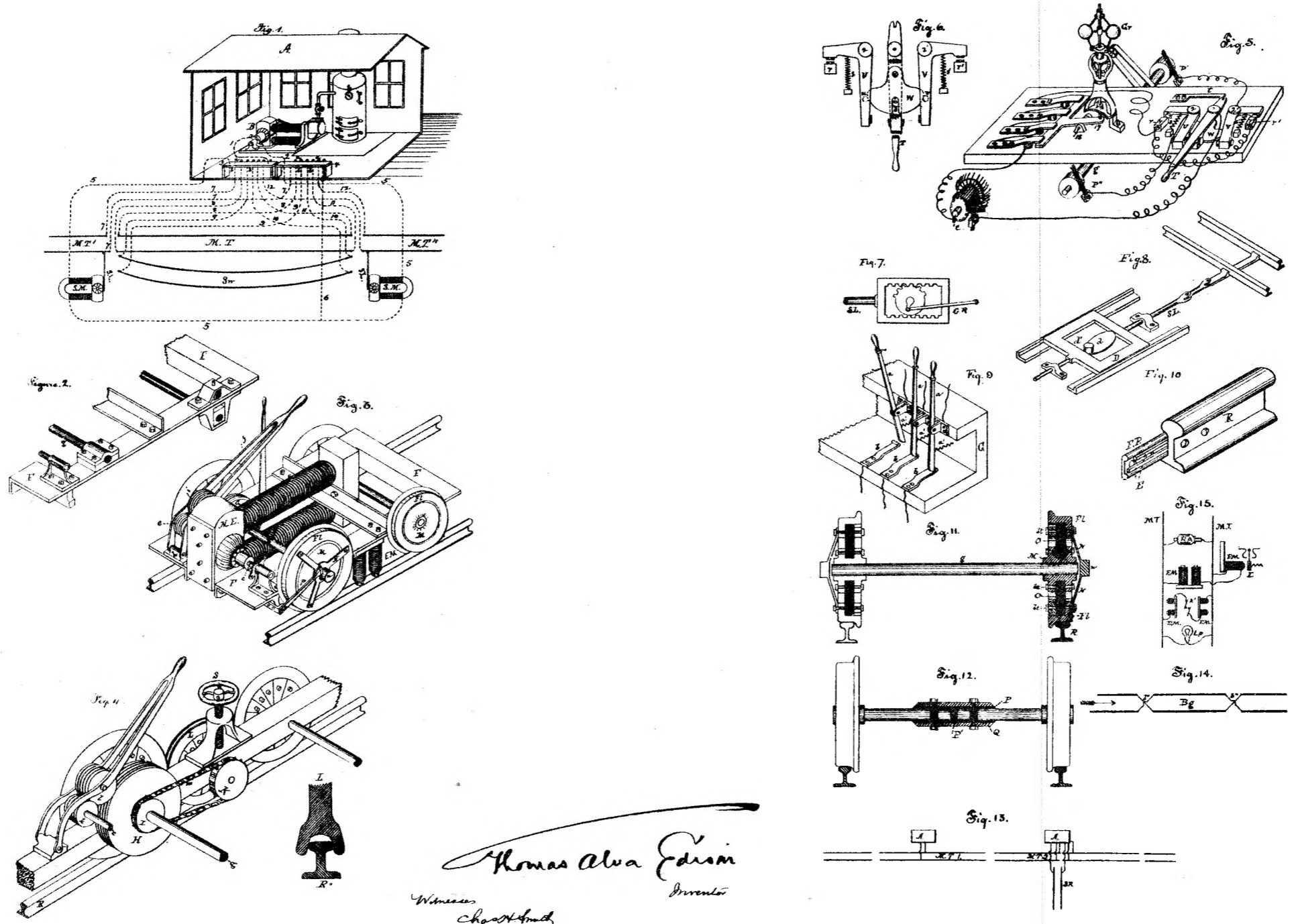
We have, &c.,

J. SMITH.

CHAS. WATT.

The Under Secretary of Justice.

[Drawings—two sheets.]



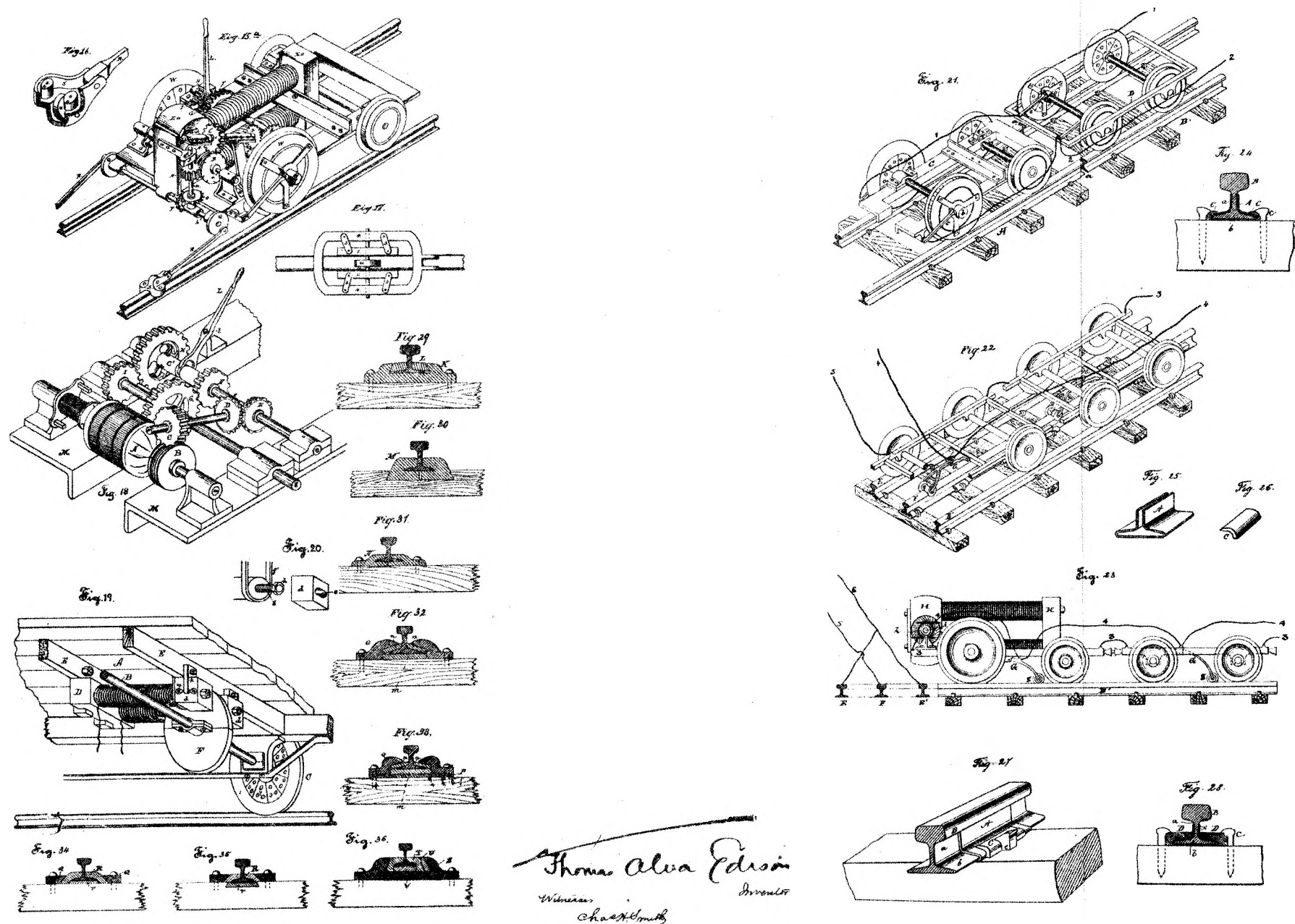
Thomas Alva Edison
 Inventor

Witnesses
Charles Smith
J. Smith

This is the Sheet of Drawings marked B referred to in the annexed Letters of Registration granted to Thomas Alva Edison, this twenty-fifth day of June, A.D. 1881.
Augustus Loftis

"C"

[948]



Thomas Alva Edison
 Inventor
 Chartered
 J. Hunt

PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE,
 SYDNEY, NEW SOUTH WALES.

This is the Sheet of Drawings marked C referred to in the annexed
 Letters of Registration granted to Thomas Alva Edison, this
 twenty fifth day of June, AD. 1881. Augustus Loftus.



A.D. 1881, 4th July. No. 949.

A REGULATOR FOR REGULATING THE FLOW OF GAS OR GASES.

LETTERS OF REGISTRATION to John Louis Castner, for a Regulator for regulating the flow of gas or gases.

[Registered on the 5th day of July, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting:

WHEREAS JOHN LOUIS CASTNER, of Sydney, in the Colony of New South Wales, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "A Regulator for regulating the flow of gas or gases," which is more particularly described in the specification, marked A, and the two sheets of drawings, marked B and C respectively, which are hereunto annexed; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein, and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said John Louis Castner, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto to the said John Louis Castner, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said John Louis Castner shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this fourth day of July, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

A Regulator for regulating the flow of gas or gases.

A.

SPECIFICATION.

TO ALL WHOM IT MAY CONCERN: Be it known that I, JOHN LOUIS CASTNER, of Sydney, contractor, have invented a new and useful apparatus for regulating the flow of gases or air, or a combination of gases and air, under pressure; and I do hereby declare that the following is a description thereof, reference being had to the accompanying drawings, and to the letters of reference marked herein.

WHEREAS I am desirous of obtaining Letters of Registration for securing unto me Her Majesty's special license that I, my executors, administrators, and assigns, or such others as I or they should or may at any time agree with and no others, should and lawfully might, from time to time, and at all times during the term of fourteen years from the day on which this instrument is left at the office of the Department of Justice, at Sydney, make, use, and exercise and vend within the Colony of New South Wales an invention for regulating the flow of gas or gases for illuminating or other purposes under a high or low pressure:

Now I, John Louis Castner, declare that the following is a fair explanation of the drawings:—

Section A B is a regulating valve and valve seat.

C is a block in which is fixed the fulcrum D of the lever E.

F is a pin fixed through the discs G G and the diaphragm H, by the nut I, the other end being slipped into a slot in the lever E; it is also supported in position by the conical shaped spiral spring J, the other end of which is on the bottom of the box K.

L, a regulating screw, passes through the top of the inner cover M, and engages with the nut N, which is attached to the upper spiral spring O; when fixed exactly in position it is held fast there by the jam nut P; the whole being covered in and secured by the outside cover Q.

DESCRIPTION OF THE ACTION OF THE REGULATOR.

The gas enters the regulator through the valve at A, and opens the valve B, which depresses the lever E, which in turn acts upon the spiral spring O and the diaphragm H, and closes the spiral spring J. Exactly in proportion as the lever E is depressed the gas or gases pass the valve B and enters the box K, and fills it. It exerts a directly opposite pressure upon the diaphragm that the valve B does. The pressure upon the diaphragm being nicely adjusted by the spring O, closes the valve B and keeps it closed until the gases are let out of the box K, through the exit R. When a stopcock is placed at the exit R and kept open, the valve B is held in suspension, and allows only just so much gas to pass as may be desired at a uniform pressure.

Having thus described the nature of my invention and the manner of its operation, I would have it understood that I do not confine myself to precise details, so long as the nature of my said invention is retained, but I claim the valve and the valve seat in various forms to suit circumstances; the lever and joints; the diaphragm as it may be arranged; the spring and buttons adjusted in position so as to produce the desired result.

I also claim the combination of valve and seat and lever with diaphragm set and adjusted, with or without screws, nuts, or springs, to be used for the purpose set forth, substantially as described.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to John Louis Castner, this fourth day of July, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

The application of Mr. J. L. Castner for Letters of Registration for "Apparatus for regulating the flow of gases under pressure" having been referred to us, we have examined the specification and drawings accompanying the same, and have now the honor to report that we see no objection to the issue of Letters of Registration as prayed for.

Sydney, 28 May, 1881.

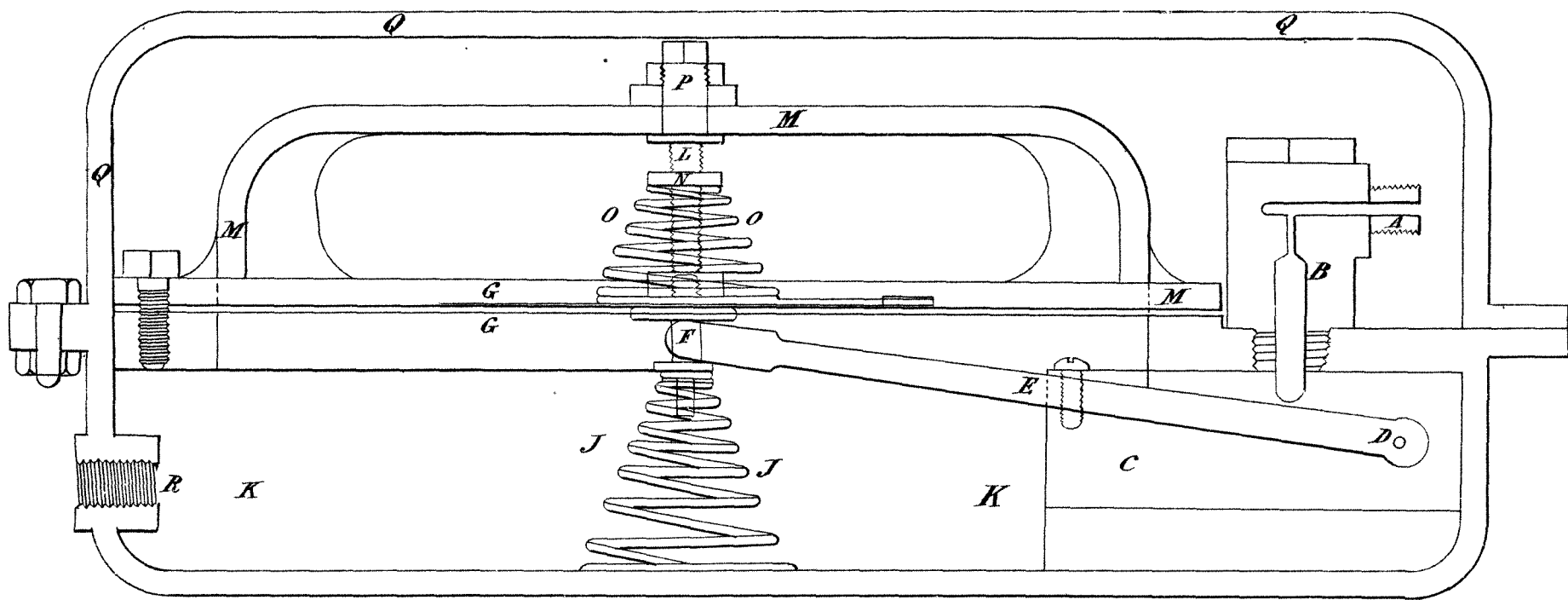
We have, &c.,
J. SMITH.
CHAS. WATT.

The Under Secretary of Justice.

[Drawings—two sheets.]

—== GAS ==—
 —== PRESSURE REGULATOR ==—
 —————

Section.



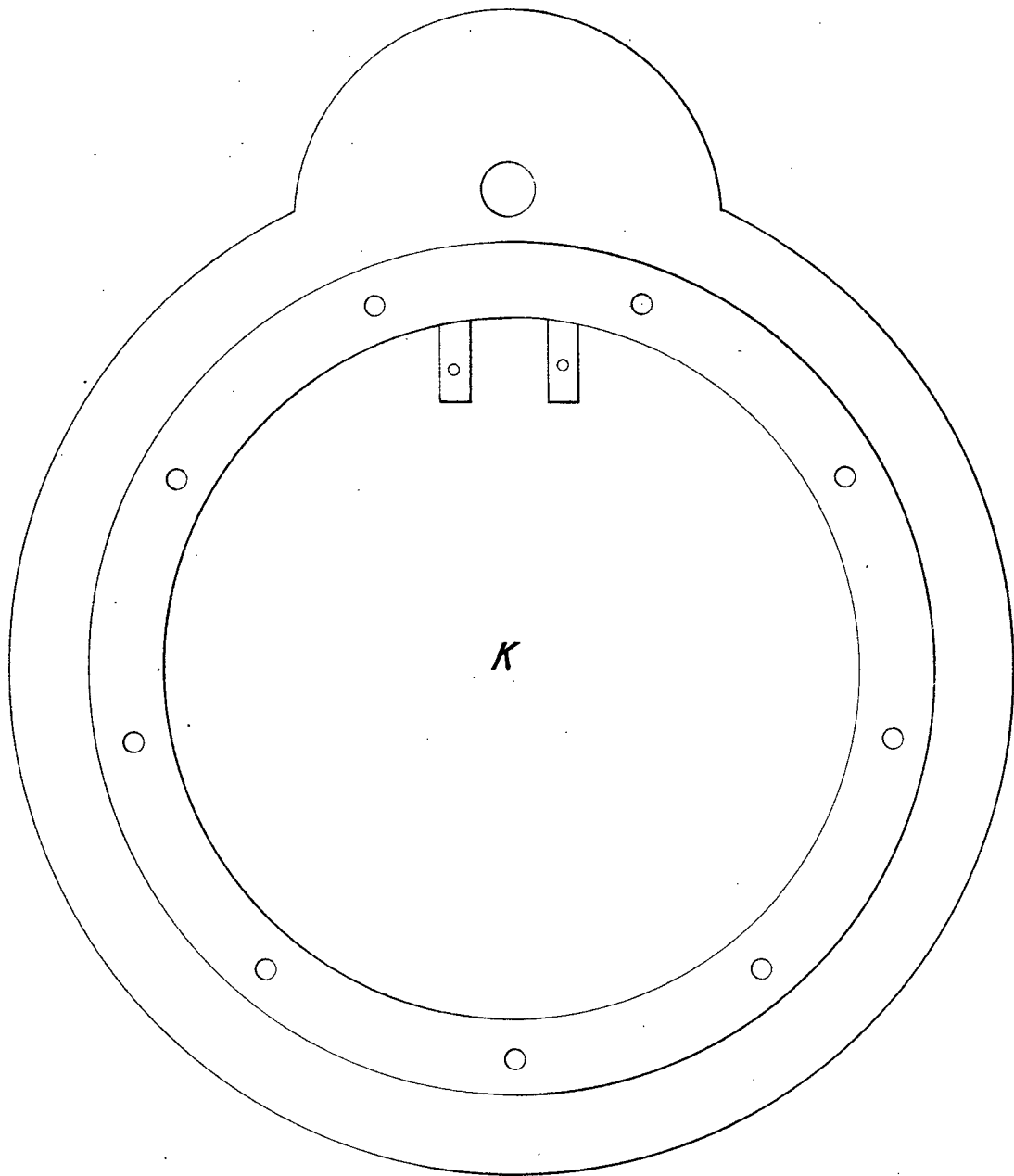
*This is the Sheet of Drawings marked B referred to in the annexed
 Letters of Registration granted to John Louis Castner; this fourth
 day of July, A.D 1881.*

Augustus Loftus.

*John L. Castner
 Sydney*

— CAS —
 ——— PRESSURE REGULATOR ———
 —————

Plan.



*This is the Sheet of Drawings marked C. referred to in the
 annexed Letters of Registration granted to John Louis
 Castner; this fourth day of July, A. D. 1881.*

Augustus Loftus.

John Louis Castner.

Rydney.



A.D. 1881, 4th July. No. 950.

IMPROVEMENTS IN MAGNETO OR DYNAMO ELECTRIC MACHINES. -

LETTERS OF REGISTRATION to Thomas Alva Edison, for Improvements in Magneto or Dynamo Electric Machines, applicable to both Generators and Engines.

[Registered on the 5th day of July, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS THOMAS ALVA EDISON, of Menlo Park, in the State of New Jersey, United States of America, electrician, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in Magneto or Dynamo Electric Machines, applicable to both Generators and Engines," which is more particularly described in the specification, marked A, and the two sheets of drawings, marked B and C respectively, which are hereunto annexed; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Thomas Alva Edison, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said Thomas Alva Edison, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said Thomas Alva Edison shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this fourth day of July, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Magneto or Dynamo Electric Machines.

A.

SPECIFICATION.

TO WHOM IT MAY CONCERN: Be it known that I, THOMAS ALVA EDISON, of Menlo Park, in the county of Middlesex and State of New Jersey, United States of America, electrician, have made certain new and useful "Improvements in Magneto or Dynamo Electric Machines, applicable to both Generators and Engines," of which the following is a specification:—

A PORTION of the invention relates to the commutator brushes.

As is well known, the commutator brush generally used consists of a bundle of wires, or layers of sheet metal, fastened in a frame or brush-holder in such position as to bear upon and make contact with the commutator. As hitherto constructed, the brush-holders have usually been rigidly attached to the frame of the machine, with some device for adjusting them to different positions, with relation to the commutator, and also so attached that if a commutator brush became so damaged as to need repairs or replacement a stoppage of the machine was necessitated.

It is important that the pressure of the brushes upon the periphery of the commutator should be constant and capable of adjustment to the desired degree, as when the pressure is too great the parts are too rapidly abraded and worn away, and when too slight an arc may form between the opposed surfaces or portions thereof, causing them to be burnt or oxidized.

It is also important that provision should be made permitting the removal for repair or replacement of a brush without stoppage of the machine, or interference with its capacity or the current transmitted.

To accomplish these results, each brush or spring is secured in a holder having an angle therein so that the brush or spring may be set to bear obliquely upon the commutator—that is, at an angle other than a right-angle with the axis of the commutator. This holder is pivoted in a U-shaped jaw in the top of what is afterwards the stem or shank of the holder. At the pivoted point of the holder is a chamber in which is a spring whose force is exerted to throw the brush upon the commutator, a ratchet wheel and pawl being arranged in connection therewith so that the force of the spring may be adjusted. By this means an adjustable spring-seated commutator brush or spring is secured.

Upon one side and near the lower end of the shank or stem is a recess into which from below passes the end of a set screw.

In front of the commutator are two metallic conducting bars, each forming one terminal of the exterior circuit. These bars are of the size of the recess in the stems or shanks last described, and are provided with a groove in their under surface.

Upon each of these bars, two, three, or more of the adjustable spring-seated commutator brushes are placed by slipping the recessed portion upon the bar, they being then secured thereto by turning the set screw until its end takes in the groove in the bar.

This is fully illustrated in figures 1, 2, and 3 of the annexed drawings, in which figure 1 is a view of a commutator and series of commutator brushes embodying the invention; figure 2 is a side view of one brush-holder; and figure 3 a longitudinal section of part of one brush-holder.

A is the commutator of a dynamo or magneto electric machine, placed as usual at the end of the rotating armature B, and supported at its outer end in bearings C; *a a* being the strips thereof connected to the coils of the armature, but insulated from each other.

At a suitable distance from the commutators square bars DD are supported in (but insulated from) supports D'D' (one of which only is shown).

The brush-holders are made in two pieces, E F, the part E being formed with a U-shaped recess or jaw at its upper end in which takes and in which is pivoted the part F. A pin or pivot, *i*, passes through the two parts and holds them together.

In the lower portion of the part F a chamber is formed in which is placed the spring *h*, whose inner end is attached to *i*, the outer end being fast to the wall of the chamber.

Upon the end of *i* outside of the chamber is a ratchet wheel, *k*, a pawl, *m*, being arranged upon E to take into the teeth of *k*, and hold it in a fixed position.

In the upper or free end of F is a chamber or recess, *f*, for receiving and holding a brush, which is secured therein by a set screw, *e*.

Upon the inner side of E is cut a groove the size of the bar D, in the under side of which is cut a slot, as shown in figures 2 and 3.

A series of commutator brush-holders thus constructed are placed side by side upon the bars DD by simply slipping each on to the bar from the front, each being secured thereon by the set screws *d*, taking into the groove in D.

The use of a series as shown involves several advantages. Each series of brushes is in metallic contact at the same time with the same strip or strips of the commutator; hence sparks between the commutator and brushes are greatly lessened, if not entirely obviated, even with a very large current.

If repairs upon or replacement of one or more brushes be necessary, the set screws *d* of the defective brushes are loosened, and the holders of such defective brushes removed from the bar D without disturbance of the remaining brushes, which afford ample contact surface.

As before stated, the ratchet *k* is upon the pivot *i*, to which is attached the spring *h*; hence by turning the ratchet *k* any desired degree of resilience may be given the spring, which force is expended in holding the brushes upon the commutator with a steady and uniform pressure, which may be varied or regulated by means of the ratchet.

This arrangement affords a large contact surface, while at the same time any one brush may be removed for repair or replacement without interference with the generative capacity of the machine or disturbance of the current, and to it I have applied the name "Large Current Multiple Brushes."

Another portion of the invention relates to the combination of the prime motor with the magneto or dynamo electric machine.

In using magneto or dynamo electric machines it is very important that the armatures should be rotated at a uniform and constant speed, as any variation therein immediately manifests itself in the current.

As

Improvements in Magneto or Dynamo Electric Machines.

As ordinarily used such machines are connected to the prime motor by intermediate gearing, usually belts, which are liable to slip, causing irregularity in the rotation of the armature or bobbin, every such irregularity affecting the current, causing the irregularity to be repeated and shown in the operation of whatever translating devices are used in the circuit.

To obviate this it is preferable to connect the prime motor and the generator directly, that is supposing the prime motor to be a steam-engine, the pitman rod of the engine is connected directly to the shaft, or axle of the revolving bobbin, preferably by a crank pin on a disc upon the end of the bobbin shaft, which disc is weighted upon the side opposite to the crank pin with a weight which counterbalances the weight of the pin and pitman, so that any jar or irregularity in passing dead centres is obviated. This arrangement is specially needed, as the engine used should be one of very rapid stroke, not less than four hundred to five hundred per minute, in order that the bobbin may receive its needed high rate of rotation. The engine should also be what may be called a "self-contained engine," that is, provided with a governor and an automatic variable cut-off, which may be so adjusted that upon the speed becoming too great the cut-off shall be automatically changed to cut off at a less fraction of the stroke, and *vice versa*.

Of course as the speed of the engine lessens the rate of rotation of the bobbin is lessened, and consequently the electro motive force or pressure of the generated current drops.

If the steam-engine and generator be so arranged, there is provided a system of generation in which automatically the pressure or force of the current may be maintained constant.

In manufacturing generators of large capacity very large cores and very large castings for polar extensions are required. These very large parts cost more proportionately than small ones, and are much more difficult to handle, the winding of them requiring greater labour and care.

The greatest effect upon the cores is given by the coils nearest to it, but in using very large cores some of the coils are necessarily somewhat distant from the core.

With several smaller cores, whose aggregate of weight is that of one larger core, a larger surface for the action of coils may be obtained and a larger amount of wire used, whose average distance from the surface of the cores in either case is the same.

Generators of very great capacity may therefore be profitably constructed of a series (two or more) of coils and cores, or field magnets, each set having its own polar extensions, but one armature or bobbin common to all being used.

By such construction, as before explained, ease and economy of construction are secured, the coils are brought on an average nearer the cores, and a greater amount of wire may be profitably used. Moreover, if at any time it is desired to increase the capacity of the generator, it may be done by adding more field magnets to those already in the generator, the only new part required being a proportionately longer bobbin.

As ensuring compactness and strength it is preferable to mount the engine and generator upon one base, on which is secured upon intermediate supports of a non-magnetic substance the generator; the non-magnetic supports being necessary to avoid the formation of a magnetic circuit outside of the polar extensions.

In order to give greater rigidity and needed support to the generator, the series of polar extensions are united physically by a brace or union of non-magnetic material which in effect makes the opposite poles one structurally, but preserves them separate magnetically.

This is illustrated in figure 4 of the drawings, which represents a prime motor and a generator united and constructed as before set forth.

L is a suitable base, preferably of cast-iron, upon which is secured the individual base M of the steam-engine. This base M may be cast in one piece with L, or it may be made separate and properly fastened thereon.

A is the cylinder of the engine, provided with the usual throttle-valve, *a*, and with steam chest, &c., not shown in the drawing.

The piston rod B connects to pitman *b*, which takes on a crank pin on the disc C, to which is secured a block or weight which counterbalances the weight of the crank pin and the pitman *b*.

The disc C is mounted upon the shaft *c*, which also carries the revolving armature or bobbin, and is therefore both the engine and bobbin shaft, and may be termed properly either a bobbin or an engine shaft.

The engine is provided with a governor, G, rotated as usual from some rotating part of the machinery and attached to a variable cut-off, so as to automatically vary the cut-off, reducing or increasing the speed by lengthening or shortening the proportion of the stroke during which steam is admitted.

E E' E'' represent three series of field of force magnets, each series forming one magnet, the cores of whose coils are connected by a back piece or yoke, *e e' e''* being the yokes of E E' E'' respectively.

Each magnet is provided with its own polar extensions, one for each pole, as F F' F'', which form one pole of each magnet, the other pole being hid by the plate H and base I in the drawing.

These poles are separated slightly from each other, affording opportunity for the passage of air on all sides of each one.

For compactness these magnets are placed horizontally instead of vertically. In order then to give necessary rigidity and ensure the proper distance between the poles for the rotation of the bobbin, a plate, H, of non-magnetic material is bolted to them.

Upon the shaft *c* is the bobbin or armature E⁴ formed on a sleeve, D, which is keyed to the shaft *c*. This bobbin is of an effective length equal to the length of the aperture formed by the polar extensions, and in which it is to rotate. In addition to performing its function as a bobbin or armature, the bobbin is so proportioned that it acts as a fly or balance wheel to the engine.

In order to prevent a magnetic circuit being formed of the magnets, non-magnetic material, I K, is placed between the generator and base L.

If the generator were purely a dynamo machine any drop in the pressure or force in the circuit due to increased resistance, or work in the circuit, would be immediately felt in the field coils themselves, whereas it is preferable that such current should not be so affected.

Improvements in Magneto or Dynamo Electric Machines.

In order to maintain the pressure uniform so far as regards such disturbances, it is well to use a small auxiliary dynamo generator as the source of the current for the field magnets.

The bobbin of such auxiliary generator may be placed upon a prolongation of the shaft *c* and its current passed through the field of force coils *E E' E''*. These field of force coils may be connected in one circuit as a series, or they may be connected to the field of force circuit by derived circuits as a "multiple arc" circuit.

While in the drawing only three series of magnets are shown, it is evident that two or any increased number may be used.

It is further evident, given a generator of certain capacity, that its capacity may at any time be increased by the addition of more series of magnets without the necessity of remodelling the machine, further than the providing of a proportionately longer bobbin.

Another portion of this invention relates to the government or regulation of these machines when used as engines for the conversion of current into power.

Governors as usually hitherto made for such engines have been arranged to break the circuit upon the occurrence of too much speed, the circuit being again closed upon the proper lessening of the speed; but it is evident that the abnormal speed will be continued by the momentum of the parts for a greater or less interval after the breakage of the circuit.

This plan gives rise to undesirable variations in the speed of the engine, as the speed must first rise when the circuit is broken, then fall when it is again completed, thus alternating in rise and fall of speed, often giving a jerky motion to the engine and connected gearing.

The better plan would seem to be to so arrange the governor that ordinarily the abnormal or greater than desired speed should not be reached, the speed being maintained practically uniform.

The object of this part of the invention is to accomplish this result, and to that end it consists in a governor by which the circuit is broken at regular intervals, that is, once in every revolution of the governor, and ordinarily at a certain determined point, the engine running by momentum until the circuit be again completed, thus, so to speak, allowing the current to act through only a portion of the stroke, cutting it off then, after a manner analogous to the cutting off in steam-engines, the governor being also so arranged that as the speed increases the current shall be cut off and the engine run by momentum a proportionately longer time during each revolution, forming a variable automatic cut-off, exactly analogous to the steam-engine cut-off.

A centrifugal governor is arranged to be driven from some rotating part of the engine. Upon its shaft and connected with the ball-arms, so as to be moved up and down thereby, is a sleeve composed of an insulating and a conducting portion, their line of union being a diagonal, that is, if the surface of the spindle were laid flat it would be of the shape of an Italic *N*, the line between the two being the diagonal connecting the legs of the *N*. A spring bears upon this spindle, and the circuit to the engine passes through the spring and spindle.

The governor is so adjusted that upon rotation at the proper speed, and with the proper pressure of current, the commutator will be in the right position for the circuit to be complete during enough of each rotation of the sleeve to maintain uniform such speed.

As either additional work is given the engine to do or less current is supplied, the governor slowing will cause the current to be on for a greater portion of the rotation, or, so to speak, will cut off a greater fraction of the stroke, or *vice versa*.

Figure 5 of the drawings illustrates such a governor.

A is a centrifugal ball governor composed of two balls, attached to the fly-rods, which are pivoted in supports, fixed upon the shaft *B*, which is mounted in suitable bearings, and receives motion by means of a cord or belt passing around the pulley *C*, and connecting it to some moving part of the engine.

The links *a a* of the governor are pivoted to a sleeve, *b*, to which is attached a commutator, *D*, both arranged to slide up and down upon the shaft *B*. The commutator *D* is made of a conducting portion, *d*, and insulating portion, *d'*, each cut diagonally and united at their diagonal edges.

The circuit to the engine passes by conductor 1 to the shaft *B*, then by the conducting portion *d* to spring *e*, supported on but insulated from the frame of the governor, and thence to 2.

The governor is so adjusted that upon rotation at the proper speed and with the proper pressure of current the commutator will be in the right position for the circuit to be complete during enough of each rotation of *D* to maintain uniform such speed.

As either additional work is given the engine to do, or less current is supplied, the governor slowing will cause the current to be on for a greater portion of the rotation, or, so to speak, will cut off at a greater fraction of the stroke, or *vice versa*.

Another portion of the invention relates to means for communicating motion from the rotating armature of an electric engine to the driven mechanism without the use of belts, gears, or other similar devices used to diminish the speed.

The best effects are obtained from electric engines when the armatures are steadily and uniformly revolved at a very high speed. This rate of speed is oftentimes, or rather generally, greater than the rate at which it is desired to run the driven machinery. In order therefore to reduce the speed, the motor and driven machinery are connected by belts or gearing in whose use there are inherent defects, such as the slip and stretch of belts, the rattle of gear, &c.

The method which I have devised for this purpose may be stated in general terms, as follows:—The rotary motion of the armature is first converted into an oscillatory motion, which is then converted into a continuous rotary motion, in the following way:—

Upon the shaft of the armature is a balanced crank pin, to which is attached a pitman or driving-rod, connected to and oscillating a friction pawl mechanism.

Upon the driving-shaft is fixed a wheel having a frictional periphery. Loose upon the driving-shaft is an arm extending a distance above the rim of the frictional wheel and then bent over and fashioned into a frame in which are pivoted two pawls, connected together by a frame capable of being shifted so that only one pawl can take at a time upon the wheel.

The pawls are so constructed that they communicate motion in opposite directions, hence the direction of rotation of the driving-wheels depends upon which one of the pawls is used. The

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The arm carrying the pawls is slotted, and the pitman or driving-rod is connected thereto by a pin whose position is adjustable in the slot so that the leverage may be adjusted and the speed communicated easily varied.

The arrangement described is used in duplicate, that is, two or more driving rods communicate motion from the armature shaft to as many frictional pawls and driving-wheels on the driven shaft, the crank pins being so arranged relatively to each other that a continuous motion is imparted to the driven shaft and mechanism connected therewith.

Upon the driven shaft is loosely mounted the fly-wheel and main driving-pulley, a clutch being used to fasten them to the shaft when it is desired to communicate motion, so that the machinery may be stopped without stopping the motor itself.

This system of devices is more clearly shown in the drawings, in which figure 6 is a perspective view of the driven mechanism, detached from figure 7, which is a perspective of a motor engine complete. Figure 8 shows the application thereof to a locomotive, and figure 9 its application to a pump, it being understood however that the invention is applicable to many other uses, these being shown as types.

In figure 7 is shown an electric engine composed of magnets, M M, yoke Y, polar extensions P P, and rotary armature A, the commutator springs or brushes being removed in order not to obscure the view of the other parts.

Driven from some rotating part of the machinery is a governor, G, which operates a circuit-breaker adapted to make or break the circuit at a number of points simultaneously. This circuit-breaker is merely arbitrarily indicated at G', its construction, operation, and functions being more fully shown or explained in prior Patents applied for by me.

Upon the shaft *b* of the armature A is a disc, *a*, on which is the crank pin *e*. The disc *a* is weighted upon one side or cut away, so as to be balanced.

Loosely pivoted upon the shaft *d* of the driving-wheel D is the arm *g*, extending above D and formed into the frame *i*, in which are pivoted the pawls K K', connected together by the shifting frame *m*, by which one or the other may be brought into contact with the periphery of D. In *g* is the slot *h* in which is secured the pin *f*. A pitman or driving-rod, *c*, is connected at one end to pin *e*, and at the other to pin *f*. As the distance of pin *f* from its centre *d* is always greater than that of *e* from the centre *b*, the rotation of *a* communicates only an oscillating motion to *g*. The pawls are so fashioned, as shown, that in movement in one direction they slide over the face of D, while in the reverse movement they lock to the face and move D.

As shown the pawl *k* is in use. If *a* rotates in the direction of its arrow, *k* during the forward half of *a*'s rotation slides over the face of D, but upon the rearward half rotates D with it in the direction of the arrow marked thereon.

In practice two or more sets are used, as shown at 2 3, in figure 7, so that a constant motion is secured, instead of the intermittent action due to one only.

If desired to reverse the motion, the frame *m* is moved to the left, lifting *k* from contact with D, at the same time putting *k'* in contact therewith. Any suitable device may be used for holding the frame *m* in the position to which it is moved.

Upon the shaft *d* is mounted loosely the fly-wheel F and driving-pulley E, a clutch, C, with lever L being used to connect E F to the shaft *d*, so that the movement of the driven machinery may be controlled without subjecting the motor itself to the objectionable effects of sudden starts and stoppages.

In figure 8 the engine is shown mounted upon a wheeled frame, driving wheels D *w* being substituted for the fly-wheel and pulley, constituting an efficient locomotive.

In figure 9 a pump, P *r*, is shown connected directly by pitman *r* to a crank *c r*, on shaft *d*. By thus connecting directly instead of through the medium of intermediate gearing, increased efficiency of service is secured.

Some method by which power could be readily and economically transferred to a distance from a prime motor has long been felt to be desirable, and to that end many suggestions have been made and plans devised, involving its transfer by ropes, by compressed air, and by electricity.

Practically it has been determined that the power of a prime motor may be converted into electricity, and the electricity conveyed to a distance to be retranslated into power; this, however, only to a limited extent and by the use of very large conductors, for to transmit power to any great distance without the use of large and costly conductors requires that the current should have very great electro-motive force or "pressure," say as much as two thousand to three thousand volts. In practice, with magneto or dynamo electric machines as now built, it is impracticable to generate currents of such high electro-motive force. These machines have but a single bobbin, and the difference of potential between one section of wire upon the bobbin and another would be very great. Against so great a difference of potential it is extremely difficult to guard, even by the most careful winding and insulation. The result, especially in damp weather, or when the bobbins become damp, is that the currents break a short path from section to section, burning the wires.

In addition, such great electro-motive force causes a large increase of destruction spark at the commutator.

If currents of such electro-motive force could be safely and economically generated and translated, exceedingly small and inexpensive conductors relatively could be used to transfer without material loss a very large amount of power, say several hundred horse-power.

Another object of this invention then is to furnish means and methods by which this transmission may be made.

In systems of this kind a prime motor is used, which may be an air, steam, or water motor or windmill.

A high-speed engine should be used, geared directly to the generator. When a water-wheel is used, such as are now ordinarily used on account of the low speed with ordinary heads of water, it would have to be connected to the generator by gearing, ordinarily belts, arranged to increase the speed so as to give the bobbin a sufficiently rapid rotation. The use of belts or gearing, however, involves loss of power and irregularity. Still another object of this invention then is to so arrange water-wheels in connection with

Improvements in Magneto or Dynamo Electric Machines.

with generators that the wheel and generator may be connected directly and without intermediate gearing, and still the necessary high speed obtained. To accomplish these last-named results a battery of generators is used, each separate and complete in itself, but with all the rotating armatures or bobbins (each provided with its own commutator) mounted upon the same driving-shaft, the total electro-motive force of all the bobbins being equal to the electro-motive force desired.

By thus dividing it between a number of bobbins it is lessened in each bobbin, with a consequent reduction of difference of potential between the layers or sections on each bobbin.

The motors or retranslating engines are divided up in the same way, all the bobbins, each having its own commutator, being mounted upon the one driving-shaft, upon which they all exert their force. Where a water-wheel is used with a fall only sufficient to give a low rate of speed, it should be used to actuate a pumping apparatus raising the water to a height, whence it may flow under great head or pressure to a smaller wheel geared directly to the generators, the increased head of the water and small size of the second wheel resulting in an accelerated velocity.

This plan is followed because the loss in pumping and using the pumped water to drive the second wheel is less than the loss due to gearing by belts, &c., a slow-moving wheel to the generator in such manner as to give the desired high velocity.

By the arrangement thus generally stated it is possible and commercially practicable to convert even several thousand horse-power of a prime motor into electricity, and convey the electricity by moderate sized or even very small conductors to a distance, there to be reconverted into power.

In addition, I have discovered that for the best results certain relations must exist between the generators and engines.

In using generators to produce a current which is supplied to an electric engine the practice hitherto has been to make the generator or transmitting machine, and the engine or receiving machine exactly alike, so that when each is rotating at same speed the contrary electro-motive force of the receiver exactly equals the electro-motive force of the generator. In such cases, when no work is being done, the tendency of the engine or receiver is to acquire that rate of speed which is necessary to make the counter and the prime electro-motive force about equal.

As work is given the engine to do its speed, and consequently its counter electro-motive force, is reduced; but when both are made alike, and have when doing no work equal forces, it has not been found desirable to load the engine or receiver beyond the point reducing its speed, and consequently its counter electro-motive force, more than one-half. The difference between the electro-motive force and the counter electro-motive force (of course less friction, &c.,) represents the amount of current transferred into power, which in most cases is not more than 50 per cent.

Instead of the arrangement described, I wind the bobbins of the receiving machines or engines so that, when driven at the same speed as the generators or transmitters, their counter electro-motive force shall be only one-half, or even less that of the transmitters. Unloaded then, as their tendency is to run at the rate which shall develop the same electro-motive force, they rotate at twice the speed of the generators.

Now, if they are so loaded with work as to reduce their speed to the same as that of the transmitter they develop only half their unloaded counter electro-motive force, turning 50 per cent. into power at that rate.

It is preferable to load the engine with work only to that point which permits of a speed not less than that of the generator, and usually somewhat greater, so that the counter electro-motive force developed shall be about 75 per cent. of the prime electro-motive force, at about which point is the greatest economical conversion into force.

In connecting up the generators and engines the same plan may be followed in both.

As stated previously, but a small current is required to keep up to the point of magnetic saturation field magnets once brought to that point. Where all the current generated is taken through the coils of the field of force magnets there is many times as much current as needed for the purpose, and the resistance of the field coils is uselessly added to the circuit of the current, consequently I prefer to use only part of the current, arranging a shunt circuit to the bobbin of one or all the machines, which shunt passes around and energizes the field of the whole series. The resistance of the fields is proportioned to the electro-motive force of the bobbin, so that only the proper proportion of current will pass through the shunt that is just enough to keep the field magnets up to the point of economical magnetic saturation.

In figure 10 of the drawings is shown this arrangement described, so far as may be shown in drawings.

E is a battery of generators, which may be of any desired number, six, A, A, A, A, A, A', being shown, their rotating armatures or bobbins and commutators being upon a shaft, c', common to them all, which is driven from any suitable prime motor, represented arbitrarily by x.

In this case the bobbins of the entire battery are connected in a series by wires 3, 3, extending from the commutator brush of one generator to that of the next; conductors 2, 4, attached to the terminal binders of the battery leading to and from the battery G of engines or translating devices.

From the commutator connections of A' a shunt circuit is formed, 5, 5, which passes from P through the coils of all the field of force magnets of the series, returning to P'.

G is a battery of engines or receivers having bobbins wound as explained, so as to have when doing no work a speed of twice that of the bobbins of the generators, in order to develop a counter electro-motive force equal to the electro-motive force of the generators.

The bobbins and commutators are placed on a shaft, c, common to them all, which shaft is suitably connected to the machinery to be driven, which connection is represented in this instance by pulley P³, on shaft c, belt D and pulley P⁴ on shaft s, which conveys the power to the driven machines.

The current comes from the generators, say by wire 2, passes to the commutator of the first engine, C, thence by wires 1, 1, through the commutators of the remainder in series, and by wire 13 and 4, back to the generators.

A shunt circuit, 14, to the commutator of C' leads through the coils of all the field of force magnets, the resistances of the shunts in both instances being proportioned as hereinbefore explained.

Instead

Improvements in Magneto or Dynamo Electric Machines.

Instead of the generators and engines being arranged in series as shown, they may, if deemed desirable, be arranged, either or both, on the multiple arc system, in which cases the relative resistances of the parts must be adjusted to compensate for the difference in resistance of a circuit inherent upon arrangement of devices in series or in derived circuits.

The engines of the battery G need not be located at one place as shown, but may be distributed, as for instance through a village which is remote from the source of supply, or station where E is located.

In such case a small dynamo may be placed in the circuit 2 at the village or locality, and the current therefrom used to excite the field magnets of the engines, a local circuit leading from and to the dynamo through all the field coils of the engines there located.

Instead of the bobbins being wound differently so as to require different speeds for the same electro-motive forces, the number of engines or receiving machines used may be less than that of the generators; for instance, as shown in figure 10, with six generators four engines may be used, with the result in order to give the same electro-motive force, that the receivers run with much greater speed than the generators.

The common type of armature used at present is one composed of a number of coils wound longitudinally over a single core, the coils crossing each other at the ends, where there is a large and cumbersome mass of wires.

If by any chance one or more coils are injured or destroyed the repairment is a difficult and tedious process. If such coils were among the first put on, those which overlap at the ends must be removed before the injured ones can be reached.

It seems desirable that such provision be made that any coil can be removed or repaired without disturbance of the remainder.

Another portion of this invention therefore relates to a construction for attaining this object.

This is accomplished by making of wire only that portion of the coil which is upon the operative face, the wires of a coil being connected at the ends by metallic plates fastened to an insulating base and insulated from each other. These plates are made so as to project at the proper points above the general surface of the core, at which points the wires are secured to them by soldering, brazing, or clamping devices. At one end each plate is suitably connected to the proper commutator block.

In case of necessity of removal of any coil, it is unloosed from its plates, at each end without disturbance of other coils. In fact by such construction it is possible to remove, repair, and replace any coil without taking the armature out of the machine, and with but a slight stoppage of the machine.

This part of the invention may be carried into effect by means substantially such as shown in figure 11 of the drawings, wherein C is the commutating end and A the other end of the armature.

Upon suitable insulating bases, circular in form, the radial metal plates numbered 1 to 18 in A and C are secured, insulated from each other as indicated by the black space between them.

Upon A the circular plate or bar *a* connects 1 and 10; *b*, 2 and 11; *c*, 3 and 12; *d*, 4 and 13; *e*, 5 and 14; *g*, 6 and 15; *h*, 7 and 16; *i*, 8 and 17; *k*, 9 and 18. Each of these bars is insulated from the other and from all the plates, excepting those which it is designed to connect.

It will be noticed that upon this end the circular bars connect exactly opposite coils as would the wires ordinarily used. Upon the commutating end C the arrangement is somewhat different.

Upon it 1 and 12 are connected by *m*; 2 and 9 by *n*; 3 and 14 by *o*; 4 and 11 by *p*; 5 and 16 by *q*; 6 and 13 by *r*; 7 and 18 by *s*; 8 and 15 by *t*; 10 and 17 by *u*. These bars are insulated, as before stated, in the case of A.

Upon the commutating end the odd-numbered radial bars are bent outwardly at a right-angle at their inner end, the bent portions, *v v*, being secured to a hub and forming the commutator.

To these end-discs thus constructed are secured wires, ribbons, or bars, in any suitable manner, forming with the radial and circular plates the coils.

For large machines I prefer to use naked bars of copper, B B', which are secured in the recesses shown in the outer edges of the radial plates.

They will be sufficiently insulated from each other by the air space between them. If bars are used not sufficiently rigid to preserve their relative distances from each other throughout their length, stays or blocks of insulating material such as mica may be placed between them at proper intervals.

By the arrangement of connections and the commutator, as shown in C, all the coils are constantly in circuit, the generated current having the electro-motive force of a coil of the total length of all the coils, while the internal resistance is kept low by the lessening of resistance in the ends, due to the much larger mass of conductor in section of the plates and bars over that of the wires ordinarily used, while the resistance of the active parts when bars are used as described is also greatly lessened.

Supposing the active parts are in such position that the commutator brushes are in connection with 5 and 15, the path of the generated currents will be as follows:—Starting (say) at the brush on 5, the path in the machine to 15 would be for one portion of the current *via* 5, *e*, 14, *o*, 3, *c*, 12, *m*, 1, *a*, 10, *u*, 17, *i*, 8, *t*, 15; and for the other portion *via* 5, *g*, 16, *h*, 7, *s*, 18, *k*, 9, *n*, 2, *b*, 11, *p*, 4, *d*, 13, *r*, 6, *q*, 15, thus including every coil.

While the term magneto or dynamo electric machines is used herein, both in description and claims, it is evident that these improvements are equally applicable to electric engines or motors, and that the claims herein are to be construed and taken as covering such application.

Another method of accomplishing the same result as that aimed at by the arrangement last described is as follows:—

For the active or generative portions of the armature coils of wire or naked bars are used, electrical connections from face to face being made through discs, as hereinafter described.

If each longitudinal set of wires or each bar be considered as one coil, a series of discs equal in number to half the coils is used at each end of the armature. These discs are made of sheet metal, preferably copper, and are separated each from the other by a layer of insulating material. Those of each series are fastened together by bolts passing through holes in all the discs of the series, the bolts being insulated therefrom by insulating washers. The bolts take into screw-holes in the ends of the armature itself, so that they not only bind the members of a series together but also secure the series of the armature itself.

For

Improvements in Magneto or Dynamo Electric Machines.

For the non-commutator end of the armature the discs are made of sheet metal, perforated in the centre to admit of the armature passing therethrough but insulated therefrom. Upon opposite sides of each disc is left a lug or ear by which the disc is attached to its proper bars or wires, so that the circuit at that end is completed between the two diametrically opposite bars or coils.

For the commutator end the discs are made of sheet metal, each disc having two ears or lugs upon its periphery for attachment of the wires or bars, which it is desired to connect at that end.

Near the centre two semi-circular pieces of the metal are cut out, leaving a metal tongue between them, which tongue is cut away from the body of the disc at one end and then bent outwardly at right-angles.

The tongue so bent out is carried to the commutator block, forming the connection of the disc thereto.

The lugs or ears upon the discs at this end of the armature are not diametrically opposite to each other, but are so arranged relatively to each other and to the tongue referred to, that the coils or bars may be connected as shown and described in the arrangement last hereinbefore noted.

This construction is illustrated in figures 12, 13, and 14 in which M, M' represent the two series of discs.

C is the armature shaft upon which is mounted the armature core D formed of sheet iron discs separated from each other by their insulating sheets.

A is an individual disc of the series M of the commutator, and provided with lugs *a, a*. In each is cut the two semicircles *d, d*, between which is left the tongue *c* which is cut loose from the body of disc at *e*. This tongue is bent outwardly and fastened to the commutator base H, as shown in figure 12.

Bolts I pass through holes *g* in the discs, but are insulated from the body of the discs, the discs being insulated from each other.

The inner ends of the bolts are screw-threaded and take into screw-holes *h* in the body of the armature, thereby securing the discs together and the assemblage of discs to the armature.

Appropriate discs of each series are connected in pairs by the coils or bars E, E, bars being preferable, the attachment of discs and bars being made by screws passing through the lugs into the bars. For instance, upon the side shown discs 1 and 2, 3 and 4, 5 and 6, 7 and 8, 9 and 10, 11 and 12, 13 and 14, 15 and 16, 17 and 18 are connected. Upon the side not shown the connections would be different, the lugs *a, a*, and tongue *c* of each disc being so arranged relatively to each other that the path of the current through the armature to the commutator on each side shall be as described in the arrangement last hereinbefore noted, so that all or nearly all the coils shall always be in circuit.

It is evident that instead of having the lugs *a, a*, or *b, b*, the discs may be plain upon the edge, and that the bars may be attached thereto by screws or solder or other suitable fastening.

What I claim as my invention is—

- 1st. The combination with the brush-holder of a magneto or dynamo electric machine of means for giving an adjustable pressure of the brush upon the commutator, substantially as set forth.
- 2nd. The combination with a commutator of a series of brushes each mounted independently upon a common supporting shaft or bar, and independently adjusted, substantially as set forth.
- 3rd. The combination with a commutator of a series of brushes and holders each mounted independently upon a common bar or shaft, and arranged so that each brush takes obliquely upon the commutator, substantially as set forth.
- 4th. A brush-holder formed of two parts, the one for fixed seating upon a proper support, the other connected thereto by an adjustable spring union, substantially as set forth.
- 5th. A magneto or dynamo electric machine consisting of a series (two or more) of independent field of force magnets, and a single armature or bobbin, common to them all, substantially as set forth.
- 6th. The combination of a magneto or dynamo electric machine, a steam-engine connected thereto by a counter-balanced connection, a governor and variable cut-off, automatically controlled thereby, and an armature or bobbin, serving both as an armature or bobbin and as a fly or balance wheel, substantially as set forth.
- 7th. The combination with a common base of an automatically controlled engine, a magneto or dynamo electric machine, and non-magnetic supports placed between the generator and the base, substantially as set forth.
- 8th. The combination with the polar extensions of a series of independent electro magnets, forming with a bobbin common to them all a generator, of a non-magnetic plate or brace uniting and supporting the polar extensions, substantially as set forth.
- 9th. The combination of a generator, a high-speed steam-engine, and a variable cut-off and governor, so that the speed of the engine and the power or pressure of current are automatically regulated, substantially as set forth.
- 10th. A governor for an electric engine, arranged to break the circuit at regular definite intervals, substantially as set forth.
- 11th. A governor for an electric engine, arranged to break the circuit once in every revolution of the governor, at a point and for a fraction of the revolution dependent upon the speed of the engine or amount of load, substantially as set forth.
- 12th. The method of reducing speed between an electric engine and the machinery driven thereby, by first converting the rotary motion of the armature into oscillatory motion, and then reconverting the oscillatory motion into rotary motion, substantially as set forth.
- 13th. The combination with the rotary armature of an electric engine, of an oscillating pawl-carrier and a friction wheel actuated thereby, substantially as set forth.
- 14th. The combination of a rotating armature, an oscillating pawl-carrier, a pitman, and an adjustable connection, so that the throw and speed of the pawl-carrier may be varied, substantially as set forth.

15th.

Improvements in Magneto or Dynamo Electric Machines.

- 15th. The combination of a rotating armature, an adjustable double pawl-carrier, an adjustable connection between them, and means for determining which pawl shall be kept in operation at any one time, substantially as set forth.
- 16th. The combination of an electric engine, a machine driven thereby, and a pitman for connecting the two directly without the intervention of gearing or belts, substantially as set forth.
- 17th. The combination of a magneto or dynamo electric machine and an electric engine, constructed relatively to each other, so that the engine must run at a much greater speed than the magneto or dynamo electric machine to produce a counter electro-motive force equalling the electro-motive force of the dynamo or magneto electric machine, substantially as set forth.
- 18th. The combination of a battery of magneto or dynamo electric machines and a battery of electric motors or engines, arranged differently, relatively to each other as described, substantially as set forth.
- 19th. The method of transferring power into electricity, and reconverting the electricity into power, consisting in generating the current in dynamo or magneto electric machines, or in a battery thereof, giving a certain speed, a certain electro-motive force, transmitting the current to an electric engine or motor, or series thereof, arranged to give the same electro-motive force, only at a much higher rate of speed, substantially as set forth.
- 20th. The combination with the main circuit of a series or battery of magneto or dynamo electric machines used either as generators or receiving machines, of a shunt circuit to the bobbin or armature of one of the machines, which shunt passes around and energizes all the field of force magnets of the battery, substantially as set forth.
- 21st. The method of generating currents by the use of a water-wheel as a prime motor, consisting in using two wheels, the first and larger pumping water to a height, then using the water so pumped, with its greater head, to actuate a smaller wheel at a greater rate of speed, the second wheel being connected to the generator, substantially as set forth.
- 22nd. A revolving armature for magneto or dynamo electric machines, having its ends formed of radial plates, suitably connected, substantially as set forth.
- 23rd. The combination in an armature for magneto or dynamo electric machines of radial plates and circular connecting plates, substantially as set forth.
- 24th. The combination with the armature of a magneto or dynamo electric machine provided with a series of coils or bars of a commutator and connections, arranged to retain all the coils constantly in the circuit, substantially as set forth.
- 25th. An armature for dynamo or magneto electric machines having its active or generative portions made of naked bars or ribbons of metal, substantially as set forth.
- 26th. An armature for dynamo or magneto electric machines, in which the active or generative portions may be removed without disturbance of the end or inert portions, substantially as set forth.
- 27th. A rotating armature, having its ends composed of discs, to which are united the active coils or bars, substantially as set forth.
- 28th. The combination with the commutator of an armature end composed of discs having tongues integral therewith for electrical union with the commutator, substantially as set forth.
- 29th. The combination in a revolving armature of a series of discs and bars, the discs connecting electrically the bars in couples, substantially as set forth.
- 30th. The discs for the commutator end of a revolving armature, provided with a tongue, substantially as set forth.

Signed by me, this 1st day of February, A.D. 1881,—

Witnesses—

CHAS. H. SMITH.
GEO. T. PINCKNEY.

THOMAS ALVA EDISON.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to Thomas Alva Edison, this fourth day of July, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 26 May, 1881.

The application of Mr. T. A. Edison for Letters of Registration for "Improvements in Magneto or Dynamo Electric Machines, applicable to both Generators and Engines," having been referred to us, we have examined the specification and drawings accompanying the same, and have now the honor to report that we see no objection to the issue of Letters of Registration as prayed for.

We have, &c.,

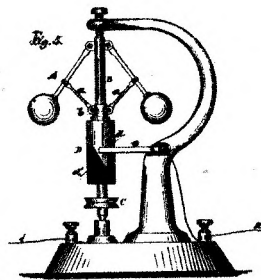
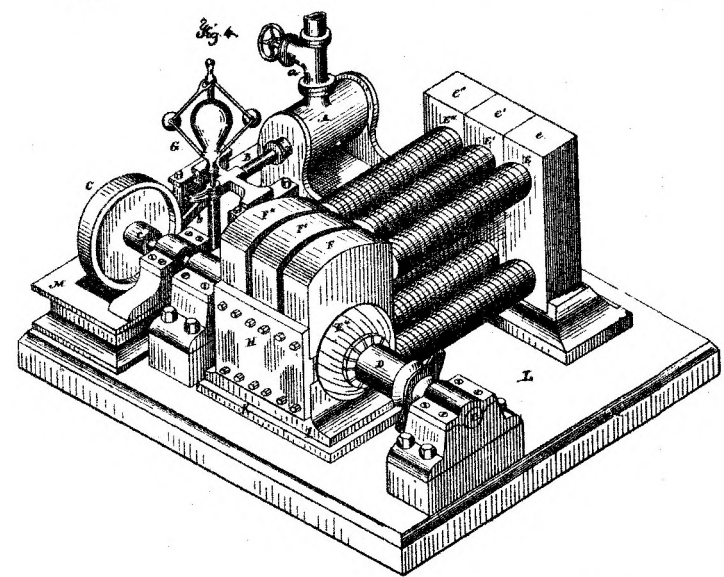
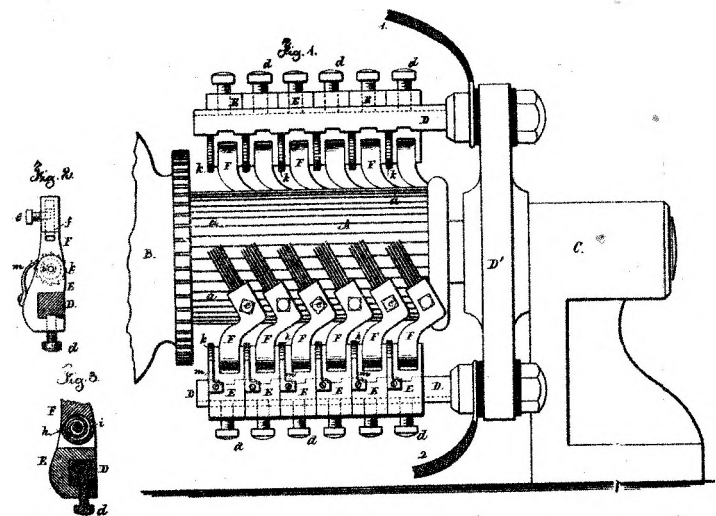
J. SMITH.
H. C. RUSSELL.

The Under Secretary of Justice.

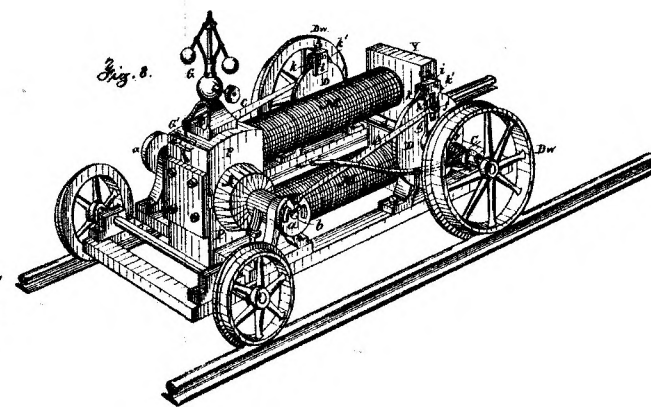
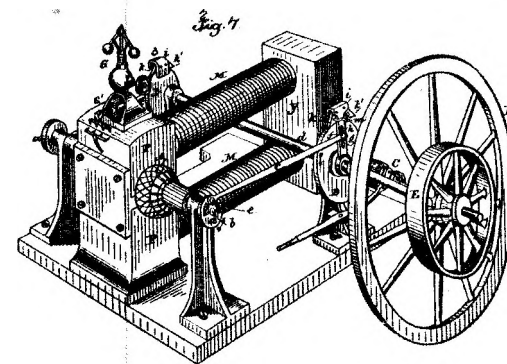
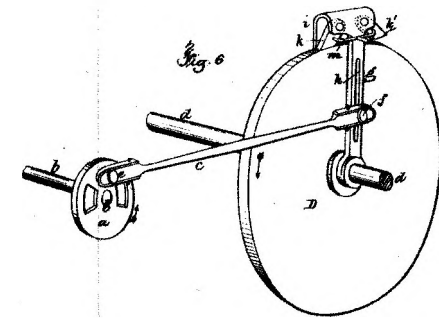
[Drawings—two sheets.]

B.

950



*Wm. Christy
J. Fair*



*Thomas Alva Edison
Inventor*

PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE,
SYDNEY, NEW SOUTH WALES.

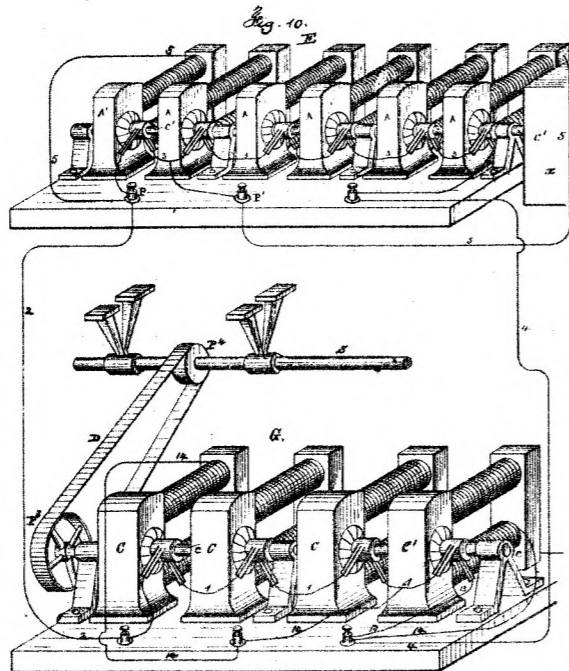
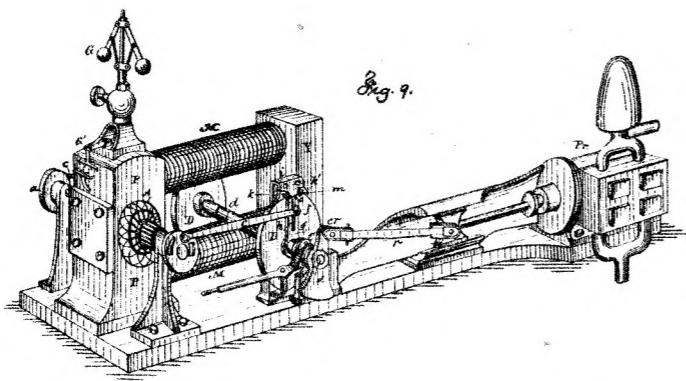
*This is the Sheet of Drawings marked B referred to in the annexed
Letters of Registration, granted to Thomas Alva Edison this fourth
day of July, A.D. 1881.*

Augustus L. of us.

(Sig 34.-)

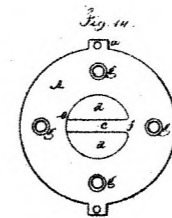
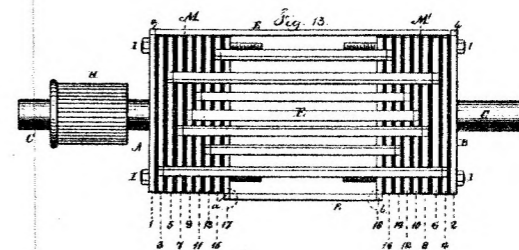
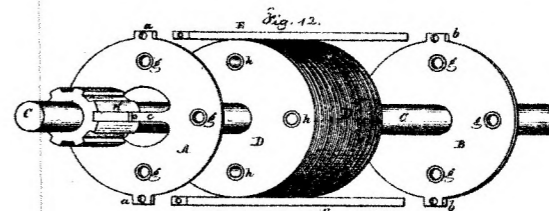
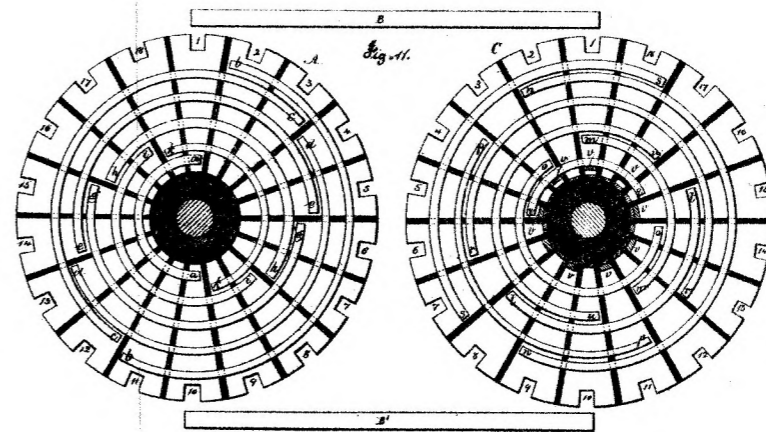
C.

[950]



Witness
 Charles
 J. Hall

Thomas Alva Edison
 Inventor



This is the Sheet of Drawings marked C referred to in the annexed
 Letters of Registration, granted to Thomas Alva Edison this fourth
 day of July, A.D. 1881.
 (Sig. 34.)

Augustus Loftus.

PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE,
 SYDNEY, NEW SOUTH WALES.



A.D. 1881, 8th July. No. 951.

**IMPROVEMENTS IN PRODUCING COLD AND IN THE MANUFACTURE OF
SULPHUROUS ACID.**

LETTERS OF REGISTRATION to Raoul Pierre Pictet, for Improvements in producing Cold and in the manufacture of Sulphurous Acid, and in Apparatus for these purposes.

[Registered on the 8th day of July, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS RAOUL PIERRE PICTET, of Geneva, in Switzerland, civil engineer, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in producing Cold and in the manufacture of Sulphurous Acid, and in Apparatus for these purposes," which is more particularly described in the specification, marked A, and the three sheets of drawings, marked B, C, and D, respectively, which are hereunto annexed ; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four ; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years : And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Raoul Pierre Pictet, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof ; to have, hold, and exercise unto the said Raoul Pierre Pictet, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended : Provided always, that if the said Raoul Pierre Pictet shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this eighth day of July, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in producing Cold and in

A.

SPECIFICATION of RAOUL PIERRE PICTET, of Geneva, in Switzerland, civil engineer, for an invention entitled, "Improvements in producing Cold, and in the manufacture of Sulphurous Acid, and in Apparatus for these purposes."

THIS invention has for its object improvements in producing cold, and in the manufacture of sulphurous acid, and in apparatus for these purposes.

Ice-making machines now in use present serious difficulties and grave inconveniences when required to work regularly in a hot climate.

1. Ammoniacal machines work at a pressure of 20 atmospheres, with water at a temperature of 30° Centigrade and are thus liable to leakage and danger of explosion.
2. Methylated ether machines have the same objection, and in addition the danger of fire, which unfits them for use at sea.
3. Sulphuric ether machines are constantly rendered useless through leakage of air into them.
4. The necessity of lubricating all these machines causes incessant trouble.

I have found that there are great advantages in substituting sulphurous acid (SO₂) for these various agents. This gas liquefies at 10° Centigrade of cold, and then has a tension equal to the pressure of the atmosphere, and at 30° Centigrade of heat its tension does not exceed four atmospheres, so that excessive and dangerous pressures are avoided by its use. In addition to this, experience shows that in an anhydrous state it reacts neither on greases nor on metals. Numerous sulphites useful in commerce can be directly made, and again its use prevents all danger of explosion or of fire.

The apparatus in which I propose to produce the sulphurous acid is shown on sheet 1 of the drawings hereunto annexed, figure 1 being a plan and figure 2 an elevation showing the apparatus as I prefer to arrange it.

In the brickwork B is set a retort, A, of rather stout cast-iron, which is provided with a flanged pipe and inclines slightly upwards. Under the retort there are two furnaces, C C', about one metre apart. A chimney, D, allows the products of combustion to escape at any convenient point. Either sulphurous vapours or a substance capable of giving off vapours of sulphur are introduced into the retort, but by preference I use sulphur either in flour or sticks, say from 2 to 20 kilogrammes, according to the size of the retort. A small stream of commercial sulphuric acid is introduced into the retort from any convenient reservoir through a safety tube, *a*, entering at the top of the highest end of the retort. This acid runs along the retort and is volatilized by the heat of the furnace C', and its vapour by reason of its high temperature takes with it the vapour of sulphur. This mixture of vapours passes along the retort, and in passing the furnace C attains a temperature of at least 300° Centigrade. Decomposition then takes place, the sulphuric acid loses an equivalent of oxygen which combines with the sulphur and forms sulphurous acid, and at the same time the sulphuric acid itself becomes sulphurous acid. In this reaction about 5 kilogrammes of sulphuric acid of commerce (66°) and about 1 kilogramme of sulphur are required to produce 6 kilogrammes of sulphurous acid.

In order to cleanse the gas as it leaves the retort of particles of sulphur held in suspension, it is caused to ascend along an inclined pipe, E, where it deposits the undecomposed sulphur or sulphuric acid, which again descends into the retort.

Although it is not indispensable, I prefer, to ensure greater success in the operation, to use the sulphurous acid gas in an anhydrous state. For this purpose it can be passed over any substance more or less hygrometric, such as chloride of calcium, chloride of sodium, &c.; but as cheaper, I prefer to cause the gas to pass over a stream of sulphuric acid in the slightly inclined washing tubes FF, in which the sulphuric acid, entering at one end and coming out at the other, absorbs in its course all the vapour of water from the decomposed sulphuric acid. The gas is then collected in an oil gasometer, G, from whence it is withdrawn by the pump H and flows into the worm I, which is surrounded with ice. The anhydrous sulphurous acid is thus condensed into a liquid which, as it comes from the worm, is stored in copper vessels provided with a tight tap.

The drawings sufficiently indicate the arrangement of the details of the apparatus, and render unnecessary any fuller explanation. A vessel, M, surrounded with ice is shown for condensing the greater part of the water in the gas before it passes to the washing tubes, but this detail is not essential. The gas thus liquefied and stored may be used for any purpose. I will now describe the way in which I propose to use it in the manufacture of ice.

The principle of the apparatus is the same as that already used with other agents, and consists in producing cold by the evaporation of a volatile liquid, but the apparatus is here considerably simplified.

The apparatus is shown in plan and elevation on sheet 2 of the drawings, and is composed of three parts.

1. The refrigerator, figure 1, in which the congelation is produced by the volatilization of the liquid sulphurous acid. It consists in a copper or iron tubular boiler, A, of ordinary construction, jacketed and having tight joints. The liquid sulphurous acid is introduced into the boiler by the opening *a* and circulates among the tubes, which it surrounds, and then as it volatilizes it is sucked up the ascending tube B. A saline solution (such as will not freeze at less than 15° or 20° of cold) circulates in the interior. A screw, C, placed in front of the tube plate and driven in any convenient way causes the salt water to circulate very rapidly, so that all the tanks of the refrigerator are in a bath as cold as possible. This rapidity of circulation is one of the important elements of success in the operation. Around the tubular boiler are disposed, as is seen in the drawing-sheet, iron tanks containing the water to be frozen. These tanks, D, contain from 10 to 20 litres, and are separated the one from the other by spaces of a few millimètres, so as to allow the freezing liquor to pass. The number of the tanks, it is unnecessary to say, depends on the size of the machine. The cistern containing the tanks is protected by a bad conducting jacket.

2. The double-acting suction and circulation pump is shown at figure 2. The sulphurous acid vapours resulting from the volatilization of the liquid acid in the boiler A of the refrigerator are sucked through the pipe B by the pump, which receives them by the tube X and expels them through the tube X' to the condenser hereinafter described. The pump is of ordinary construction, and is driven in any convenient

the manufacture of Sulphurous Acid.

convenient way. The stuffing-box only requires a particular arrangement. As is seen at figure 4, the stuffing-box of the piston rod is long, and has at its centre a metallic ring which divides the pump in two. At this ring there is a small tube which communicates with the suction pipe of X the pump, so that the gas which has leaked through the packing is again sucked into the pump, thereby materially reducing the loss. If desired, the cylinder and piston rod may be lubricated, but in this arrangement lubrication may be dispensed with.

3. The Condenser—figure 3. The sulphurous acid vapours forced out by the pump are brought to the top of the condenser E by a tube having on it the cock *e*. The condenser is tubular, and is shown in the drawing in a vertical position, but it may be in any other position, or may be replaced by a worm of iron, copper, or other metal. A stream of water, either fresh or salt, constantly circulates around the worm in the opposite direction to the flow of the gas, say entering at *e*² and flowing out at *e*³, so as to absorb the heat given off by the condensation of the sulphurous acid vapour. The acid is liquefied by the pressure of the pump and descends to the bottom of the condenser. At the bottom of the condenser there is a discharge cock, *e*¹, through which the liquefied acid passes into a copper or iron receptacle, G, in which there is a small cylinder or sphere carrying a stem which closes a small orifice at the bottom. This float is balanced by a spring, and the condensed sulphurous acid rises more and more up the float until the line of floatation is reached, when the stem rises and opening the orifice allows the liquid to escape by the opening and to return to the refrigerator by the closed tube H. The sulphurous acid is thus constantly recondensed, and the quantity required to replace leakage is very small.

The drawing shows the arrangements of connections, but it must be understood that these arrangements may be modified according to circumstances, for on board ship I use an apparatus which is identical in principle, but differs slightly in its arrangement, as is shown on sheet 3 of the drawings. The parts corresponding to those on sheet 2 are marked with the same letters. Here the exhaust and circulating pump is driven directly by a small engine, as shown in the drawing. The cylinder P of the engine receives steam from the boiler, and has a piston whose rod, Q, carries a cross head and connecting rod, driving a fly-wheel in the usual manner; but the rod Q is also carried back on the other side of the piston through the end of the cylinder, and serves as the piston rod of the pump R which exhausts the sulphurous vapours from the refrigerator, and forces them to the condenser.

The refrigerator and condenser I by preference place one above the other, as indicated in the drawing, both being horizontal and pointing along the ship, thereby avoiding excessive agitation of the liquids, more especially the water in the freezing tanks.

Parallel partitions may also be introduced longitudinally, but not going to the two ends, so as not to prevent the circulation of the salt water, but at the same time limiting the effect of the rolls. The float is in this case placed under the condenser.

Having thus described the nature of my said invention and the manner of performing the same, I would have it understood that I do not limit myself to the precise details of this description, but that what I claim as my invention is—

First—The mode of manufacturing liquid sulphurous acid, substantially as described and shown on sheet 1.

Second—The employment of liquid sulphurous acid in freezing machines, substantially as described.

Third—The arrangement of freezing apparatus, substantially as described and shown on sheets 2 and 3.

In witness whereof, I, the said Raoul Pierre Pictet, have hereunto set my hand and seal, this eighth day of June, in the year of our Lord one thousand eight hundred and eighty.

Witnesses—

LEONCE ERIC CHARLES PICTET, Genève, Négociant.

AMI NICENCE, Préparateur, Soleil levant, 3.

Signed, sealed, and delivered by the abovenamed Raoul Pierre Pictet, at the British Consulate, Geneva, Switzerland, this eighth day of June, 1880, in my presence;—

JOHN AULDGO,

Her Britannic Majesty's Consul for Switzerland, resident at Geneva.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to Raoul Pierre Pictet, this eighth day of July, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 14 May, 1881.

The application of Mr. R. P. Pictet for Letters of Registration for "Improvements in producing Cold and in the manufacture of Sulphurous Acid, and in Apparatus for these purposes" having been referred to us, we have examined the specification and drawings accompanying the same, and have now the honor to report that we see no objection to the granting of Letters of Registration, provided that the second claim is not to be held as covering sulphurous acid in general, but only its employment in the freezing machine described, sulphurous acid being one of the volatile liquids mentioned in former specifications as applicable to the production of cold.

We have, &c.,

J. SMITH.

CHAS. WATT.

The Under Secretary of Justice.

NOTE.—The suggestion of the Board as to the interpretation to be put on the second claim having been accepted by Mr. Pictet, Letters of Registration were issued accordingly.

[Drawings—three sheets.]

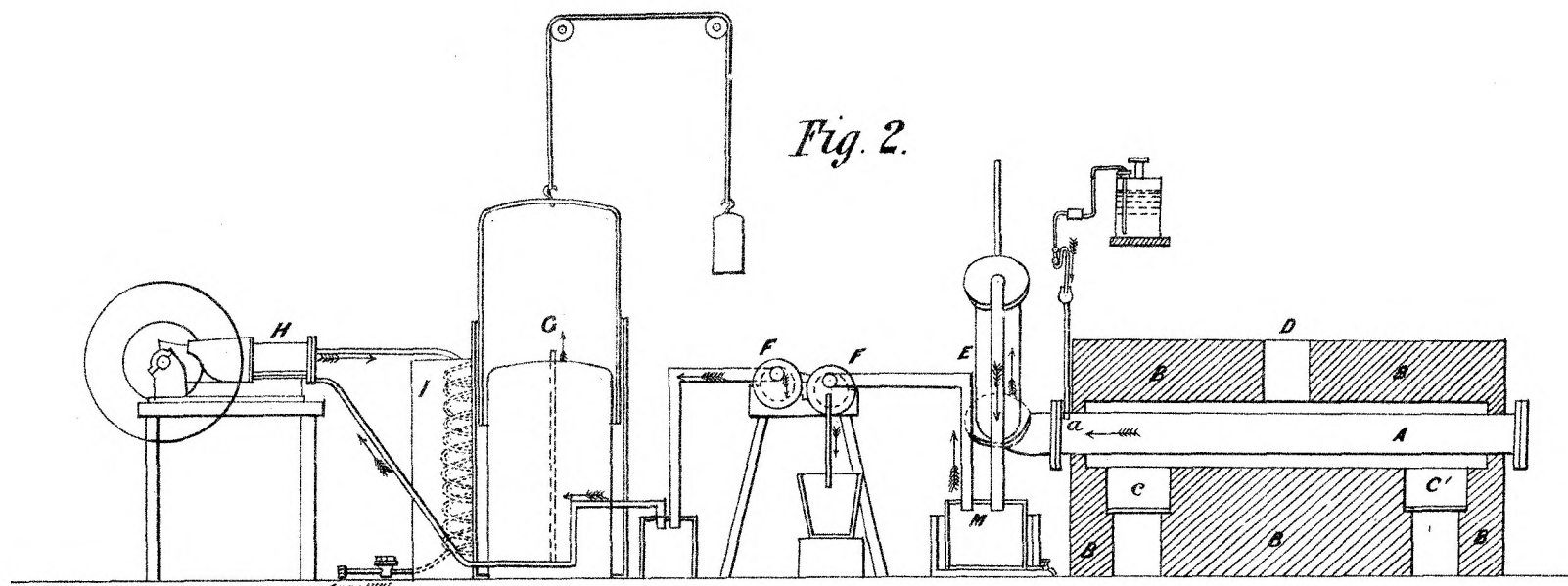


Fig. 2.

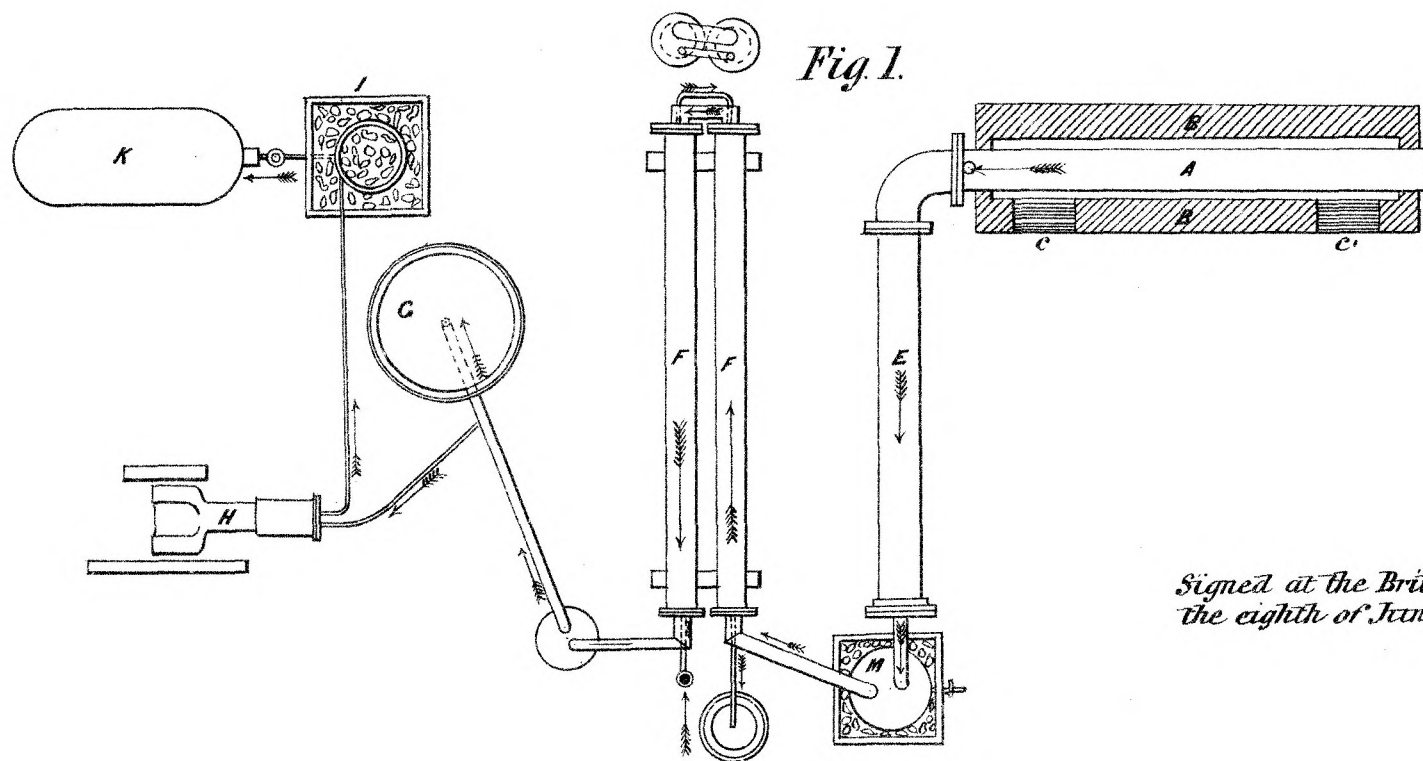


Fig. 1.

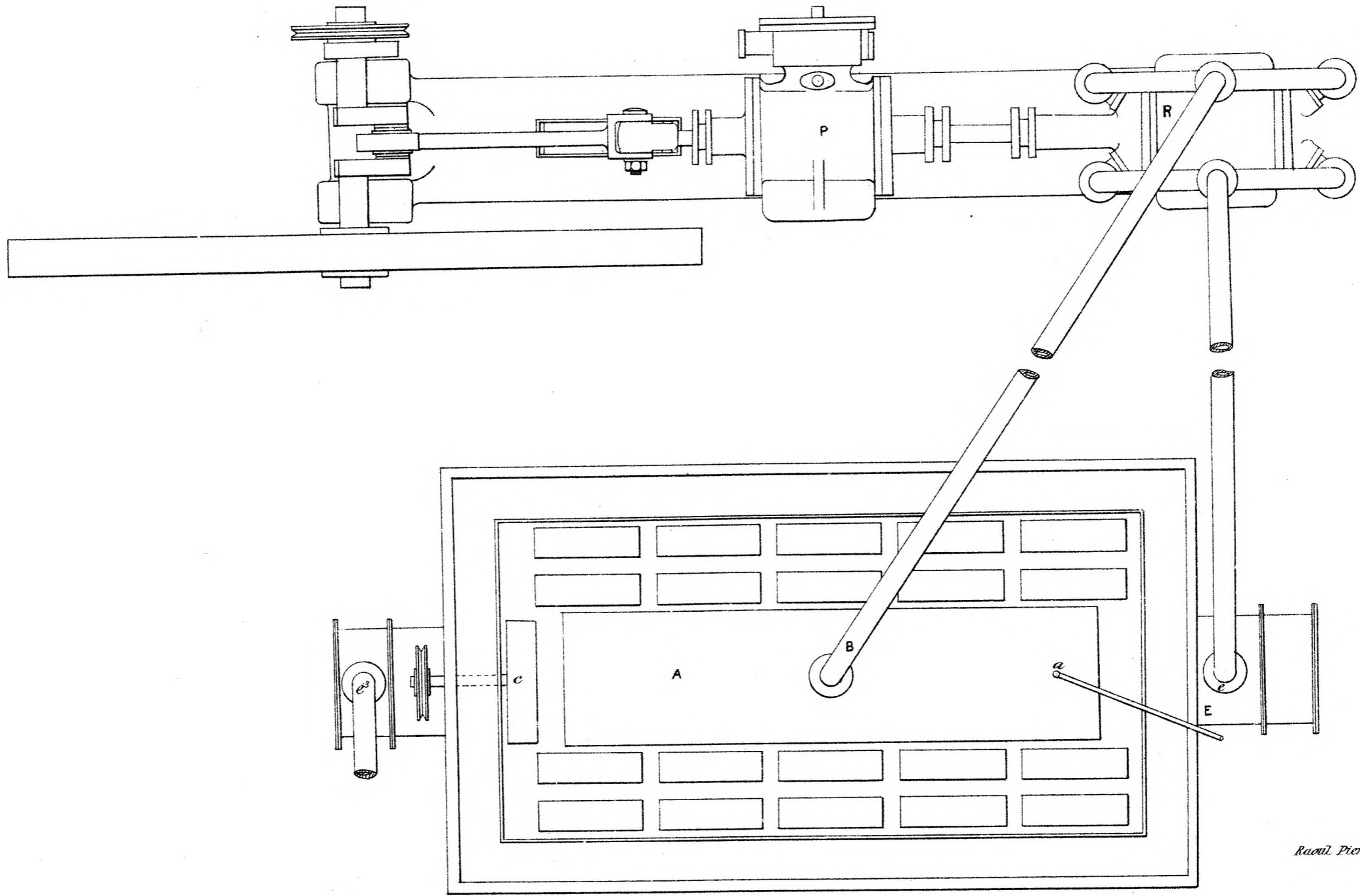
Signed at the British Consulate Geneva Switzerland
the eighth of June 1880.
John Auldjo,
H. B. M. Consul.

This is the Sheet of Drawings marked B. referred to in the annexed
Letters of Registration granted to Raoul Pierre Pictet, this eighth
day of July, A. D. 1881.
Augustus Loftus.

Leonce, Eric, Charles, Pictet, Rue Petitot Genève
Négociant

Ami, Nicanor, Préparateur, Soleil Levant.

Raoul Pierre Pictet.



Raoul Pierre Pictet

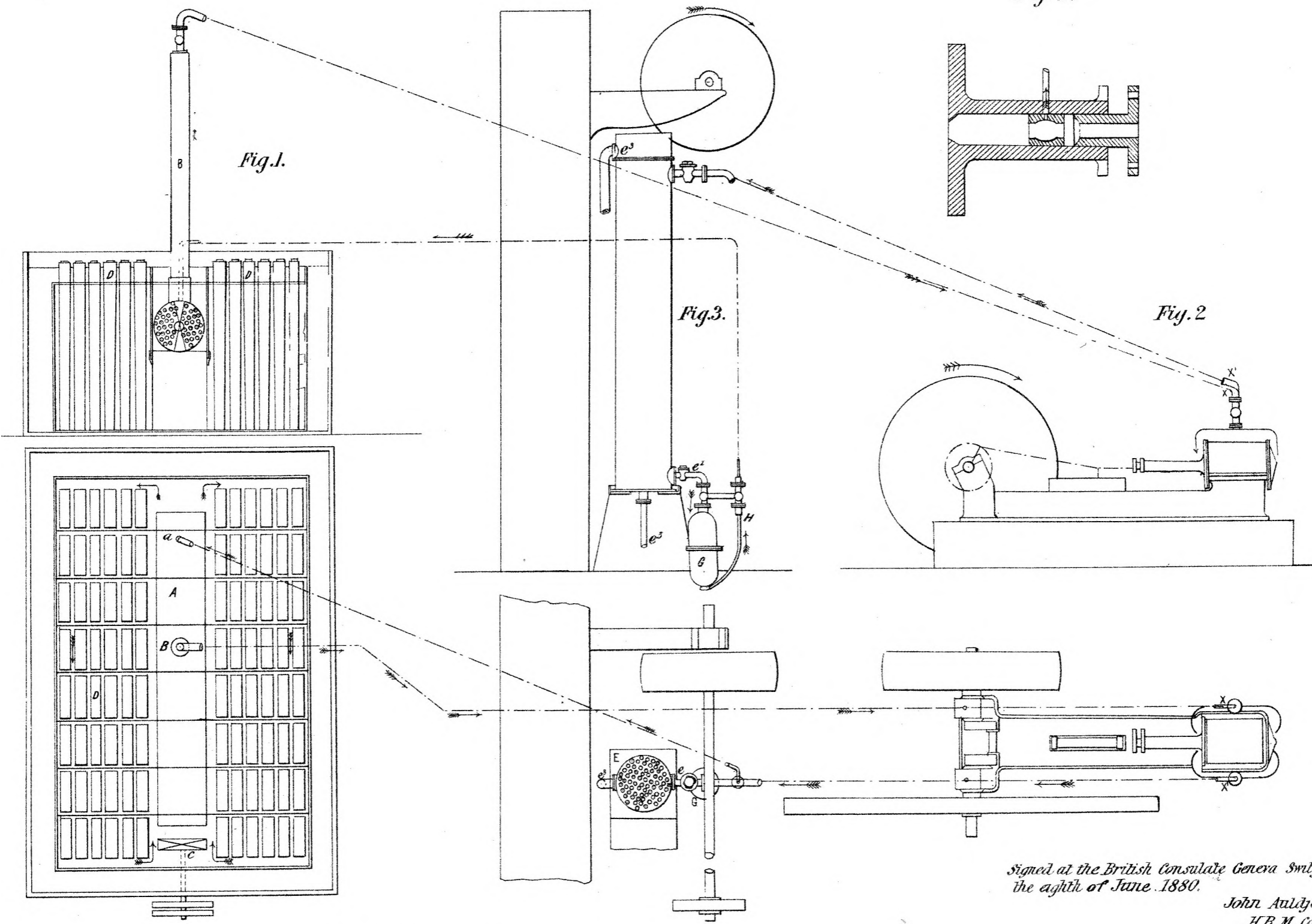
*This is the Sheet of Drawings marked C referred to in the annexed
Letters of Registration granted to Raoul Pierre Pictet, this eighth
day of July, A.D. 1881.*

Augustus Loftus.

*Leonce, Eric, Charles Pictet rue Pâquier Genève
Négociant*

*Signed at the British Consulate Geneva,
Switzerland, the eighth of June, 1880.
John Auldjo,
H.B.M. Consul.*

Ami Nicot Préparateur, soleil levant 2,3



This is the Sheet of Drawings marked D referred to in the annexed Letters of Registration granted to Raoul Pierre Pictet, this eighth day of July, A.D. 1881.

Augustus Loftus.

Signed at the British Consulate Geneva Switzerland the eighth of June 1880.

*John Auldjo,
H.B.M. Consul*

Ami, Nicotose Préparateur Soleil levant

*Leonce Eric, Charles Pictet rue Pètilot Genève
Négociant*

Raoul Pierre Pictet.



A.D. 1881, 8th July. No. 952.

**IMPROVEMENTS IN APPARATUS FOR THE MANUFACTURE OF NAILS FOR
FASTENING HORSE-SHOES AND OTHER PURPOSES.**

LETTERS OF REGISTRATION to John Addison Coleman, for Improvements in Apparatus for the manufacture of Nails for fastening Horse-shoes and other purposes.

[Registered on the 8th day of July, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting:

WHEREAS JOHN ADDISON COLEMAN, of Providence, Rhode Island, United States of America, engineer, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in Apparatus for the manufacture of Nails for fastening Horse-shoes and other purposes," which is more particularly described in the specification, marked A, and the two sheets of drawings, marked B and C respectively, which are hereunto annexed; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said John Addison Coleman, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said John Addison Coleman, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said John Addison Coleman shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this eighth day of July, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Apparatus for the manufacture of Nails.

A.

SPECIFICATION of JOHN ADDISON COLEMAN, of Providence, Rhode Island, United States of America, engineer, for an invention entitled "Improvements in Apparatus for the manufacture of Nails for fastening Horse-shoes and other purposes."

It has been proposed to manufacture nails such as are employed for fastening horse-shoes, my machinery operating in the following manner:—

A bar of iron rolled with a thickened rib along each edge is fed step by step under a pair of punches, which by their descent punch transversely therefrom two blanks or pieces of the metal intended each to form a nail, the thickened end in each case being suited to form the head of the nail. As these pieces are severed, they lie to opposite hands in the die, and in that position they are received by spring fingers, which by a sweeping movement take them out of the die and carry them round, one towards the right and one towards the left, and insert them between two rollers. In passing through between those rollers the blanks are drawn out in length, and squeezed partly towards the finished shape. Leaving the rollers, the blanks are again seized by fingers and transferred to another pair of rollers, by which they are further drawn and pointed to the required shape. From the second pair of rollers the nails are transferred to a pair of finishing punches, which strip off the thin fins and such other protuberances as may be caused by the squeezing action of the rolls, delivering the nails in finished condition. My invention consists in improvements in the general arrangement and construction of apparatus of this kind, whereby the structure and action of the parts are rendered more simple, and the machine, besides being less expensive in first cost, is thus rendered more durable and capable of producing an increased quantity of the articles which it manufactures.

The accompanying drawings represent my improved machine:—Fig. 1 is a front view, fig. 2 a side view, and fig. 3 a vertical section of the machine. The other figures show separately parts thereof drawn to an enlarged scale, that is to say, fig. 4 is a front view, fig. 5 a side view, and fig. 6 a plan of the apparatus for transferring the punched blanks from the die to the first pair of squeezing rollers. Fig. 7 is a front view, showing the mode of holding the blank as it issues from the first pair of rolls so as to transfer it to the second pair of rolls; fig. 8 being an enlarged side view, and fig. 9 an enlarged plan of the spring holders employed for this purpose. Figs. 10 and 11 are respectively front and side views, showing the mode of holding the nails ready for the action of the finishing dies. In all these figures corresponding parts are marked by similar reference letters. A is the framing of the machine, which at its upper part has bearings for the main shaft A^1 , by the continued revolution of which all the movements of the various parts are effected. This shaft may conveniently be driven as shown by bevel gearing, $A^2 A^3$, from a more rapidly revolving shaft, A^4 , which may be driven from any suitable motor. In the middle of the shaft A is fixed an eccentric, A^5 , which in every revolution of the shaft gives an up and down motion to a pair of punches, b . These punches are so shaped as to punch at each stroke a pair of blanks having approximately the shape of the nails, from a bar, B. This bar, as is more clearly seen in fig. 4, is rolled of a section having the metal thickened towards each edge; and the two punches b being set, the one with the broad part of its face towards the right, and the other with the broad part of its face towards the left, each punches out a blank having one of its ends wider and thicker than the other to form the nail-head, the two blanks thus punched being forced through the die b^1 with their heads presented towards the right and left respectively. At each up stroke of the punches b the bar B is fed forwards a suitable distance to present fresh metal for the next punching. This feed motion is effected in the following manner:—A barrel cam, A^6 , on the shaft A, gives reciprocating movement to a bent lever, B^1 , and through it to a sliding carriage, B^2 . In this carriage is a hinged flap, b^2 , which is alternately prized firmly down on the bar B and relieved therefrom. This movement is effected by a face cam, A^7 , on the shaft A, which, engaging a stud on a vertical slide bar, a , causes it to reciprocate, and this movement communicated by a connecting rod, a^1 , to a lever, a^2 , mounted on the carriage B^2 , brings a cam face, a^3 , on that lever alternately to bear on the flap b^2 and to relieve it. The cams A^6 and A^7 are so timed to one another and to the eccentric A^5 that, while the punches b worked by A^5 are performing the upper part of their movement clear of the bar B, the flap b^2 is pressed firmly on the bar B, and the carriage B^2 is advanced the proper feeding distance; while the punches b descend the carriage B^2 holding the bar B remains stationary, and while the punches b are penetrating and holding the bar B the flap b^2 is released, and the carriage B^2 moves back without tending to drag back the bar B. The two blanks punched from the bar B are pressed through the die b^1 , each in a horizontal attitude, being received between the spring jaws of a holder, c^1 , for the one blank, and c^2 for the other blank. These two holders c^1 and c^2 are respectively fixed on spindles, C^1 and C^2 , which are geared together by toothed wheels, c^3 and c^4 , at their ends, so that the two spindles make a partial revolution in opposite directions—the one of them, C^1 , being worked by a crank which engages in a cam slot in a reciprocating plate, C^3 . This plate, which is mounted on a pivot, c^5 , is worked by a rod, C^4 , from a lever, C^5 , which is pivoted at C^6 , and has a forked end embracing an eccentric, A^8 , on the shaft A. The spindles C^1 and C^2 are mounted on a frame, C, which is pivoted at c^6 to the framing of the machine, and is drawn up by a spring, c^7 . The cam slot in C^3 is so shaped as to give to the holders $c^1 c^2$ the following series of movements:—First, having remained in their upper position for a time stationary, to receive their respective blanks pushed into them by the descent of the punches b , they are caused by the partial movement of the lever C^5 to turn through an angle of 90° , each therefore turning its blank from a horizontal to a vertical attitude, with its head presented downwards. The crank of c^1 now comes against a stop, c^8 , on the frame C, preventing the holders $c^1 c^2$ from turning further round; but the continued movement of C^3 causes the frame C to move bodily downwards, and the blanks are thus thrust by their holders between the first pair of rollers, $D^1 D^2$. The dotted lines in fig. 4 indicate these movements of the holders. As the lever C^5 makes its back stroke, the frame C is raised by the spring c^7 , and the spindles $C^1 C^2$ are turned backwards through 90° , so that the holders $c^1 c^2$ resume their first position ready to receive another pair of blanks from the die b^1 . The two pairs of rollers, $D^1 D^2$, the upper pair, and $D^3 D^4$, the lower pair, receive reciprocating rotary motion through a part of a revolution, each pair in opposite directions by toothed wheels D^5 and D^6 , which gear with one another, whilst D^5 gears with a pinion on the axis of the roller D^1 , and D^6 gears with a pinion on the axis of D^3 , the pinion

Improvements in Apparatus for the manufacture of Nails.

pinion on D^1 gearing with a pinion on D^2 , and the pinion on D^2 gearing with a pinion on D^4 . The first wheel, D^5 , has on its axis a crank arm, D^7 , which is linked by a rod, D^8 , to a crank pin, A^9 , projecting from the wheel A^2 , so that for each revolution of the shaft A the rollers are caused to perform their complete reciprocation. The rollers have portions of their peripheries hollowed out, as indicated by the dotted lines $d^1 d^2$ in fig. 4, and by the darkened parts $d^1 d^2 d^3 d^4$ in fig. 3; these hollows being so shaped that the blanks delivered from the holders $c^1 c^2$ in between the rollers $D^1 D^2$ are, by the movement of these rollers, to a certain extent squeezed into shape and extended in length, and that the blanks delivered thus partly shaped from the rollers $D^1 D^2$ are further shaped to their final form by the hollows of the second pair of rollers, $D^3 D^4$, between which they are caused to pass. The rollers $D^1 D^2$ are so set on their axes, and their movement is so timed to that of the holders $c^1 c^2$, that they present their hollows, $d^1 d^2$, upwards, when the holders $c^1 c^2$ descend, inserting the blanks between the rollers; and this descending movement of the holders is made to correspond as nearly as possible with the surface movement of the rollers $D^1 D^2$, as they begin to grip the blanks, until the rollers having got a firm grip drag the blanks out of the holders, and pass them through to other holders ready to receive them below the rollers $D^1 D^2$, in order to transfer them to the lower rollers $D^3 D^4$. The holders e for this purpose, shown to an enlarged scale in figs. 8 and 9, and appearing partly in section as they hold the blank in fig. 7, present trumpet-mouthed slots, having one side covered by a movable piece, e^1 , which is held up by a spring, e^2 . The upper rollers $D^1 D^2$, in delivering the two blanks from between them through a fixed guide, d^5 , thrust the blanks head downwards, one into each of the slots in e , the cover piece e^1 yielding to let the heads of the blanks pass, and then being returned by the spring e^2 , so as to grip firmly the shanks of the blanks, the heads of the latter projecting below as indicated in fig. 7. The blanks thus held in the slots of e are by the descent of e conveyed to the lower rolls $D^3 D^4$, and have their heads thrust into the hollows of these rolls, which are at that time directed upwards to receive them. The rolls $D^3 D^4$, having gripped the blanks, drag them out of the holder e , which reascends to receive a succeeding pair of blanks. As the blanks leave the rolls $D^3 D^4$, they are in a similar manner received by another holder like e , and are by it conveyed down to grippers hereafter to be described, by which they are presented to the finishing punches. The two holders, namely e , above the rolls $D^3 D^4$, and the corresponding holder below these rolls are respectively at the ends of arms e^3 and e^4 , projecting from vertical rods, e^5 and e^6 . These rods are caused to reciprocate in a guide, E , respectively, by studs on them engaging in the cam slots of two vibrating plates, E^1 and E^2 , worked by crank arms, E^3 and E^4 , and connecting rods, E^5 and E^6 , from two eccentrics, A^{10} and A^{11} , fixed side by side on the shaft A . The cam slots in E^1 and E^2 , and the eccentrics which work these, are so shaped and timed as to give the respective holders the required movements, that is to say, each remains for a time stationary, in its highest position, while it receives the blanks passed into its slots from the rolls above it, then each descends to deliver the blanks, the one to the rolls $D^3 D^4$, and the other to the grippers, which will now be described. A lever, F , pivoted at f^1 , has the end of its short arm rounded and toothed, to gear with a short lever which is pivoted at f^2 . On each of the levers is a pair of fingers, having their upper ends shaped to receive and hold the heads of the nails. One of the fingers is in each case fixed on its lever, the other being pivoted loosely thereon, and the fixed finger of each is linked to the movable finger of the other, so that as the lever F is caused to reciprocate, the fingers of each pair are made to open apart to receive a nail, and to close together and grip it. The lever F is worked by a link, F^1 , from a sliding rod, F^2 , which is drawn up by a spring, F^3 . A projection, F^4 , on the rod F^2 , is struck by a spring pawl hinged at the end of an arm, E^7 , projecting from the axis of E^4 , so that when the holder worked by E^2 descends with the nails received from the lowest pair of rolls the grippers connected to F are opened for a moment to receive the nail-heads, and when the arm E^7 passes F^4 the grippers are closed by the spring F^3 , so as to grip tightly the nails $g^1 g^2$, which have been introduced between them. On the reascend of the arm E^7 , the spring pawl at its end yields in passing the projection F^4 . The nails $g^1 g^2$ are held by the grippers exactly in front of a die, G , having two holes through it, each exactly the shape of a finished nail—each hole receiving a punch, h , of the same shape. The punches h are fixed to the face of a horizontal slide, H , which is connected by a link, H^1 , to one arm, H^2 , of a bell-crank lever, the other arm of which is connected by a rod, H^3 , to an eccentric, A^{12} , on the shaft A . By means of the punches h , which at their forward stroke push the nails $g^1 g^2$ out of the grippers and through the die G , is performed the final operation of cutting off from the nails such fins, burrs, or projections of the metal as may have been produced by the squeezing of the rolls, and the finished nails drop through a passage, G^1 , behind the die G , the burrs sliced off by the punches and dies falling through an opening, G^2 , in front of the die.

Having thus described the nature of my invention and in what manner the same is to be performed, I hereby declare that I make no general claim to apparatus for manufacturing horse-shoe or other nails, by punching blanks from a bar of metal, squeezing the blanks into form by rolls, and finishing by final punching, but I claim in respect of apparatus of that kind—

First—The arrangement and construction of machine, consisting of the framing A , having at its upper part bearings for a main rotating shaft, A^1 , which, by means of cranks, eccentrics, and cams, gives movement to the feed-slide B^2 , and its flap b^2 , to the punches h , to the holders $c^1 c^2$, to the rolls $D^1 D^2 D^3 D^4$, to the holders e , and the grippers of the nails $g^1 g^2$, and to the finishing punches h , substantially as herein described with reference to the accompanying drawings.

Second—The combination of the cams A^6 and A^7 , the lever B^1 and slide B^2 , the rods $a a^1$, lever a^2 , and its cam face a^3 , constituting the feed apparatus, substantially as herein described.

Third—The combination of the eccentric A^8 , fork lever C^5 , and rod C^4 , cam-slotted plate C^3 , spring frame C , and holders $c^1 c^2$, for transferring the punched blanks from the die to the upper rolls, substantially as herein described.

Fourth—The combination of the eccentrics A^{10} and A^{11} , their rods E^5 and E^6 , the arms $E^2 E^3$, the cam-slotted plates E^1 and E^2 , the slide rods e^4 and e^6 , with spring holders e , for transferring the blanks from the first pair of rolls to the second pair, and from the second pair to the grippers, substantially as herein described.

Fifth—

Improvements in Apparatus for the manufacture of Nails.

Fifth—The combination of the arm E' and its spring pawl with the spring slide F², and rod F¹, the lever F, and the grippers for holding the nails g¹ g², at the finishing dies, substantially as herein described.

Sixth—The method substantially as herein described of transferring a pair of punched blanks handed from a die to squeezing rolls, by causing them to turn through an arc of 90° in opposite directions, and then to advance to the gap of the rolls.

In witness whereof, I, the said John Addison Coleman, have hereunto set my hand and seal, this twenty-third day of March, in the year of our Lord one thousand eight hundred and eighty-one.

JOHN A. COLEMAN.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to John Addison Coleman, the eighth day of July, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 7 June, 1881.

Having examined the specification and plans accompanying the Petition, we have the honor to recommend that Letters of Registration should be issued to John A. Coleman, for an invention entitled "Improvements in Apparatus for the manufacture of Nails, for fastening Horse-shoes and other purposes," as shown in the drawing and described in the specification attached to his Petition.

We have, &c.,

E. O. MORIARTY.
EDMUND FOSBERY.

The Under Secretary of Justice.

[Drawings—two sheets.]

No. 953.

[Assignment of No. 387. See page 131 of Return of 9 July, 1875.]

No. 954.

[Assignment of No. 951. See page 199.]

No. 955.

[Assignment of No. 945. See page 167.]

No. 956.

[Assignment of No. 774. See Letters of Registration for 1879, page 145.]

No. 957.

[Assignment of No. 696. See Letters of Registration for 1878, page 107.]

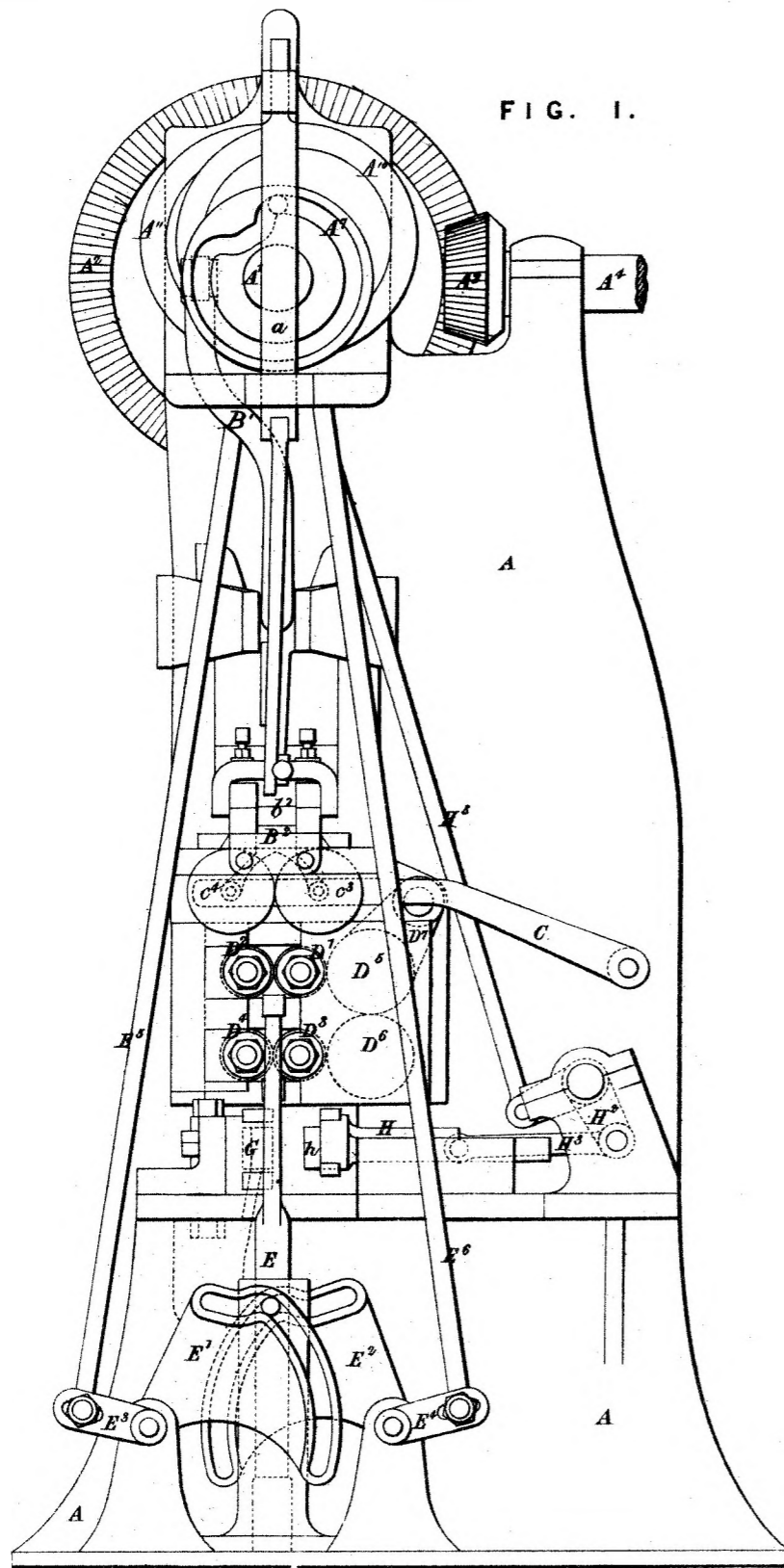


FIG. 1.

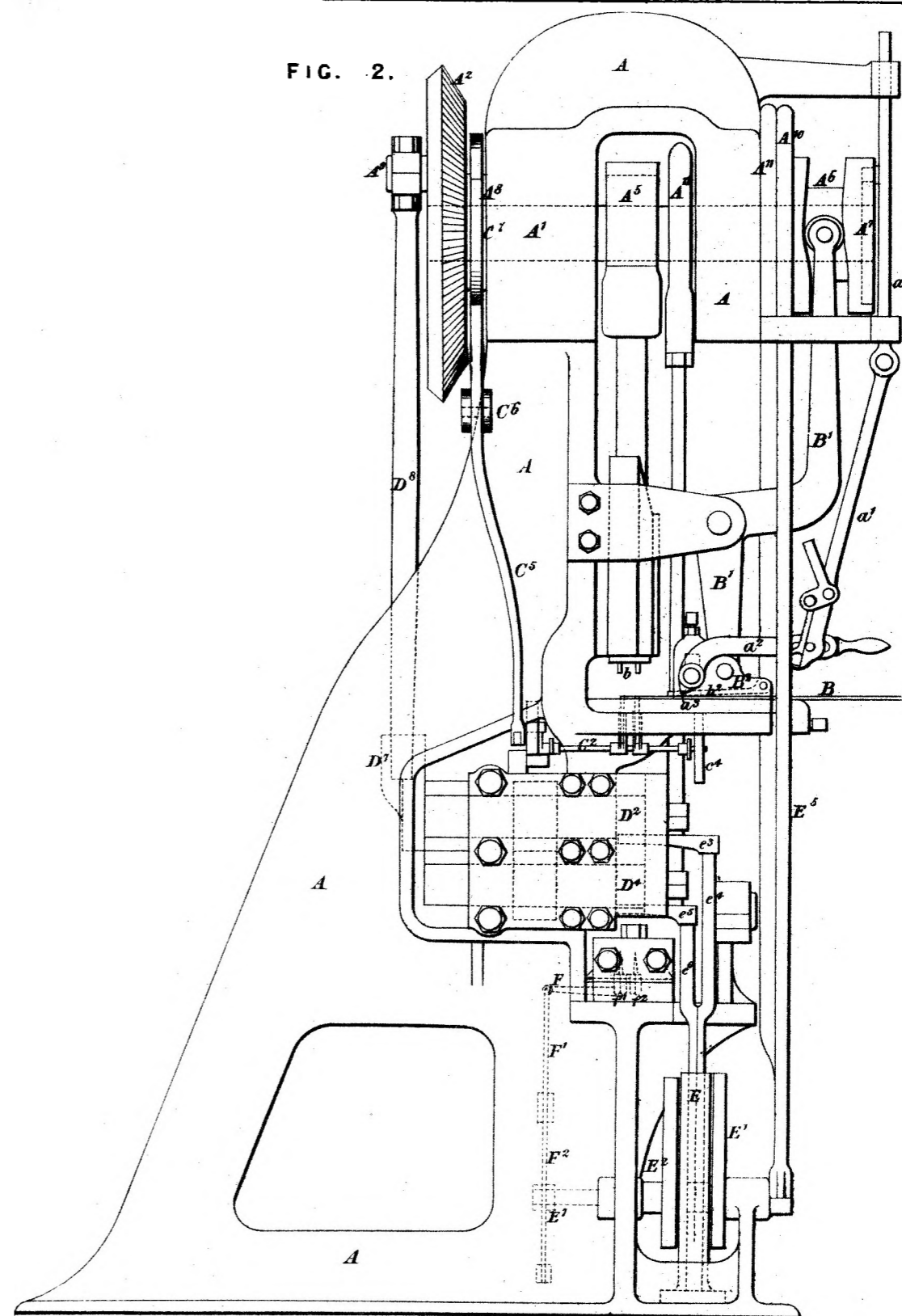


FIG. 2.

I

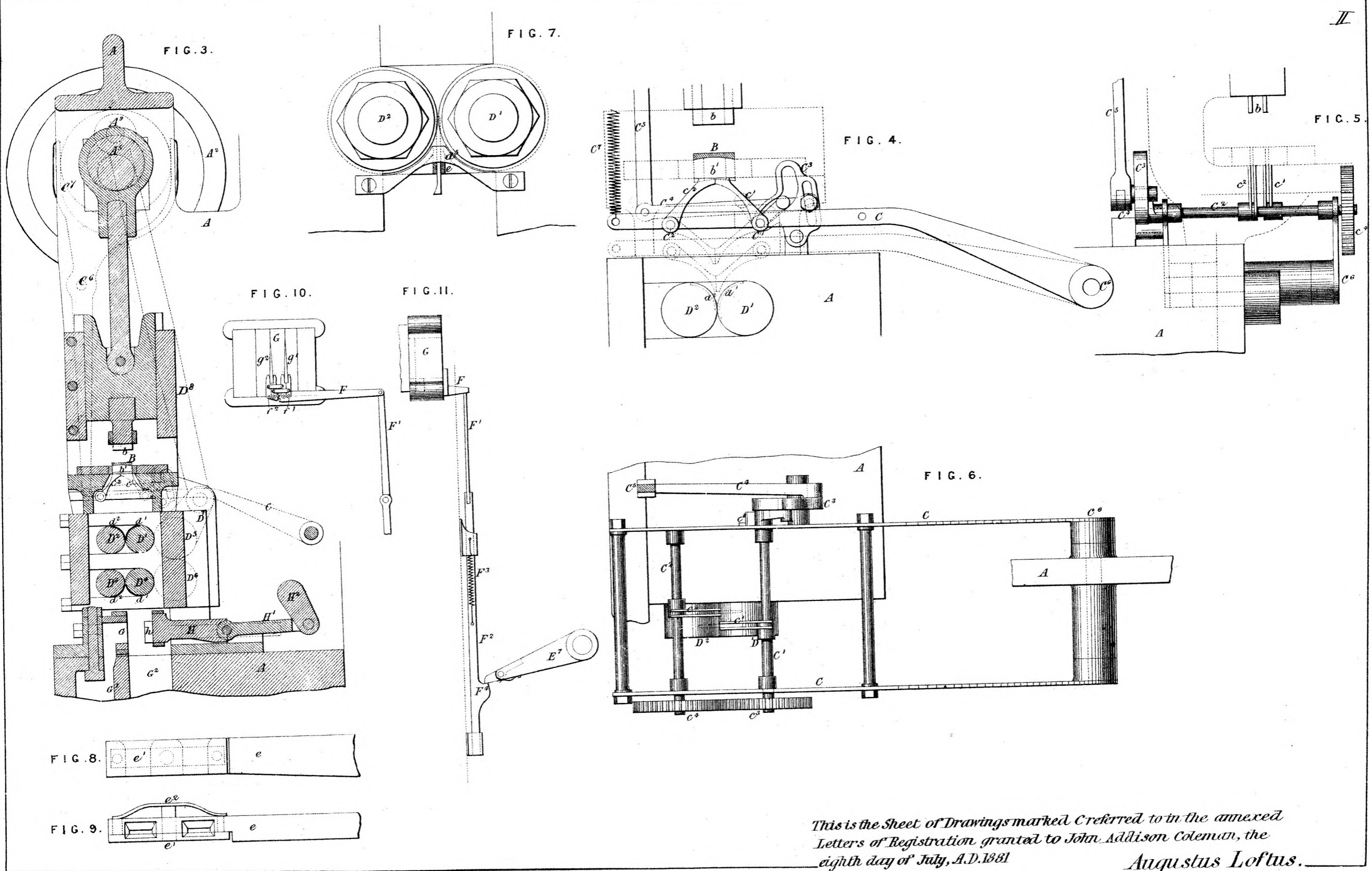
(34)

PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE, SYDNEY, NEW SOUTH WALES.

This is the Sheet of Drawings marked B referred to in the annexed Letters of Registration granted to John Addison Coleman, the eighth day of July, A.D. 1881
Augustus Loftus.

C.

II



This is the Sheet of Drawings marked C referred to in the annexed
 Letters of Registration granted to John Addison Coleman, the
 eighth day of July, A.D. 1881
 Augustus Loftus.



A. D. 1881, 2nd August. No. 958.

IMPROVEMENTS IN THE PREPARATION OF NITRO-GLYCERINE COMPOUNDS.

LETTERS OF REGISTRATION to Gilbert Smith Dean, for Improvements in the preparation of nitro-glycerine compounds.

[Registered on the 3rd day of August, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS GILBERT SMITH DEAN, of the city and county of San Francisco, State of California, United States of America, chemist, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in the preparation of nitro-glycerine compounds," which is more particularly described in the specification which is hereunto annexed; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do, by these Letters of Registration, grant unto the said Gilbert Smith Dean, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said Gilbert Smith Dean, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said Gilbert Smith Dean shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this second day of August, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in the preparation of Nitro-Glycerine Compounds.

SPECIFICATION of GILBERT SMITH DEAN, of the city and county of San Francisco, State of California, United States of America, chemist, for an invention entitled "Improvements in the preparation of nitro-glycerine compounds," and I hereby declare the following to be a full, clear, and exact description thereof:—

THE object of this invention is the preparation of a new variety of nitro-glycerine compounds.

The results sought are briefly as follows:—

First—The production of a compound which shall have greater breaking power than pure nitro-glycerine; which shall be solid and free from leakage; which shall be sufficiently plastic to enable the bore-hole to be completely filled, and the full force of the explosive to be thereby obtained.

Second—The preparation of said compound in such a manner as to permit of its ready and complete admixture with common blasting powder.

Third—The increasing of the safety of the aforesaid compounds, and of nitro-glycerine compounds in general.

The manner of accomplishing the result desired is as follows:—I first prepare a new variety of nitro-dextrine, by the process hereinafter described; I then mix the nitro-dextrine with nitro-glycerine, as hereinafter specified. Common blasting-powder or other materials may be added to the compound during the process of manufacture. I then allow the mixed material to stand and set. When first mixed it forms a liquid or paste, but it speedily hardens to a proper consistency. Increased safety is secured by mixing in explosive liquids with the compound during the process of manufacture, as hereinafter described.

The first step of the process is the preparation of the nitro-dextrine. The material used for this purpose is old cotton rag which has been thoroughly bleached; unbleached cotton, hemp, &c., may be used, as may be wood-pulp (*i.e.*, wood which has been thoroughly ground and bleached), but wood in the form of saw-dust or shavings is useless. The first-named material (*i.e.*, old cotton rag) is that which I consider best.

The preparation of the nitro-dextrine (the crude material having been selected as above) divides itself naturally into three stages:—

1. The preparation of the material.
2. The nitration.
3. The washing.

The object of the first stage is to start the conversion of the cellulose into dextrine. To this end the rag is immersed in hot dilute mineral acid, *i.e.*, sulphuric, nitric, or hydro-chloric, or a mixture of two or more of these acids. The kind of acid used is not important, nor is it necessary (or even desirable) that the dextrination be completed during this preliminary process, for, if it be once fairly started it will be continued and completed in the nitration process to be presently described.

The most convenient acid to use for this purpose is nitric, for where this (or hydro-chloric) is used, it is simply necessary to immerse the rag in the acid, heat it till it becomes tender, and then dry the rag without washing. This is because of the volatile nature of these acids. But the cheapest acid for this purpose is the waste mixture of sulphuric and nitric, the residue (or "waste acid") of the nitration process.

I shall therefore describe the process as followed with this waste acid; premising, however, that if commercial acid of any kind be substituted, it should be diluted with four or five times its volume of water; and that if a volatile acid is used, the washing process may be omitted.

It will be seen that this preliminary process (termed "cutting" by the workmen) is somewhat similar to the preparation of parchment from paper, or to the preparation of dextrine and glucose from starch.

I place the acid in a pot or boiler of porcelain or other acid-proof material, and heat it nearly or quite to boiling.

The rag being immersed in the hot acid is watched by the operator; as fast as it becomes tender he removes it and replaces it by fresh rag.

It is not generally desirable that the boiling be continued till the fibre is completely broken-down, for in that case it becomes more difficult to wash; but there is a point easily known after one or two trials, where the action of the acid is sufficient, yet where the fibre is not so completely destroyed as to render the washing slow and tedious. This point is judged by the tenderness of the rag. It should be as tender as possible, yet not reduced to pulp. If "overcut" and thereby reduced to pulp or powder, it may still be used, but, as before stated, it becomes difficult to wash.

After removal from the boiler, the material is thoroughly washed, either with water or weak alkaline solution, or both, till all acid is removed; the washing being in all cases completed with water. It is then thoroughly dried and cooled, and is ready for the next operation.

THE NITRATION.

This operation somewhat resembles the preparation of nitro-glycerine, being conducted with cold acids, stirring, and cooling.

For the nitration I use a mixture of about six parts by weight of the strongest sulphuric acid, and two parts by weight of the strongest nitric; adding thereto one part by weight of the prepared material. It is desirable that these proportions be not widely departed from, for experience has shown that one part of the dry material requires not less than one and three-fourth ($1\frac{3}{4}$) part of strong nitric acid (48° to 50° Baumé) for its nitration; and requires at least seven parts of mixed acid to form a mass sufficiently liquid for pouring. The acids are, of course, mixed and allowed to cool before using.

The mixed acids may be placed in a tank and the dried material added and stirred in; but I prefer to draw into the tank, alternately or simultaneously, and gradually, the mixed acid and the organic material, with a view to obtaining a product as nearly uniform as possible.

Constant stirring is kept up during the operation, and care is taken that all material used be in a cool state, and that heating of the tank and its contents be prevented by external cooling. In these respects the process resembles that ordinarily followed in the manufacture of nitro-glycerine.

When

Improvements in the preparation of Nitro-Glycerine Compounds.

When all the materials have been introduced into the tank, and the whole thoroughly stirred together, the process is finished. The nitro-dextrine should now be in a state of *quasi* solution in the acid, resembling "mush" or thick ropy mucilage. If, however, it be so thick that it will not pour out readily, it must be thinned by the addition of more strong acid.

The perfection of the result depends largely on the perfect management of the preliminary process described, termed by the workmen "the cutting," for if the rag be not sufficiently "cut" it nitrates in the strong acids but does not dextrinate, and consequently retains its original form of rag.

It appears in fact that the process of dextrination must be fairly started in the preliminary operation; and that when so started, it is continued in the strong acids *pari passu* with the nitration.

If, therefore, the rag be withdrawn from the cutting acids before it has become very tender, it may yield some nitro-dextrine, but will give principally nitro-cellulose; whereas, if the "cutting" process be pushed sufficiently far, complete dextrination will take place in the nitrating acids.

THE WASHING.

The nitration process being finished, the mixture of acids and nitro-dextrine should be drawn off into water.

Special precautions are here necessary to prevent decomposition of the nitro compound, for, though it appears in a state of semi-solution in the acid, it precipitates immediately when drawn into water.

It is therefore necessary—

First—That a somewhat large volume of water be used to receive the mixture, say about eight or ten times the amount of the acid mixture; still more water is better. If the water becomes more than lukewarm during the washing its quantity is insufficient.

Second—That the water be violently agitated and beaten up while the mixture is flowing into it.

Third—That the mixture be not added to the water in a lump, but be poured in gradually and not too rapidly.

Without these precautions there is certain to be more or less of over-heating and decomposition.

The nitro-dextrine falls to the bottom of the washing tank, whence it is withdrawn and washed and freed from acids by simple and well known processes.

I regard a granular semi-crystalline appearance of the finished product as evidence that the "cutting" has been well conducted; and I regard the combustion of the finished article, without leaving any notable amount of carbonaceous residue, as evidence that a sufficient amount of strong nitric acid has been employed and that the washing has been well conducted; the nitro-dextrine, however, is scarcely so combustible as the fibrous nitro compounds.

THE COMBINATION.

Having prepared the nitro-dextrine, we come to the next stage of the process, namely, the combination of the nitro-dextrine with nitro-glycerine, to produce the desired compound.

To this end, one part of nitro-dextrine (prepared as described) is thoroughly mixed with from one to three parts of nitro-glycerine, and the mixture is allowed to stand from one to two hours, that perfect combination may take place.

When first mixed the compound is a liquid or paste, but it speedily hardens or sets (like plaster) to a proper consistency for use in blasting.

The best consistency for most uses is obtained by the employment of one part of nitro-dextrine to three of nitro-glycerine. A large proportion of nitro-dextrine produces a compound of greater destructive force, but of less specific gravity.

This combination may be mixed with ordinary blasting-powder, or such modifications thereof as may suit particular uses.

It is, in fact, admirably adapted to form a component of such mixtures, as the nitro-glycerine being held by the nitro-dextrine, may be combined with the powder in any desired proportion, and all danger of leakage of nitro-glycerine from the material is avoided by the strong affinity existing between the nitro-glycerine and the nitro-dextrine.

In preparing mixtures of this kind, I mix the nitre, sulphur, and charcoal (or other organic material which may replace the charcoal) with the nitro-dextrine. The nitro-glycerine is added and the mixture left till the setting or hardening of the compound has taken place, when it is again mixed and then packed in cases for use.

We have thus, by means of the nitro-dextrine, a method of combining nitro-glycerine in any proportion with any powder whatever, and are consequently able to produce powders adapted to any and every kind of work.

In order to increase the safety of the (nitro-glycerine-nitro-dextrine) compound, herein described, as, indeed, to increase the safety of nitro-glycerine compounds in general, I mix with the compound an inexplusive liquid in such quantity as to give the degree of safety desired.

Water is the liquid which I prefer for this purpose, provided proper steps are taken to prevent its evaporation, such as packing the explosive in boxes containing damp saw-dust, or using a deliquescent salt to impede the evaporation of the water.

Non-volatile liquids may be used instead of water, but are more expensive, and generally produce a material which is more inflammable; it is, however, extremely safe against explosion.

The best method of combining these inexplusive liquids with compounds of nitro-glycerine is to add them to the solid portion of the nitro-glycerine compound; and after they have become evenly distributed through the mass, to add the nitro-glycerine and mix thoroughly. By this means a perfect combination may be obtained between the nitro-glycerine and any liquid whatever.

Five per cent. of an inexplusive liquid added to a nitro-glycerine compound increases its safety to a remarkable degree. When the proportion of the inexplusive liquid is raised to from ten to twenty per cent. of the compound, it becomes inexplusive by the ordinary detonators, and is apparently useless; but it may, when the limit of explosibility in the open air has been passed, be readily exploded when firmly confined in rock or iron.

Improvements in the preparation of Nitro-Glycerine Compounds.

It might be supposed that the admixture of water would destroy the usefulness of combinations of nitro-glycerine and blasting-powder, but such is by no means the case.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is—

1. The nitro-dextrine prepared as described.
2. The compound of nitro-dextrine and nitro-glycerine prepared as described.
3. The compound of nitro-glycerine, nitro-dextrine, and blasting-powder, prepared as described.
4. The method of increasing the safety of nitro-glycerine, consisting in combining therewith an inexplusive liquid in the manner described.

In witness whereof, I, the said Gilbert Smith Dean, have hereunto set my hand and seal, this seventh day of May, 1881.

GILBERT SMITH DEAN.

This is the specification referred to in the annexed Letters of Registration granted to Gilbert Smith Dean, this second day of August, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 25 June, 1881.

The application of Mr. Gilbert S. Dean for Letters of Registration for "Improvements in the preparation of nitro-glycerine compounds" having been referred to us, we have examined the specification accompanying the same, and have now the honor to report that we see no objection to the issue of Letters of Registration as prayed for.

We have, &c.,
J. SMITH.
CHAS. WATT.

The Under Secretary of Justice.



A.D. 1881, 2nd August. No. 959.

DENNY'S IMPROVED PERCUSSION SEPARATOR AND CONCENTRATOR.

LETTERS OF REGISTRATION to Thomas Denny, for a Machine for separating and concentrating auriferous Pyrites and for washing auriferous gravel, and for saving the Gold resulting therefrom.

[Registered on the 3rd day of August, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting:

WHEREAS THOMAS DENNY, of 113, Pitt-street, Sydney, in the Colony of New South Wales, engineer, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention of "A machine for separating and concentrating auriferous Pyrites and for washing auriferous gravel, and for saving the Gold resulting therefrom," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria number twenty-four; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Thomas Denny, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said Thomas Denny, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said Thomas Denny shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this second day of August, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Denny's Improved Percussion Separator and Concentrator.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, THOMAS DENNY, of 113, Pitt-street, Sydney, in the Colony of New South Wales, engineer, send greeting:

WHEREAS I am desirous of securing by Royal Letters Patent Her Majesty's special license that I, my administrators, executors, assigns, or such other as I or they should at any time agree with and no other, should and lawfully might from time to time, and at all times during the term of fourteen years, to be computed on the day of which this instrument shall be left at the office of the Chief Secretary, make, use, exercise, and vend within the Colony of New South Wales and its dependencies an invention for separating and concentrating pyrites, gold, and other metals, as more particularly described in specification hereunto annexed.

THOS. DENNY.

SPECIFICATION.

DENNY'S Improved Percussion Separator and Concentrator.

THIS invention is for the treatment of stanniferous ore, auriferous gravel, wash-dirt, and quartz tailings. The jigger sieve, without the revolving screen, is intended to operate upon the tailings from stamping batteries. When treating auriferous gravel or wash-dirt, the material is washed into the screen hopper A with the necessary quantity of water—about 150 gallons per minute. The screen B, while revolving 50 revolutions per minute, has the effect of thoroughly washing the gravel, also of disintegrating the clay lumps, thus liberating the gold, which follows the water through the openings in the screen bars and on to the percussion sieve C. The clean washed gravel is caused to travel by the inclination of the screen and its revolving motion to the opposite end, where it is discharged into the tail race D. The percussion sieve E is formed of two parts or frames; frame F is nine inches in depth, and is fitted with transverse pieces three inches by half-inch dovetailed into the sides and flush with the bottom. Frame F² is three inches in depth, and fitted with pieces to correspond with those in frame F. A sheet of punched iron is placed between the two frames, and the whole bolted together, forming the percussion sieve. The percussion sieve C is suspended by four rods G, to the lever, H, to which motion is given by the cam wheel I, which makes revolutions sufficient to cause 350 pulsations per minute. The lever H, when lifted by the cam wheel, falls upon a block, K, which regulates the height of lift of sieve, and communicates the necessary shock to the sieve and its contents for keeping the material under treatment in suspension by the agitation of the water.

In order to prepare the machines for work, a layer of coarse tin ore, copper ore, or pieces of round cast-iron, is spread over the sieve to a depth of one and a half inches for one-third of its length, one inch for the next portion of a third, and half an inch for the last portion. In order to make the sieve work with the greatest advantage the layer of iron is kept level on the top surface, although it is of different thicknesses; this is accomplished by making a rise in the bottom of the second portion of sieve, and a further rise in the last portion, the amount of rise being that required to make a level surface of the thick and thin layers of ore or iron as described above.

The sieve hangs freely inside the box L, which holds water to the opening M. The cam shaft is then set in motion, and the material introduced. As the quartz tailings, wash-dirt, or other material passes over the sieve, the gold, mercury, pyrites, tin, copper, or other heavy material is drawn through the load as the sieve ascends, and thus is forced through the perforators in the sieve. After getting clear of the last-named part of the machine the metal falls into the divisions N¹, N², N³, and is drawn off in a clear state from a valve in the bottom. The waste stuff passes over the tail end of the sieve into the box O, from which it is raised by elevators P to any required height, discharged, and thus completed.

The metal gathered in N¹ is perfectly clean, that in N² a little mixed, that in N³ of about the same value as that entering the machine. This latter must be put through again.

The specialities of this machine are, that it is continuous in its action, the cost of wear and tear being nominal; that it is self-discharging; that it discharges waste at one part and clean ore or metal at another; that the peculiar motion imparted to the sieve by the rapid strokes of the percussion cam keeps the whole of the stuff passing over the sieve in suspension, thereby effecting a perfect separation of the various bodies according to their difference of specific gravity. By means of this machine auriferous gravel may be treated with greater economy than by any known process. The advantages being—1st. Placing the machine in such a position as to get rid of the refuse without further handling. 2nd. By means of the revolving screen, clay and other tough and hard substances are disintegrated, thereby liberating all the gold. 3rd. No matter how fine or scaly the gold is, it cannot escape the jigger sieve. 4th. The gold cannot be stolen, because it falls from the sieve into the safe below, and is thus out of reach of all except the manager. The usual expense of cutting and extending tail races which are necessary in all sluicing works is done away with, and no matter what position the auriferous gravel occupies in the ground it can be carried and washed at the machine, when a head of water could not be brought to bear on it. Tin or copper ore may be dressed at one-tenth of the cost entailed by the use of buddles, tyes, &c.

Pyrites may be collected in a clean state from quartz tailings without the use of blanket tables or buddles, at a merely nominal cost. One machine will be sufficient to take the discharge from ten head of stampers, and in working will only require $\frac{1}{4}$ H. P. from the engine and the partial attendance of one man or boy.

I claim as my invention this form of percussion sieve, fully described above, which when working hangs perfectly horizontal, having a level top surface, and having rises in the bottom so as to admit of different thicknesses of loading on upper surface of sieve, which at the same time shall present a level surface for the material under treatment to press over.

I claim as my invention the combination of revolving screen and percussion, which will admit of washing auriferous gravel in a mechanical way, saving all the gold, however fine, instead of the usual and costly manner of working it by manual labour in sluice boxes, thereby losing a large percentage of fine gold.

I claim as my invention the combination of percussion sieve, the mode of giving it motion, the revolving screen, and the whole being a complete mechanical combination for treating auriferous gravel cheaply and for separating and concentrating pyrites.

And

Denny's Improved Percussion Separator and Concentrator.

And I do hereby, for myself, my heirs, executors, and administrators, covenant with Her Majesty, Her Heirs and Successors, that I believe the said invention to be a new invention as to the public use and exercise thereof, and that I do not know or believe that any other person than myself is the true and first inventor of the said invention, and that I will not deposit these presents at the office of the Chief Secretary with any knowledge as aforesaid.

In witness thereof to these presents I have hereunto set my hand and seal, this _____ day of June, one thousand eight hundred and eighty-one, at Sydney, in the Colony aforesaid.

THOS. DENNY.

Witness to signature,—

This is the specification referred to in the annexed Letters of Registration granted to Thomas Denny, this second day of August, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

We do ourselves the honor to state that we are of opinion that Letters of Registration may be granted in favour of Mr. Thomas Denny, for his invention of "A machine for separating and concentrating auriferous pyrites, and for washing auriferous gravel, &c.," in accordance with his Petition, specification, drawings, and claim transmitted for our report under your blank cover communication of the 10th instant, No. 5,599.

Sydney, 23 June, 1881.

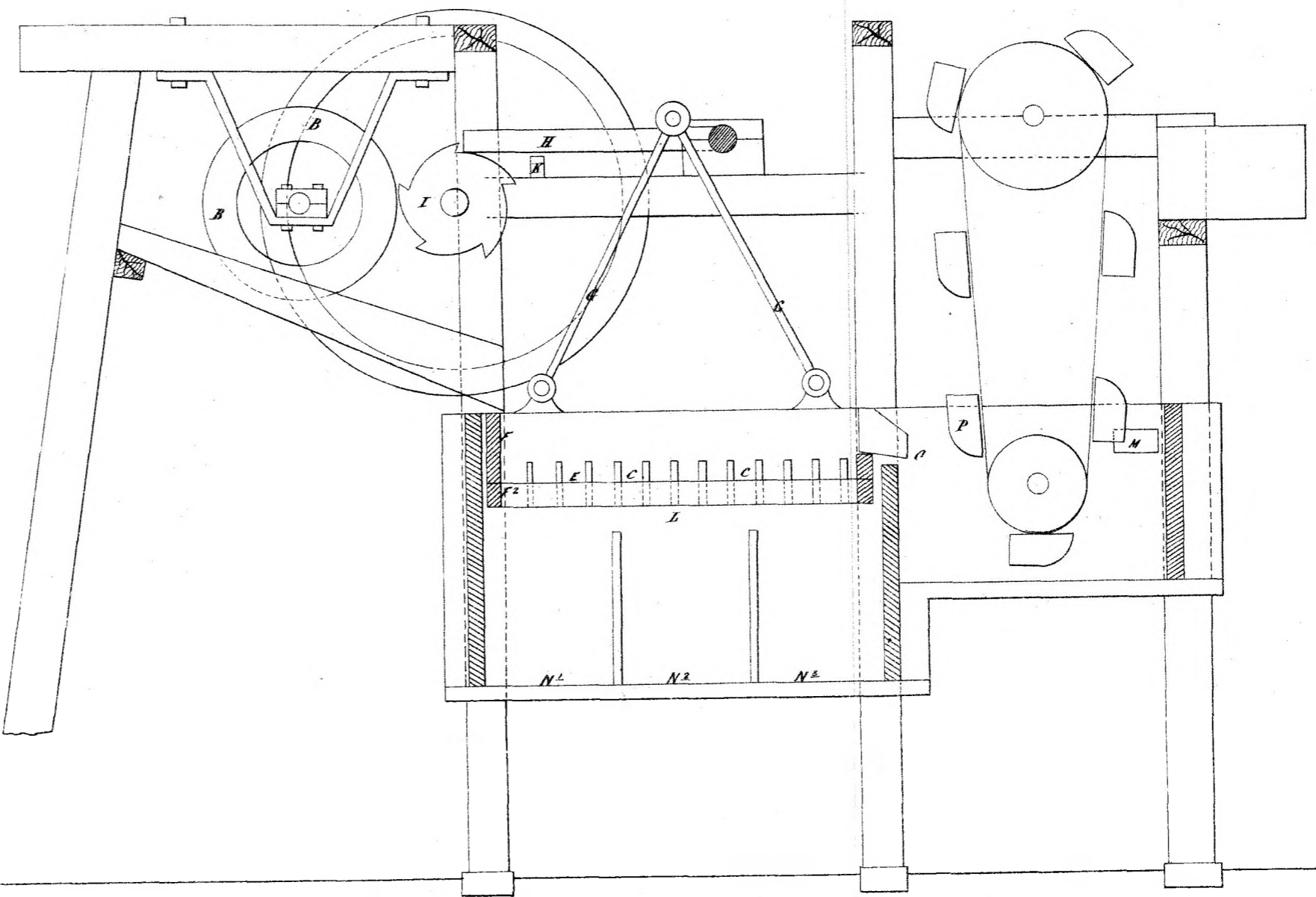
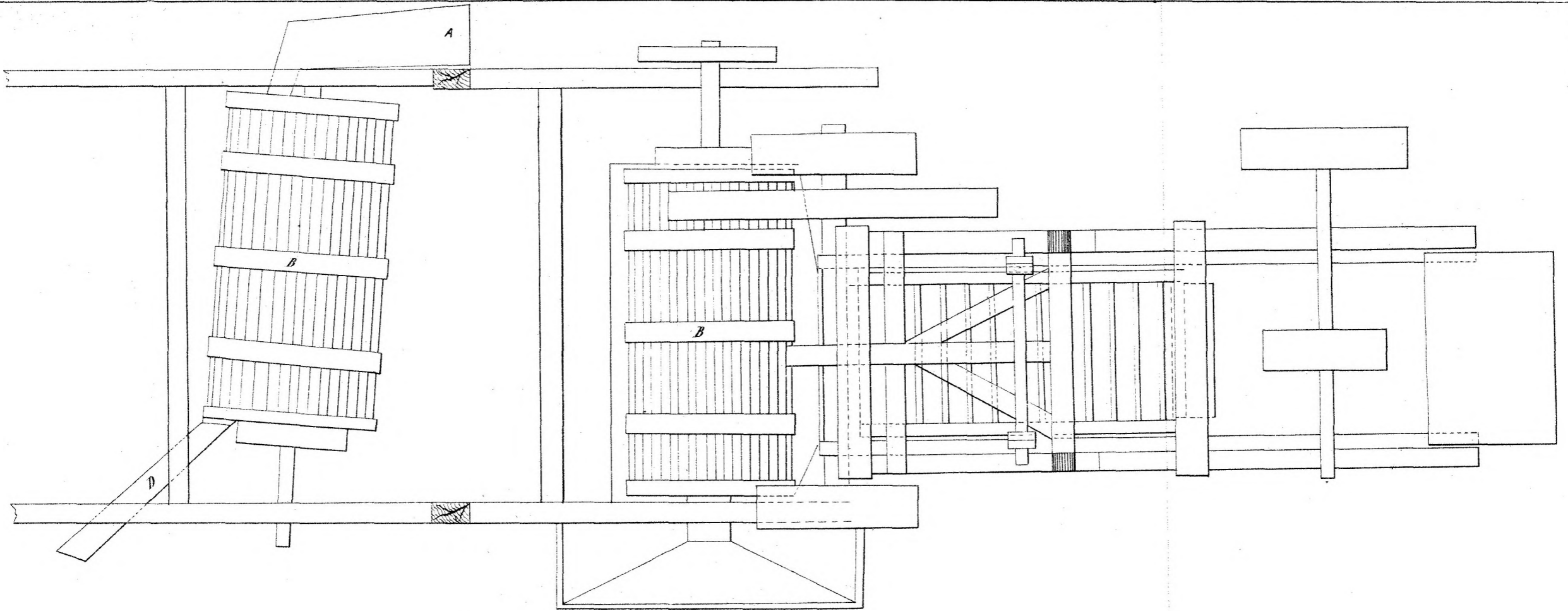
We have, &c.,

A. LEIBIUS.

GOTHER K. MANN.

The Under Secretary of Justice.

[Drawings—one sheet.]



*Denny's Patent Percussion
Separator and Concentrator*

*This is the Sheet of Drawings referred to in the annexed
Letters of Registration granted to Thomas Denny, this
second day of August A.D. 1881*
Augustus Loftus.



A.D. 1881, 2nd August. No. 960.

AN IMPROVEMENT IN MACHINES FOR STRIPPING GRAIN.

LETTERS OF REGISTRATION to James Morrow and William Henry Nicholson,
for an Improvement in Machines for stripping Grain.

[Registered on the 3rd day of August, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS
(commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of
the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-
Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS JAMES MORROW and WILLIAM HENRY NICHOLSON, both of No. 25, Bouverie-street, Carlton, in the Colony of Victoria, agricultural implement makers, have by their Petition humbly represented to me that they are the assignees of James Morrow, of Bouverie-street, Carlton aforesaid, agricultural implement maker, who is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "An Improvement in Machines for stripping Grain," which is more particularly described in the specification and sheet of drawings which are hereunto annexed; and that they, the said Petitioners, have deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and have humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to them for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said James Morrow and William Henry Nicholson, their executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said James Morrow and William Henry Nicholson, their executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said James Morrow and William Henry Nicholson shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this second day of August, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

An Improvement in Machines for stripping Grain.

SPECIFICATION of JAMES MORROW and WILLIAM HENRY NICHOLSON, both of No. 25, Bouverie-street, Carlton, in the Colony of Victoria, agricultural implement makers, the assignees of James Morrow, of Bouverie-street, Carlton aforesaid, agricultural implement maker, the author or designer of an invention entitled "An Improvement in Machines for stripping Grain."

THIS invention of an improvement in machines for stripping grain relates to the contrivances for conveying motion to the beaters of such machines, and has the effect of considerably reducing the draught. Hitherto this motion has been conveyed by means of a belt and pulley, more recently by a chain and chain pulley, and now we convey it by means of toothed gearing. This toothed gearing may be variously arranged. In our drawings we illustrate two of such ways, the first of which is technically called "spur" gearing, and the other "mitre" gearing, but both are toothed gearing.

Figure 1 shows side view of that part of a grain-stripping machine to which our spur gearing is applied; and figure 2, plan thereof.

Figure 3 shows side view of sufficient of a grain-stripping machine to illustrate our mitre gearing; and figure 4, plan thereof.

A is the ordinary wheel of a stripping-machine, carrying a circular toothed rim, A¹, in which there gears a pinion, B, on spindle B¹, supported on the framing in the usual way. This is the spindle which usually carries the large belt or chain wheel, but on which we place a spur wheel, B², which drives intermediate wheel C (supported on spindle C¹), which in its turn drives the pinion D on what is frequently called the "drum" shaft, but which is really the shaft which carries the beaters. If so preferred the intermediate wheel C might be dispensed with, but then the sizes of the wheel B² and pinion D would have to be altered to enable them to engage with each other, and at the same time retain their relative proportions so as not to alter the speed, and the toothed rim A¹ would have to be toothed on the outside, as in figure 3, instead of the inside, in order that the motion of the beater shaft might be in the right direction.

In figures 3 and 4, A¹ is the circular rim toothed on the outside, which engages with the pinion B, the spindle of which also carries mitre wheel E, which in its turn engages with mitre pinion F on spindle F¹, at the other end of which is bevel wheel F², gearing into another bevel wheel, F³, on the beater (or drum) shaft.

It will be noticed that the driving pinion B in figures 1 and 2 gears into the front side of the circular toothed rim, whereas it ordinarily gears into the hinder side.

Having thus described the nature of our invention, and the manner of performing same, we would have it understood that what we claim as our invention is—

The combination and arrangement of toothed gearing, substantially as herein described, for the purpose of imparting the necessary rotary motion to the beater (or drum) shaft of machines for stripping grain.

In witness whereof, we, the said James Morrow and William Henry Nicholson, have hereto set our hands and seals, this second day of December, one thousand eight hundred and eighty.

Witness—

W. S. BAYSTON, Clerk to Edwd. Waters, Melbourne, Patent Agent.

JAMES MORROW.
W. H. NICHOLSON.

This is the specification referred to in the annexed Letters of Registration granted to James Morrow and William Henry Nicholson, this second day of August, A.D. 1881.

AUGUSTUS LOFTUS.

REPORTS.

Sir,

Sydney, 14 March, 1881.

We do ourselves the honor to report, in reply to your blank cover communication of the 7th December, 1880, with reference to Messrs. Morrow and Nicholson's Petition for Letters of Registration for an invention of "An improvement in Machines for Stripping Grain," that we are of opinion that the invention has hardly sufficient novelty to warrant the issue of Letters of Registration.

We have, &c.,
E. O. MORIARTY.
JOHN WHITTON.

The Under Secretary of Justice.

Sir,

Sydney, 15 June, 1881.

While still entertaining considerable doubts as to the degree of novelty claimed for this invention warranting the issue of Letters of Registration, yet, as it would seem that they have been obtained in South Australia and Victoria, we are unwilling to refuse the applicant the benefit of the doubt, and would therefore beg to recommend the issue of Letters of Registration in the case.

We have, &c.,
E. O. MORIARTY.
JOHN WHITTON.

The Under Secretary of Justice.

MORROW & NICHOLSON'S.

PATENT

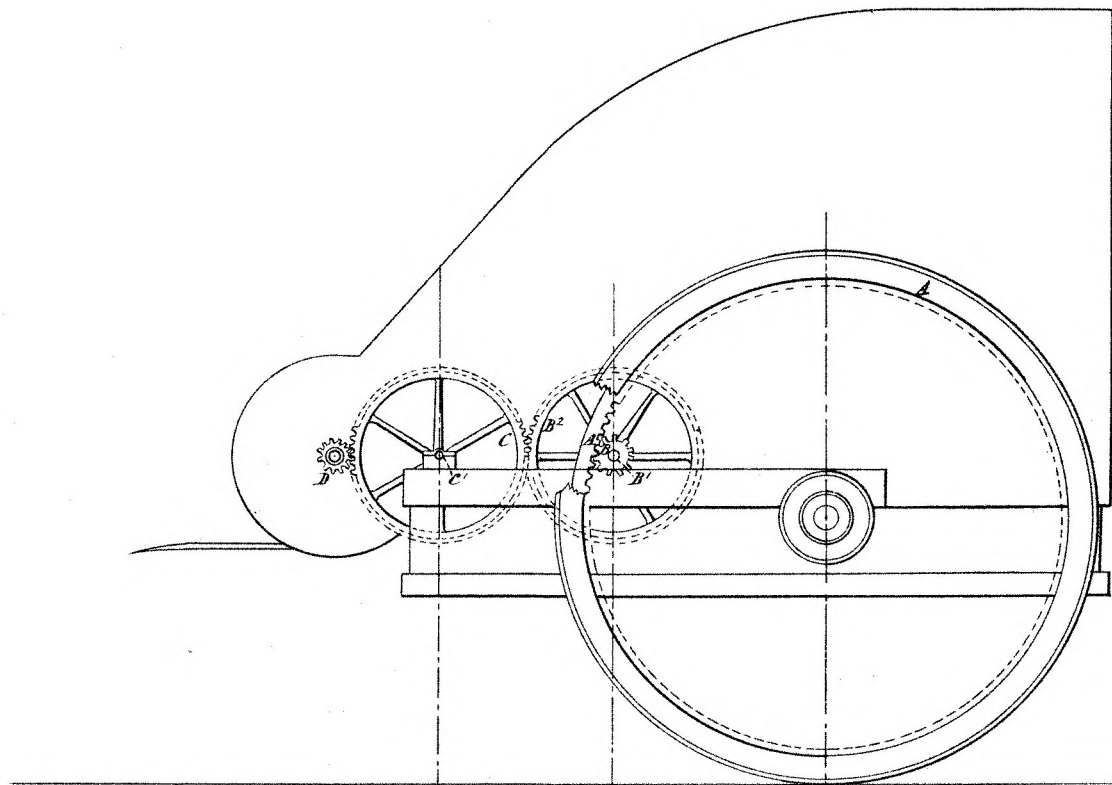


Fig. 1.

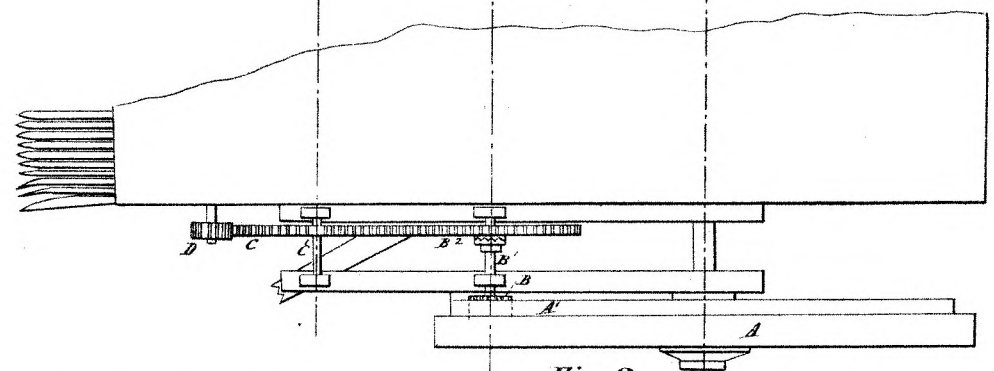


Fig. 2.

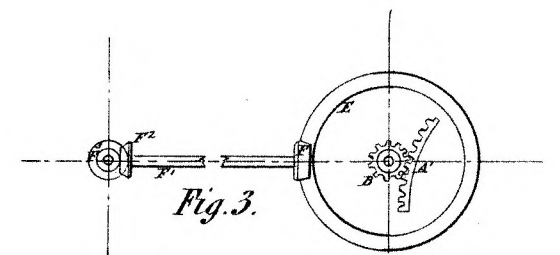


Fig. 3.

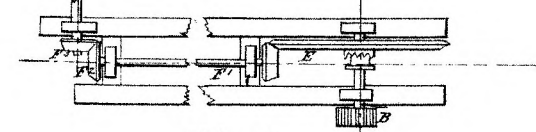


Fig. 4.

This is the Sheet of Drawings referred to in the annexed Letters of Registration granted to James Morrow, and William Henry Nicholson, this second day of August A.D. 1881.

Augustus Loftus.



A.D. 1881, 2nd August. No. 961.

IMPROVEMENTS IN GAS MOTOR ENGINES.

LETTERS OF REGISTRATION to Nicolaus August Otto, for Improvements in Gas Motor Engines.

[Registered on the 3rd day of August, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS NICOLAUS AUGUST OTTO, of Deiltz, on the Rhine, in the German Empire, engineer, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in Gas Motor Engines," which is more particularly described in the specification, marked A, and the three sheets of drawings, marked B, C, and D, respectively, which are hereunto annexed ; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four ; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years : And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Nicolaus August Otto, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof ; to have, hold, and exercise unto the said Nicolaus Augustus Otto, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended : Provided always, that if the said Nicolaus August Otto shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this second day of August, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Gas Motor Engines.

A.

SPECIFICATION of NICOLAUS AUGUST OTTO, of Deiltz, on the Rhine, in the German Empire, engineer, for an invention entitled "Improvements in Gas Motor Engines."

IN gas motor engines it is found to be very advantageous to ignite the combustible gaseous charge while the piston is still at the dead centre before commencing the working stroke, or when it has only moved slightly from that position. In the construction of the gas motor engine now generally known as the "Otto Silent Engine," and described in the specification to former Letters Patent granted to me, a space was provided in the cylinder beyond the piston when at the end of its in-stroke for containing the combustible charge whereby the engine was enabled to be worked in the manner above mentioned, and the space thus formed remained charged with air or products of combustion after the piston had performed its return stroke after the working out-stroke.

According to the present improvements the said space is still retained at the end of the cylinder, but means are provided for removing the products of combustion therefrom at the end of each return stroke of the piston after the working out-stroke either by means of an auxiliary piston so arranged that when the working piston performs its in-stroke the auxiliary piston advances into the said space so as to expel its contents, while when the combustible charge is drawn in and is being compressed the said space is left free by the auxiliary piston, or, according to another arrangement, the auxiliary piston is dispensed with and the working piston is made to perform strokes of variable length in such manner that during the return stroke after the working out-stroke it advances to near the inner end of the cylinder so as to expel the whole of the products of combustion, while at the end of the compressing in-stroke when it is on the dead centre the piston is situated at some distance from the end of the cylinder so as to leave a space into which the combustible charge is compressed.

According to another feature described in the before-mentioned previous patent, the combustible charge for the engine was so formed that while a portion of the charge at the point of ignition consisted of undiluted explosive mixture, which rendered ignition certain, the other portion of the charge consisted of combustible gas more or less diluted with or dispersed among non-combustible or inert gases whereby the combustion of the charge and consequent expansion of the gases was made to take place gradually. This mode of forming the combustible charge is also applicable with the above described modes of operating, by causing air alone to be drawn in at the commencement and afterwards a combustible mixture of gas and air.

The accompanying drawings show various arrangements for causing gas engines to operate according to one or other of the above described methods.

Figs. 1 to 7 show various arrangements for operating with an auxiliary piston. Fig. 1A shows a side elevation, and fig. 1B a plan of one arrangement. c is the engine cylinder, whose piston a is connected by a cross head running in guides (not shown on the drawing) and connecting rod a^1 to the crank shaft w , provided with a fly-wheel. c^1 is the inlet port for the combustible charge of gas and air, the admission of which is regulated by the slide c^2 , connected by rod k to crank k^1 on shaft k^2 , driven by gearing t from shaft w , the gearing being so proportioned that the crank k^1 makes one revolution for every two revolutions of w , so that the slide c^2 makes one to and fro movement while the piston a makes two in and two out strokes. By this means the piston a is during its first out stroke made to draw in the combustible charge of gas and air, which charge it compresses by the following in-stroke, after which the charge is ignited, causing the piston to perform its working out-stroke, and on the following in-stroke the gaseous products of combustion are expelled through the outlet valve v , the opening of which at every alternate in-stroke is effected by a bell-crank lever, l , connected by a rod, l^1 , to a lever, g , on shaft g , having a second lever, g^2 , with a roller in gear with a cam, n , on shaft k^2 .

The construction of the engine and its mode of operating are so far the same as described in my before-mentioned previous patent.

The cylinder c has an extension, c^1 , in which is an auxiliary piston, b , whose rod passes through a guide, d^1 , on the open cover d , and which is pressed forward into the position shown in the drawing by a spring, b^1 , the forward motion being limited by the collar on the end of the rod.

The position of the parts shown on the drawing is assumed to be that in which the piston a , being at the end of its in-stroke and on the dead centre, is about to perform its out-stroke to draw in the combustible charge of gas and air through the port c^1 , the slide c^2 being moved so as first to admit air alone and then a mixture of gas and air. On the completion of this stroke, the slide c^2 having moved so as to cut off the supply of gas and air, and the valve v being closed, the piston a , in commencing the return stroke, compresses the gaseous charge, and when, at a certain point of the stroke, the compression has attained such a degree as to overbalance the pressure of the spring b^1 , the piston b will be forced back in the extension c^1 , so that by the time the piston a has again arrived at the position shown in the drawing a space will exist between the two pistons in which will be contained the compressed charge, the passage c^3 being filled with undiluted explosive mixture of gas and air, while the said space contains such mixture more or less diluted with the air first drawn in.

By the further movement of the slide the igniting flame therein fires the compressed charge through the passage c^3 and the resulting expansion of heated gases causes the piston a to perform its working out-stroke, imparting motion to the crank shaft w and its fly-wheel. When the piston has arrived at the end of this out-stroke the cam n effects the opening of the escape valve v whereby the gaseous products of combustion are allowed to escape as the piston a performs its next in-stroke. At the same time the piston b , being relieved of the gaseous pressure in front of it, is again moved forward from its backward position into the position shown on the drawing, thereby filling up more or less entirely the space behind the piston when this arrives at end in-stroke, so that the whole of the products of combustion will be thus expelled, whereupon the above described cycle of operations will be repeated.

In the modified arrangement shown in the section of the working cylinder at fig. 2 the auxiliary piston b and the cylindrical extension c^1 are arranged at right-angles to the cylinder c , either vertically or horizontally, instead of in line therewith; the pressure of the compressed charge, in acting on the under face of the piston b , forcing it inwards against the action of the spring b^1 as before.

The

Improvements in Gas Motor Engines.

The end of the cylinder c^1 may be closed air-tight so that the imprisoned air behind the piston in being compressed will assist the action of the spring, and if the extension c^1 be vertical or inclined at any angle the weight of the piston b will also be brought in aid of the spring.

It will be evident that in both the above described arrangements the auxiliary piston might be urged by a weight instead of a spring.

In the arrangement shown diagrammatically at fig. 3 the auxiliary piston b is connected by a lever, g , and rod, p , to a lever, o , bearing with a roller against a cam, m , on shaft k^1 , which is driven by gearing t from crank shaft w so as to revolve at half the speed of the latter. By this arrangement the piston b is forced back in chamber c^1 during the compression of the charge in the cylinder, while during the second return stroke, when the products of combustion are expelled, the cam m moves the levers o and g into the positions shown in dotted lines, whereby the piston b is made to advance towards piston a so as to expel the whole of the products of combustion, as before described.

Fig. 4 shows the invention applied to a double cylinder engine, the pistons a a^1 being made to perform their in and out strokes simultaneously, but while the one is performing its compressing in-stroke the other is making its expelling in-stroke. The two auxiliary pistons b b^1 are connected to a sway beam, r , so that as b is being forced back during the compressing stroke of piston a it causes b^1 to be forced forward while piston a^1 is expelling the gases, and conversely.

In the arrangement shown at fig. 5 for a single cylinder engine the auxiliary piston has a positive motion imparted to it both for its inward and outward movement. For this purpose the shaft u , driven by gearing x at half the speed of the crank shaft w , has a crank or eccentric, u^1 , connected by rod u^2 and lever u^3 to piston b . The crank u^1 is so placed relatively to the crank of w that while the piston a is performing its suction out-stroke for drawing in the combustible charge, u^1 is moving from position 1 to position 2, and consequently the piston b during that time has a slight in and out movement, returning at the end of the stroke to the same position which it occupied at the beginning, which is that shown on the drawing. On the piston a now performing its compressing in-stroke the crank u^1 moves from 2 to 3, thereby withdrawing piston b so as to form the necessary space behind a for containing the compressed charge. During the following working out-stroke of a the crank u^1 moves from 3 to 4, maintaining piston b in its backward position; and lastly, during the expelling in-stroke of a crank u^1 moves from 4 to 1, causing b to move forward again into the position shown, so as to expel the whole of the products of combustion.

Figs. 6A and 6B show the invention as applied to a gas motor engine, in which the combustible charge is compressed by a separate pump before entering the engine cylinder, so that every stroke of the piston of the latter is a working stroke.

x is the compressing pump, having at y inlet and delivery valves arranged one above the other in any suitable known manner. The cranks w^1 w^2 respectively of the engine cylinder and the pump being situated at an angle 4—5 to each other as shown at fig. 6B, the action of the two cylinders is as follows:—The compressing pump draws in a combustible charge during the half-revolution from 4 to 1, fig. 6B, and compresses during the part 1—2 of the other half-revolution, while during the remaining portion from 2 to 4 the piston forces the compressed charge into cylinder c through the slide s , which is made for this purpose to open when w^1 is at the point 2.

On entering the cylinder c the compressed charge forces back the auxiliary piston b against the action of the spring b^1 so as to make room for the charge behind the piston a , which at the time when the compressing pump is at end of its in-stroke is just past its end in-stroke w^1 , being at point 5, it having moved from 4 to 5 while the pump crank w^2 moved from 3 to 4.

At this point the slide effects the ignition of the charge, this being the condition of the engine shown on the drawing. The piston a is then caused to perform its working stroke from 5 to 1, by the expansion of the heated gases, whereupon the escape valve v is opened by the action of cam n and the products of combustion escape while the piston is moving from 1 to 3. As the pressure in the cylinder decreases during this time the piston b is moved forward by its spring so as to meet the piston a at point 3 and thus effect the expulsion of the whole of the products of combustion. At this point the escape valve closes, and the pump piston being at point 2 while the slide is opening the inlet port to cylinder c , a fresh compressed charge is introduced and the above described cycle of movements is repeated.

The shaft k^2 being made by the gearing t to revolve with half the speed of the engine shaft, the slide s also makes a single stroke for every double stroke of the pistons, the ports and gas passages being in duplicate as shown, so that the admission and ignition of the charge will be effected during both the in and the out stroke of the slide. The cam n is also made double, so as to effect the opening of the escape valve v at each semi-revolution.

Fig. 7 shows an arrangement where the charge is also compressed by a separate pump, not shown on the drawing. In this case both the pistons a and b are connected to the crank shaft, a being connected by rod L to crank K and b by rod L^1 and lever L^2 to the smaller crank K^1 . The cranks are at such an angle that during one part of each revolution they cause the pistons to approach each other and during another part to recede from each other.

The inward movement of the piston b is made to take place while the piston a is performing its in-stroke expelling the products of combustion, while during the first part of the outward movement of b the charge is drawn in, and during the last part this piston is acted upon by the expanding gases in a similar manner to piston a .

Fig. 8 shows a construction of engine wherein the compression of the charge is effected in the working cylinder and which operates according to the second before-described method, according to which piston a is made to perform a stroke of greater length for the expelling in-stroke than for the compressing in-stroke. For this purpose the rod of the piston is not fixed to the cross-head g , but is capable of sliding through the same to an extent limited by the collars i i^1 fixed thereon, a spring, f , tending to maintain the piston in the position with its collar i^1 bearing against the cross-head, so that when no counter pressure is opposed to the pressure of the spring the piston will at the end of its in-stroke be situated close against the cylinder bottom, as shown, and it will thus be caused to expel the whole of the products of combustion during its expelling in-stroke, the escape valve v being open. But when during the compressing in-stroke the

Improvements in Gas Motor Engines.

the pressure of the compressed gases rises above that of the spring f , the piston will be forced back until the collar i comes in contact with the cross-head g , and thus when the piston has arrived at the end of its stroke there will be a space between it and the bottom of the cylinder containing the compressed charge. The cross-head g works in guides not shown, and is connected by rod a to the crank shaft w . The slide s is worked by crank k^1 on counter shaft k^2 driven at half the speed of w as before.

It will be evident that with this arrangement the charge might also be compressed by a separate pump before being introduced into the cylinder, the pressure of the inflowing charge being made to force back the piston a against the action of its spring.

Fig. 9 shows diagrammatically an arrangement in which the piston receives a positive movement for effecting the alternate longer and shorter in-strokes above described.

For this purpose the crank w^1 of the engine shaft w is connected by rod W to one end of a lever, HO, rocking on a fulcrum at O. On a pin, J, on this lever is mounted a double-ended lever, M M, whose one end is connected to the piston a , while its other end is connected by a rod, N, to a crank, P, on a shaft, P¹, driven by gearing x from shaft w at half the speed of the latter.

The crank P operates relatively to the crank w^1 in the same manner as described relatively to crank w^1 , fig. 5, so that while piston a is performing its suction out-stroke crank P moves from 1 to 2, and during the following compressing in-stroke it moves from 2 to 3, thereby moving the lever M M from the position shown in full lines into that shown in dotted lines M, so that the piston a will at the end of the compressing stroke be situated a distance away from the bottom of the cylinder, thus leaving the requisite space for containing the compressed charge. During the following working out-stroke and expelling in-stroke the crank P in moving from 3 to 1 will move lever M M back from the dotted into the full position, so that at end in-stroke piston a will be situated close against the cylinder bottom, as shown.

Having thus described the nature of my invention and in what manner the same is to be performed, I claim, in respect of a gas motor engine, whose piston is connected to a crank on the engine shaft, and in which a space for containing the combustible charge exists behind the piston when this is at the end of its stroke—

- First—The use of an auxiliary piston so arranged and operated as to be intruded into the space behind the engine piston, to expel gaseous products of combustion therefrom, and to be withdrawn from such space when the combustible charge is introduced therein, substantially as and for the purposes herein described.
- Second—Causing the engine piston to make strokes of different lengths so as at one stroke to leave a space between the piston and the end of the cylinder for containing the combustible charge, while at another stroke for expelling the products of combustion no such space is left, substantially as herein described.
- Third—The construction of gas motor engine wherein an auxiliary piston working in an extension of the engine cylinder is urged by a spring or weight so as to be intruded into the space behind the engine piston during the expelling stroke and is forced back out of such space by the compressed gases during the compressing stroke, substantially as herein described with reference to figs. 1A, 1B, and 2 of the accompanying drawings.
- Fourth—The construction of gas motor engine wherein an auxiliary piston is intruded into the space behind the working piston during its expelling stroke by the action of a cam, but is forced back out of such space by the compressed charge during the compressing stroke, substantially as herein described with reference to fig. 3 of the drawings.
- Fifth—The construction of gas motor engine with two working cylinders each of which is provided with an auxiliary piston, the two auxiliary pistons being so connected that the forcing back of one of them during the compressing stroke of the one cylinder causes the other auxiliary piston to be intruded into the space behind its working piston during its expelling stroke, substantially as herein described with reference to fig. 4 of the drawings.
- Sixth—The construction of gas motor engine wherein an auxiliary piston is actuated by a crank or eccentric so as to be intruded into the space behind the working piston during the expelling stroke, and to be withdrawn therefrom during the other stroke or strokes of the piston, substantially as herein described with reference to figs. 5 and 7 of the drawings.
- Seventh—The construction of gas motor engine with auxiliary piston for expelling the products of combustion wherein the combustible charge is compressed by a separate pump before being introduced into the engine cylinder, substantially as herein described with reference to figs. 6A, 6B, and 7 of the drawings.
- Eighth—In a gas motor engine connecting the engine piston to its crank through the intervention of a spring so that when the piston is compressing the combustible charge it will be forced back by the pressure so as to leave a space between it and the end of the cylinder for containing such charge, while at the expelling stroke the piston advances to the end of the cylinder, substantially as described with reference to fig. 8 of the drawings.
- Ninth—In a gas motor engine, connecting the engine crank to a lever on which is mounted a second lever connected at one point to the engine piston and at another point to a crank, cam, or eccentric, so arranged as to cause the piston to make a longer stroke when expelling the products of combustion than when compressing the combustible charge, substantially as herein described with reference to fig. 9 of the drawings.

In witness whereof, I, the said Nicolaus August Otto, have hereunto set my hand and seal, this twenty-third day of March, one thousand eight hundred and eighty-one.

NICOLAUS AUGUST OTTO.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to Nicolaus August Otto, this second day of August, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Improvements in Gas Motor Engines.

REPORT.

Sir,

Sydney, 16 June, 1881.

We have the honor to report that we are of opinion that there is no objection to the issue of Letters of Registration to Mr. Nicolaus August Otto, for his invention entitled "Improvements in Gas Motor Engines," in accordance with his petition, specification, and claim, transmitted to us under your B.C. communication, No. 81-4 542, of the 9th ultimo.

We have, &c.,
JOHN WHITTON.
JAMES BARNET.

The Under Secretary of Justice.

[Drawings—three sheets.]

B.

1967

I

FIG. 1^a

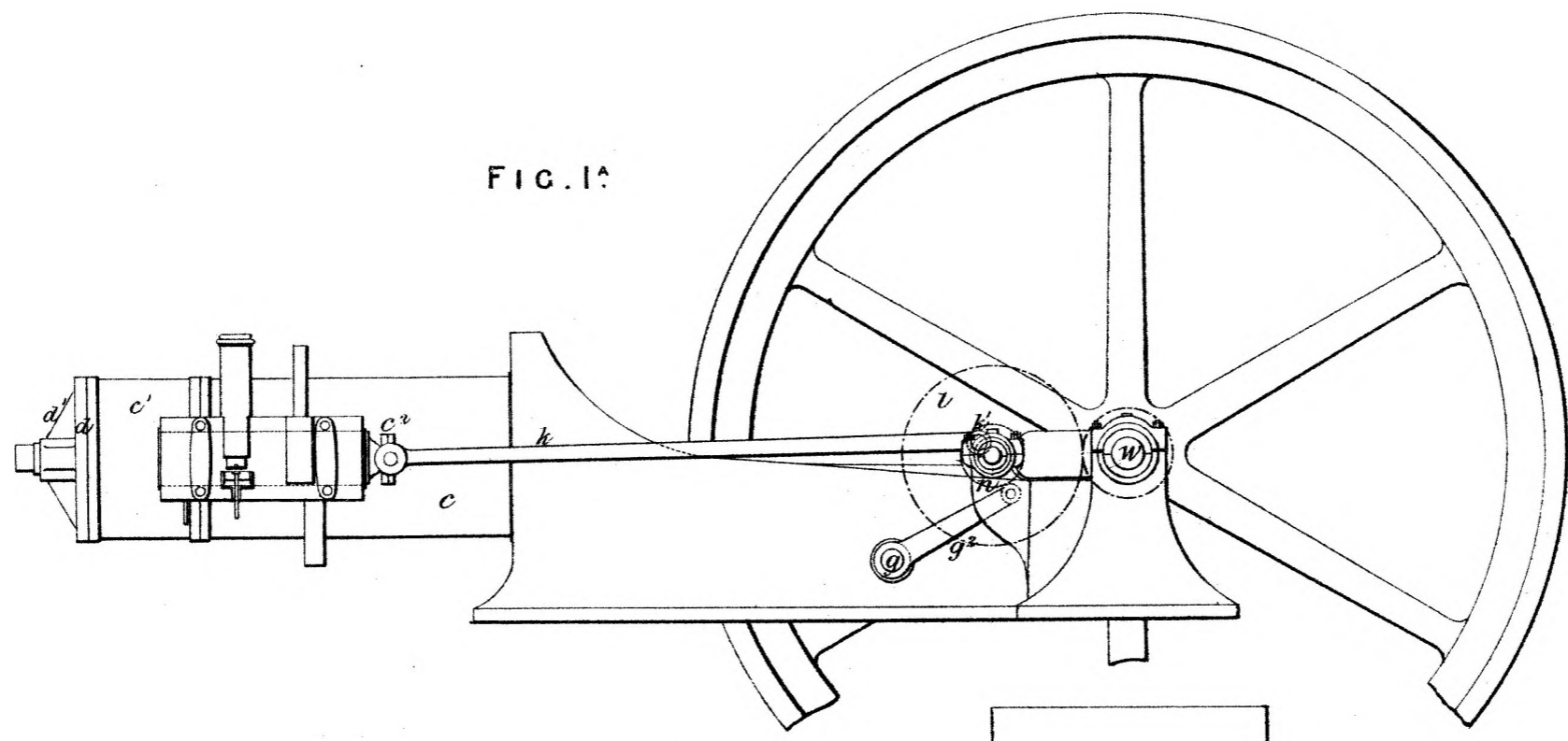
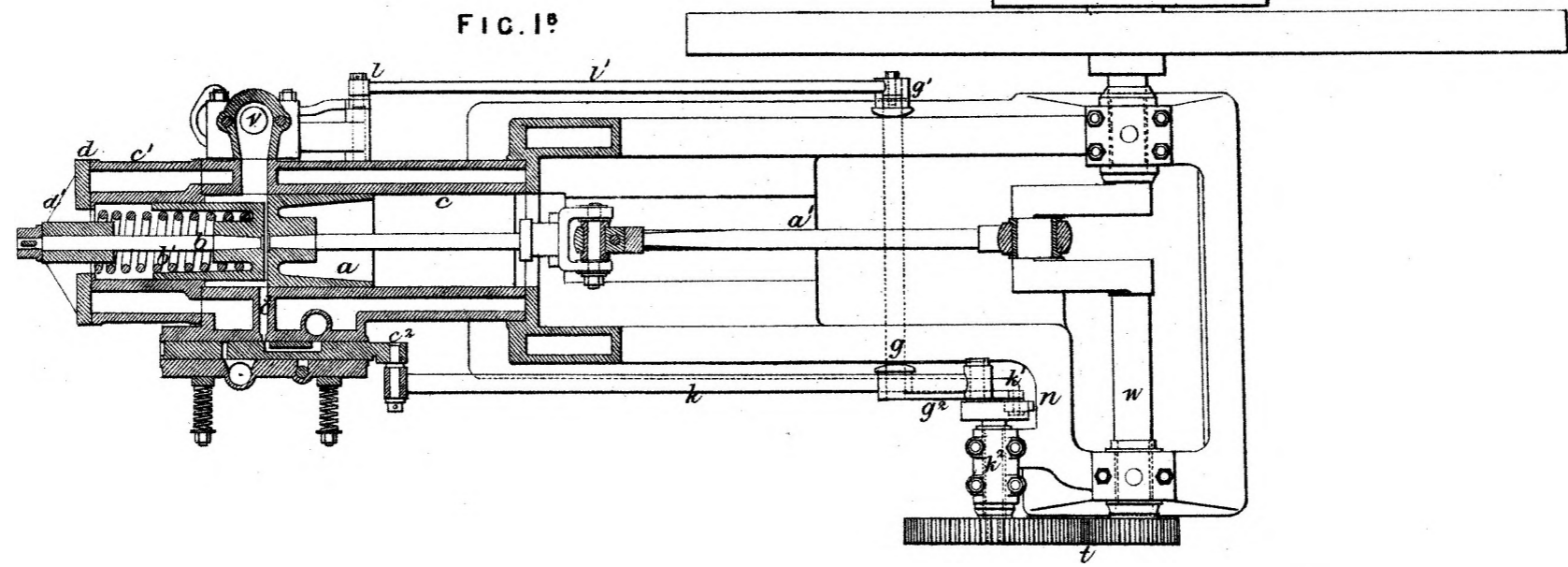


FIG. 1^b



*This is the Sheet of Drawings marked Preferred to in the annexed
 Letters of Registration granted to Nicolaus August Otto, this second
 day of August, A.D. 1881.*

Augustus Loftus.

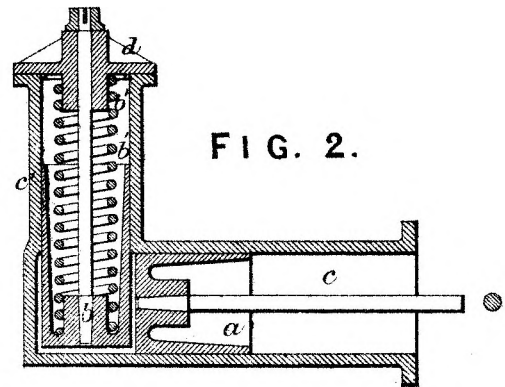


FIG. 2.

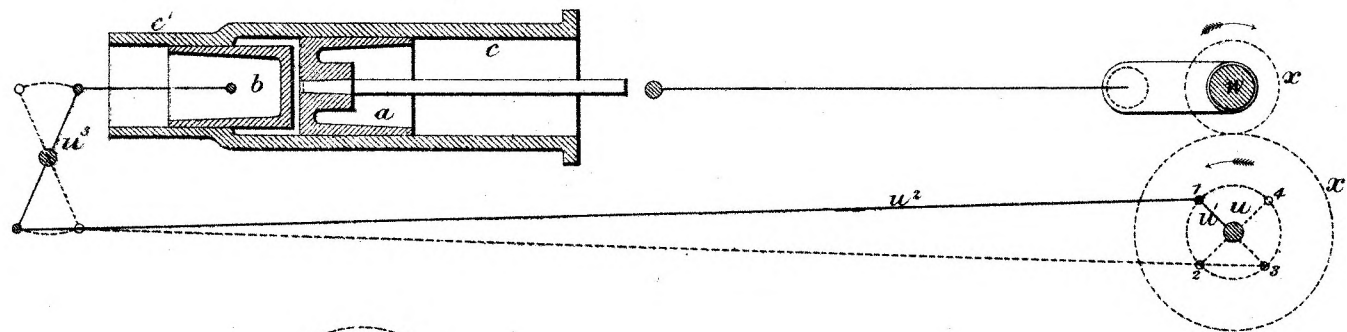


FIG. 5.

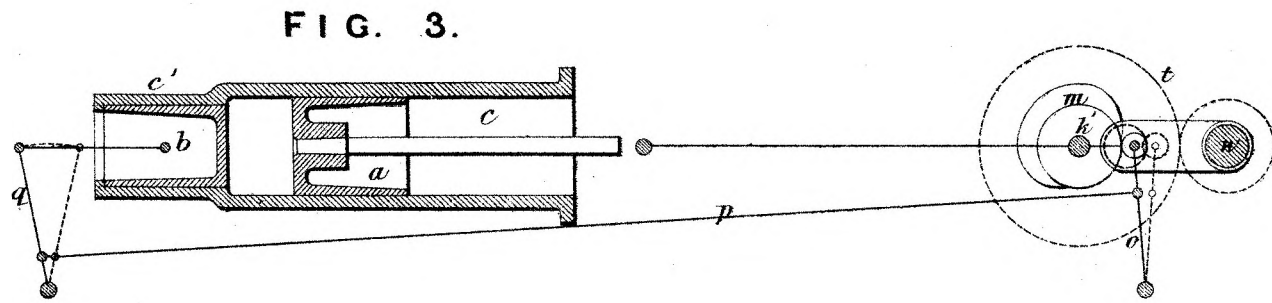


FIG. 3.

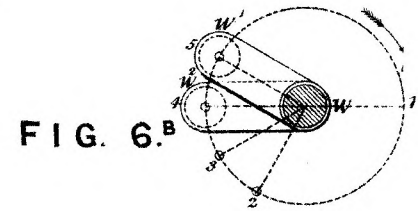


FIG. 6^B

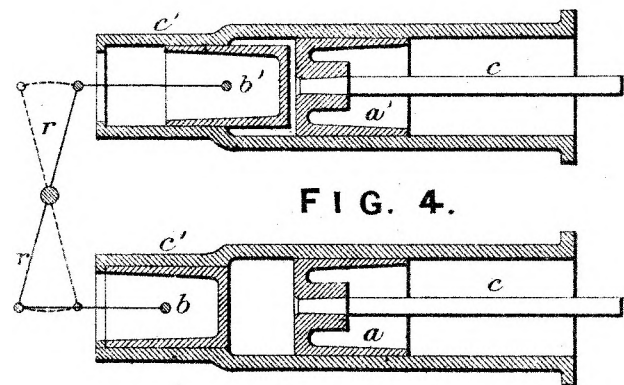


FIG. 4.

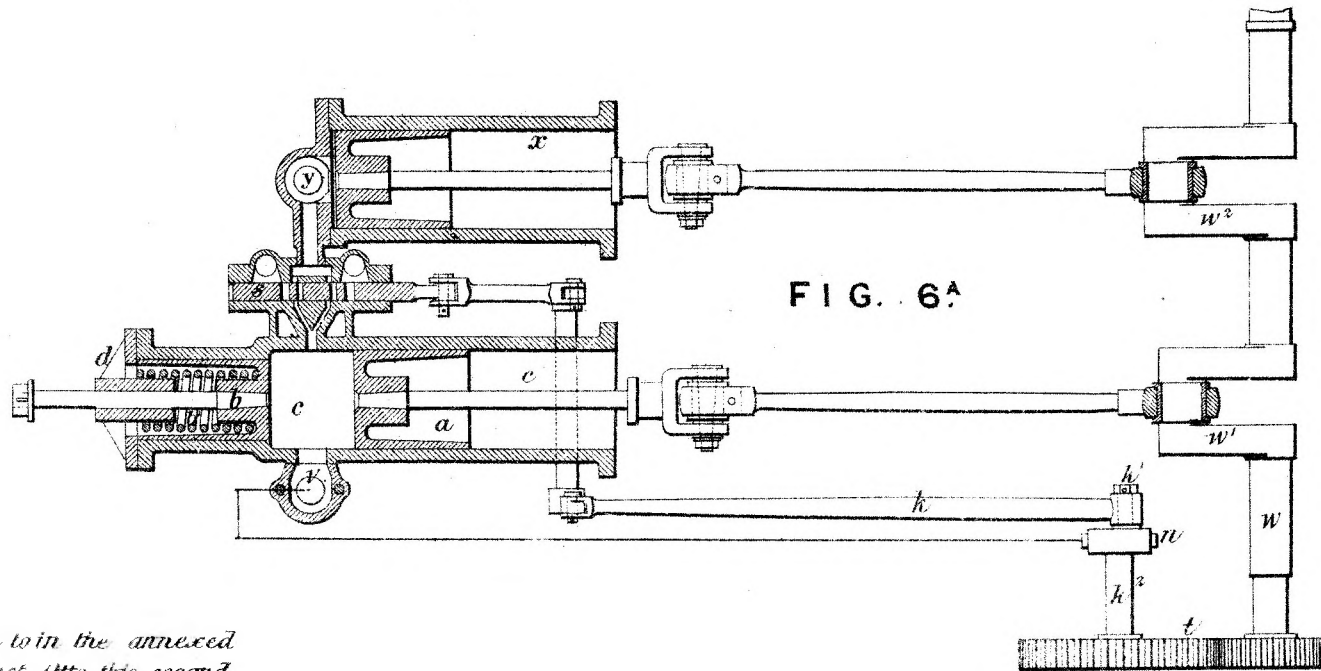


FIG. 6^A

This is the Sheet of Drawings marked C referred to in the annexed Letters of Registration granted to Nicolaus August Otto, this second day of August, A.D. 1881.

Augustus Loftus.

D.

1881

III

FIG. 7.

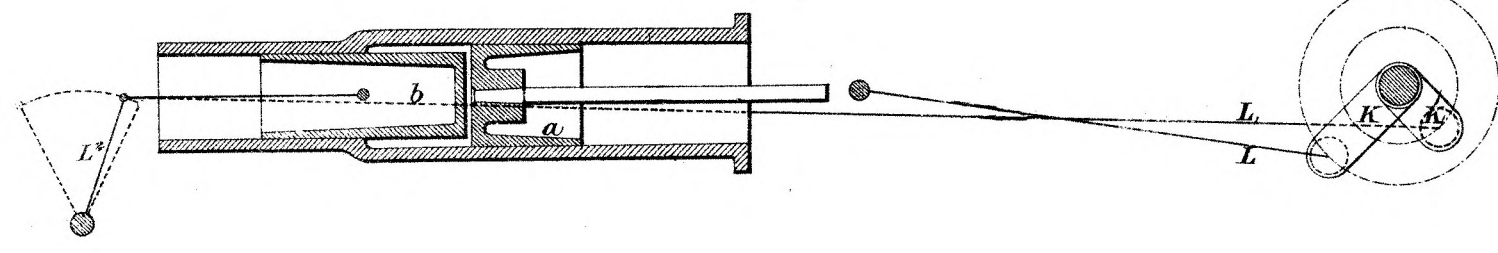


FIG. 8.

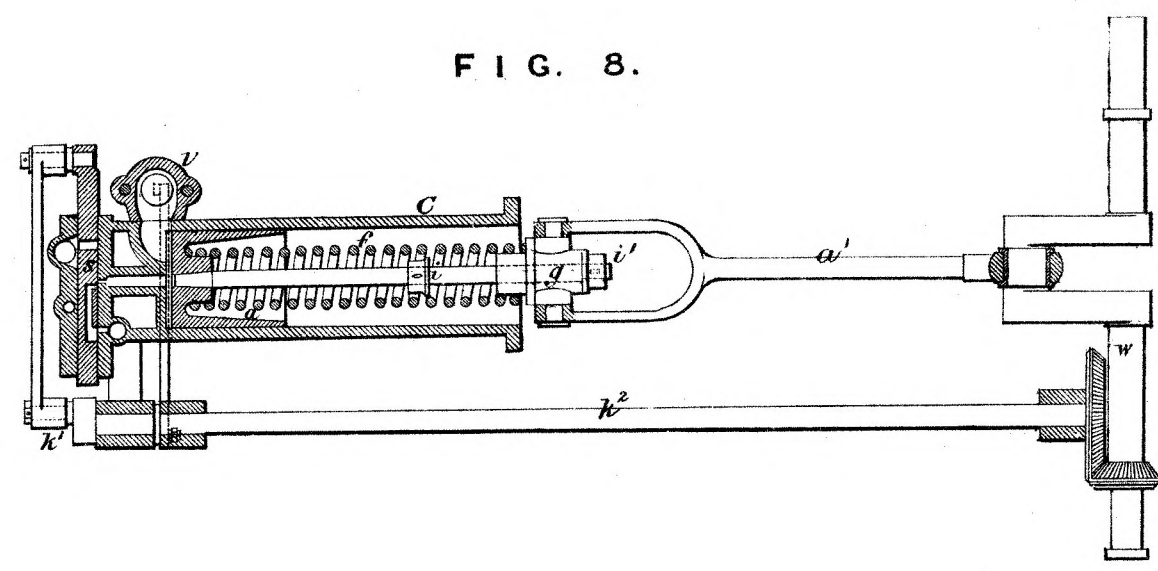
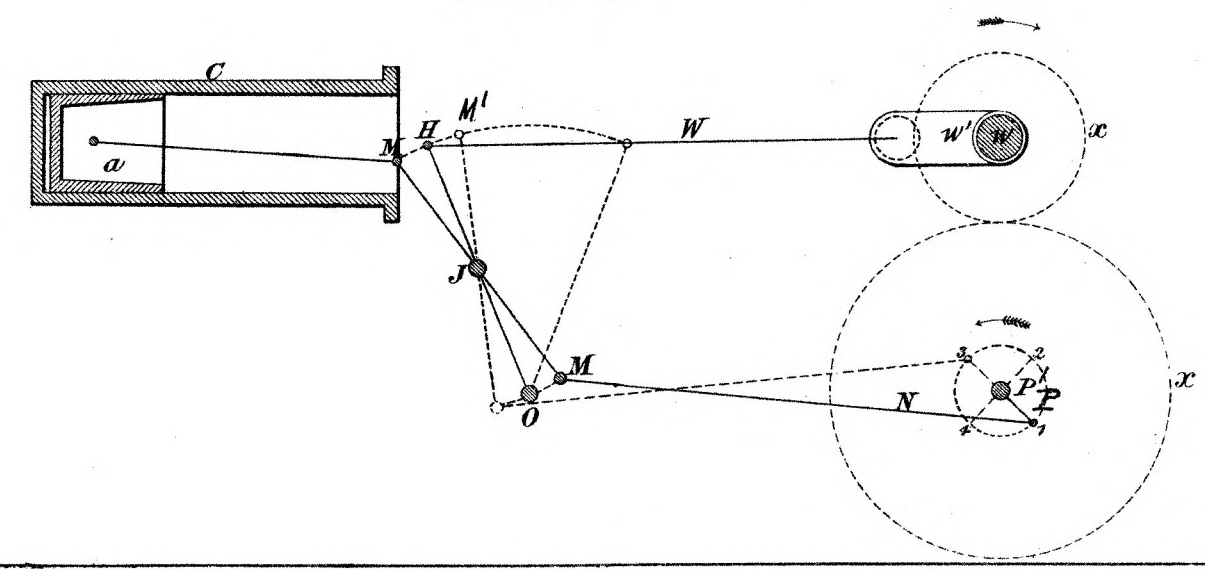


FIG. 9.



This is the Sheet of Drawings marked *D* preferred to in the annexed
 Letters of Registration granted to *Nicolaus August Otto*, this second
 day of August, A.D. 1881.
Augustus Loflus.

34



A.D. 1881, 2nd August. No. 962.

**IMPROVEMENTS IN MACHINERY FOR REDUCING AND CLASSIFYING ORES AND
FOR AMALGAMATING THE METALS CONTAINED THEREIN.**

LETTERS OF REGISTRATION to Carl Wagemann, for Improvements in machinery for reducing and classifying ores and for amalgamating the metals contained therein.

[Registered on the 3rd day of August, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting:

WHEREAS CARL WAGEMANN, of No. 137, Albert-street, East Melbourne, in the Colony of Victoria, civil engineer, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in machinery for reducing and classifying ores and for amalgamating the metals contained therein," which is more particularly described in the specification, marked A, and the two sheets of drawings, marked B and C, respectively, which are hereunto annexed; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Carl Wagemann, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said Carl Wagemann, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said Carl Wagemann shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this second day of August, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in machinery for reducing and classifying ores, &c.

A.

SPECIFICATION of CARL WAGEMANN, of No. 137, Albert-street, East Melbourne, in the Colony of Victoria, civil engineer, for an invention entitled "Improvements in machinery for reducing and classifying ores, and for amalgamating the metals contained therein."

THIS invention consists of three kinds of machines, each of which may be used by itself for the purpose for which it is specially designed, or all of which may be used consecutively in the process of reducing ores and extracting their metals. These three kinds of machines may be referred to under the headings of disc mills, Chilian mills, and ore classifiers.

In my disc mills the material to be reduced is conducted between the vertical faces of two oppositely moving discs, and the feed is from the centre outwards. There are, however, two forms of this disc mill, in one of which the opposing discs are rotated from separate shafts, and in the other only one of the discs is rotated direct from a driving-shaft; the other, which is set eccentrically to its neighbour, receives its motion from the friction arising from the rotation of the one opposite. In my drawings figures 1 and 2 show respectively plan and vertical section of the first form of such mill, in which one large disc, A, revolving at (say) three revolutions per minute, has two smaller discs, B,—I call them runners—revolving against it at (say) 250 or 300 revolutions per minute, and between these the ore is reduced. The large disc has three sets of slots in its grinding face, one of which (the feed set) goes right through to the back, whilst the other two are simply grooves or recesses in the face. The working faces of the small discs or runners are shod with plates of chilled iron, which are easily renewable, and are thinner in the centre than at the periphery. An annular surface of about 6 inches in width, next to the periphery, is smooth, and parallel to the smooth face of the large disc. That part of the runner which is surrounded by said annular surface is dished and grooved with short lengths of concentric spiral grooves, say $\frac{1}{2}$ an inch wide and an inch deep. The ore reduced to about $\frac{1}{2}$ -inch gauge passes with water through a self-acting feeder, C, and gutters, D, into a ring of cells, E, formed at the back part of the large disc A, from whence it passes through holes, hereinbefore called the feed set, one at the bottom of each cell, into the space opposite the dished portion of the runners, from whence it is carried to their periphery by centrifugal force, following the grooves, and being twined and broken continuously to finer and finer grains till it reaches the smooth ring of the runner. Here it is reduced to the size required, and is thrown out at once with the water by centrifugal force. The distance between the large disc and the runners can be modified by india-rubber springs, F, and screws, G, according to the degree of coarseness of the ore or gold in the mineral, but the runner ought never to touch the large disc. By this action of the mill the mineral is not exposed to heavy strokes, as when the ore is pulverized in stamp batteries it is only broken and split to such an extent as that the ore or gold may be easily scraped from the cells of the gangue containing it. It is evident that the whole action of the mill consists in rubbing off the ore from the matrix, that is to say, to destroy the cohesion between both without reducing them to dust or slime, and without deforming the grains of the ore, which are washed out as soon as they are detached from the matrix. In case auriferous quartz is treated, a box of sheet iron with quicksilver on the bottom is inserted into the space H, the native gold severed from the gangue, and highly polished by the rubbing action of the mill, is dashed into the quicksilver and easily amalgamated. It is to be remarked that even so-called fatty gold is cleaned by the mill and easily amalgamated, the fatty material remaining on the surface of the water which fills the box and overflowing with the tailings sideways.

Figures 3 and 4 show respectively plan and vertical section of that form of my mill which differs from the one just described, inasmuch as the large disc or bedstone has no special driving gear, but is moved by friction (generated between the runner B, the bedstone A, and the mineral to be ground), and by aid of the eccentric position of the axles of A and B. Without this eccentricity both discs would run with the same speed, and no grinding action take place. The speed of the bedstone can be changed by altering the degree of eccentricity, which is done by loosening the screws K K, and moving the whole block I along the slide-bar J. The feeding in this mill is done in a peculiar way. The self-acting feeder C throws the mineral into the funnel L on top of the bent pipe M, which passes through the hollow axle of the bedstone and terminates in the hollow space between ground-plate and disc. Water which runs into the funnel L fills the spaces between the grains of mineral in the pipe. In consequence of the quick motion of the runner B the air between it and the bedstone A is thrown out by centrifugal force, a vacuum is generated and sucks out the mineral and the water from the pipe M. To prevent the entrance of air along the outside of the pipe the end of the hollow axle N is formed in shape of a stuffing-box, P, the tightening of which is done by water introduced to the interior through the small tube Q.

An ore mill with two runners, as shown in figures 1 and 2, grinds per hour about a ton of the hardest mineral, requires about 10 gallons of water, and 4-horse power. An ore mill with one runner, as shown in figures 3 and 4, grinds per hour about $\frac{1}{2}$ a ton of hardest mineral, wants 5 gallons of water, and $2\frac{1}{2}$ -horse power.

The ground stuff is to be separated in a separating drum hereafter described. According to the nature of the mineral, this separating drum delivers two or more kinds of ground stuff of differently sized grains; the coarsest is brought back to the same mill; the next finer size goes into a second mill, as described above, but gauged for finer grain; the third size, finer yet, is either adapted for further metallurgical treatment or ground in another mill now to be described, and illustrated in figures 5 and 6 of my drawings, which show respectively plan and vertical section thereof.

This mill has the appearance of a Chilian mill, but differs from it in construction and action, as follows, namely: to the common Chilian mill a horizontal axle, A, is fixed to a spindle, B, which is turned by cog-wheels C; two heavy rollers, D, are put on the ends of the horizontal axle with their naves, and prevented from rolling off by lynch-washers, E, and pins; by turning the spindle and the rotating motion of the axle the rollers are pushed on; without the lynch the roller would be thrown in the direction of the tangent, but the lynch enforces it to jump inside and roll along the circumference of a polygon on the bottom F of the grinding basin on which the mineral is distributed. The defect of this construction is that the mineral which has to be ground is not pressed between two hard surfaces (as it was intended), but in consequence of the jumping motion of the rollers is hammered; the grinding action is therefore

very

Improvements in machinery for reducing and classifying ores, &c.

very irregular, inasmuch as a regular feeding is also prevented by the jumping motion of the rollers. The same irregularity takes place if amalgamation is to be effected, as the quicksilver and mineral are not thoroughly rubbed together. My invention consists in the following alteration, namely:—The inner part of the grinding basin G forms an upright hollow cylinder of cast-iron, through which the spindle B passes. On the said cylinder a bevel-wheel, H, is so fixed that it is unable to move horizontally, but only to slide along a groove up and down. It is supported by rings of india-rubber plates, I, resting on an iron ring, which is supported by three regulating screws, K. On the inner side of each roller another bevel-wheel, L, is so fixed that both are in gear with the horizontal wheel H; the revolving motion of the rollers D is now regulated by these three wheels, and the relative number of the teeth of the different wheels can easily be determined so that the periphery of the rollers is not only rolling along the bottom of the basin, but revolving on their own axes more quickly, so that each point of their periphery runs through a longer way than it would do if the roller were moved only by the action of the turning-axle A. Consequently the rolling motion of the surface of the rollers is combined with a sliding one, and the action on the mineral (and quicksilver) becomes similar to that of a pestle in a mortar, namely, pressing and rubbing. The advantage of this action consists in the combination of grinding and pressing the minerals, by which the finest grains are broken and the smallest particles of gold brought into intimate contact with the quicksilver. Furthermore, the feeding is done excellently, as the quickly revolving rollers draw the mineral under them; and as the motion of the rollers is not only generated by the axle A, but regulated by the tooth-wheels, the jumping motion gives place to a smooth rolling. The india-rubber rings I serve to equalize the irregularities which otherwise might occur if the bottom of the basin and the surface of the rollers become worn out and thinner.

This mill may, if preferred, be made with three rollers instead of two; it can also be constructed in such a way that the horizontal axle is fixed on bearings and driven by special belts, while the basin is slowly moving round its centre driven by a special gear. In case so-called pyrites are to be treated, the mineral ground on the ore mill first described, concentrated on jiggers and shaking tables, burnt in furnaces and treated with quicksilver in the last-mentioned amalgamator, is reduced to such a fine degree that the ore gets free and is amalgamated by the quicksilver.

Figures 7, 8, and 9 show the construction of my ore classifier; it consists of conically-shaped sieves fixed on an inclined axle, with their larger end on the higher level. The size of the holes or mesh in the different sieves decreases from the highest one marked B, which has the largest, to the lowest one marked Z, which has the smallest. The ground stuff enters through the gutter A into the conical sieve B, and all except the largest particles (for which the holes are too small) falls through into the half-round sheet iron trough C, from whence it is floated by aid of water into the centre of the next sieve, D, which has smaller holes. The large stones remaining in sieve B fall through the holes E and the funnel F out of the classifier. The same operation is repeated in each sieve, so that the pipe X delivers the grain which is able to pass through the finest jacket Z, and Y, those grains which are even finer still. The jacket of each sieve is made in two halves and fixed by aid of two pieces of flat iron, G, provided with hooks, H, which enclose the ends of the jackets on the joints. The fixing of the jackets on the frame-work is done by similar bent flat iron and hooks. The hooks are put through holes in the jackets I, and the flat iron and the latter pushed forward by a few light strokes with a hammer. The advantages of this separator are the following:—It is cheaper than any other kind of separator for different grains, as it does not require screws or elevators for transporting the stuff from one sieve to another. The ground stuff enters each sieve at its widest end, where the separating surface is the largest. If compared with separators of two or more concentrically arranged jackets, this separator has the advantage that the coarser stuff (which causes the greatest wear of the sieves) does not pass over the finest sieves, but is extracted by the first. The jackets are easily accessible, and can if choked easily be cleaned by a jet of water or substituted by fresh ones when worn out.

I claim as my improvements in machinery for reducing and classifying ores, and for amalgamating the metals contained therein—

First—The construction of machines for reducing ores in which the material to be reduced is conducted between the vertical faces of two or more discs, substantially as herein described, and as illustrated in figures 1 and 2 of my drawing.

Second—The modification of this mill, as shown in figures 3 and 4, in which only one disc is driven direct and the other by friction, such other being set eccentrically to the main disc, and also the self-feeding arrangement by aid of a vacuum, all substantially as described, and as shown in figures 3 and 4 of my drawings.

Third—The addition of the cog-wheel on the vertical spindle of a Chilian mill and the gearing or cog-wheels on the inner face of the rollers of a Chilian mill, in the manner and for the purposes herein described and explained, and as illustrated in figures 5 and 6 of my drawings.

Fourth—The combination and arrangement of conical sieves of varying mesh, the highest one having the largest mesh and the lowest the smallest mesh, all set on an incline in the manner shown in figures 7 and 8 of my drawings, and for the purpose herein described and explained, and also the contrivances shown in figure 9 of my drawings for fixing the jackets of such sieve.

In witness whereof, I, the said Carl Wagemann, have hereto set my hand and seal, this twenty-eighth day of May, one thousand eight hundred and eighty-one.

C. WAGEMANN.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to Carl Wagemann, this second day of August, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Improvements in machinery for reducing and classifying ores, &c.

REPORT.

Sir,

The application of Mr. C. Wagemann for Letters of Registration for "Improvements in machinery for reducing and classifying ores and for amalgamating the metals contained therein," having been referred to us, we have examined the specification and drawings accompanying the same, and have now the honor to report that we see no objection to the issue of Letters of Registration as prayed for.

Sydney, 10 June, 1881.

We have, &c.,
J. SMITH.
CHAS. WATT.

The Under Secretary of Justice.

[Drawings—two sheets.]

B.

1862

C. Wagemann's Patent.

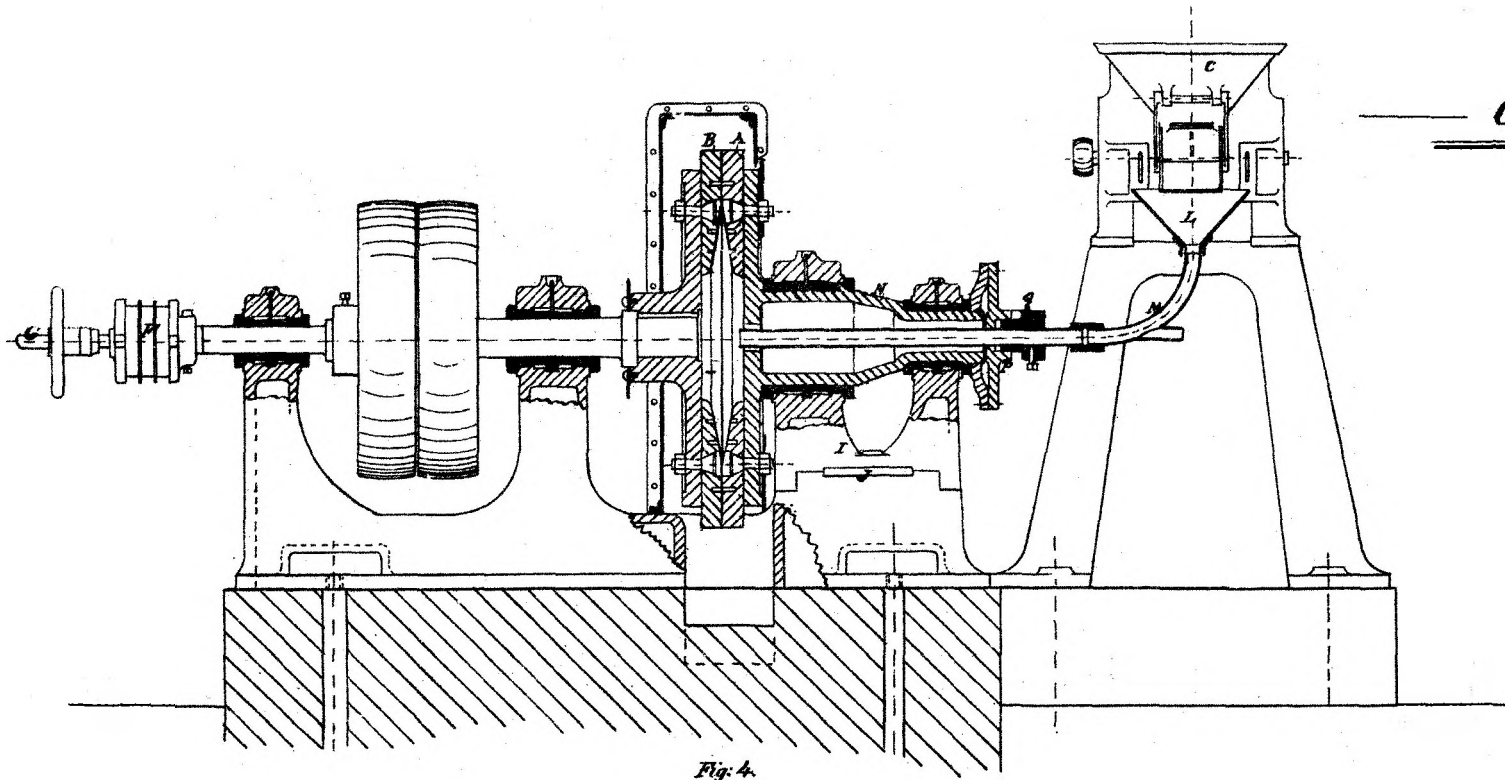


Fig. 4.

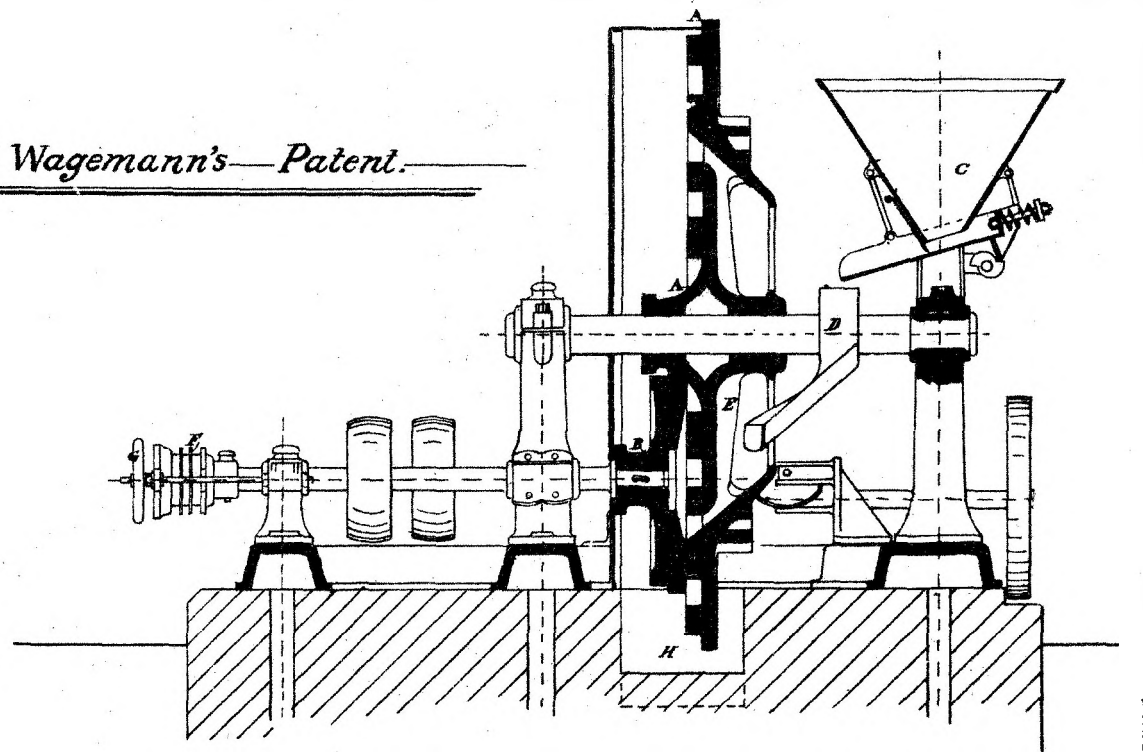


Fig. 2.

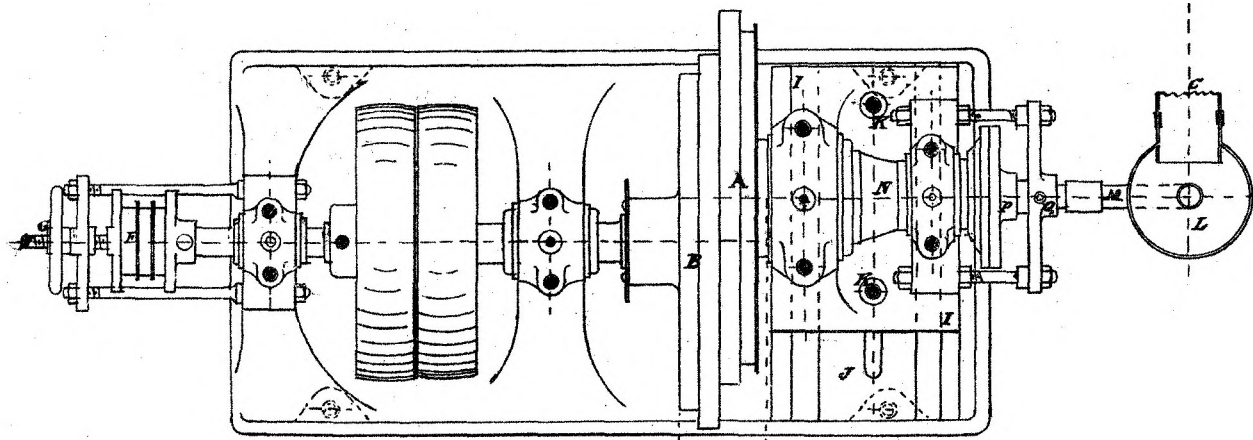


Fig. 3.

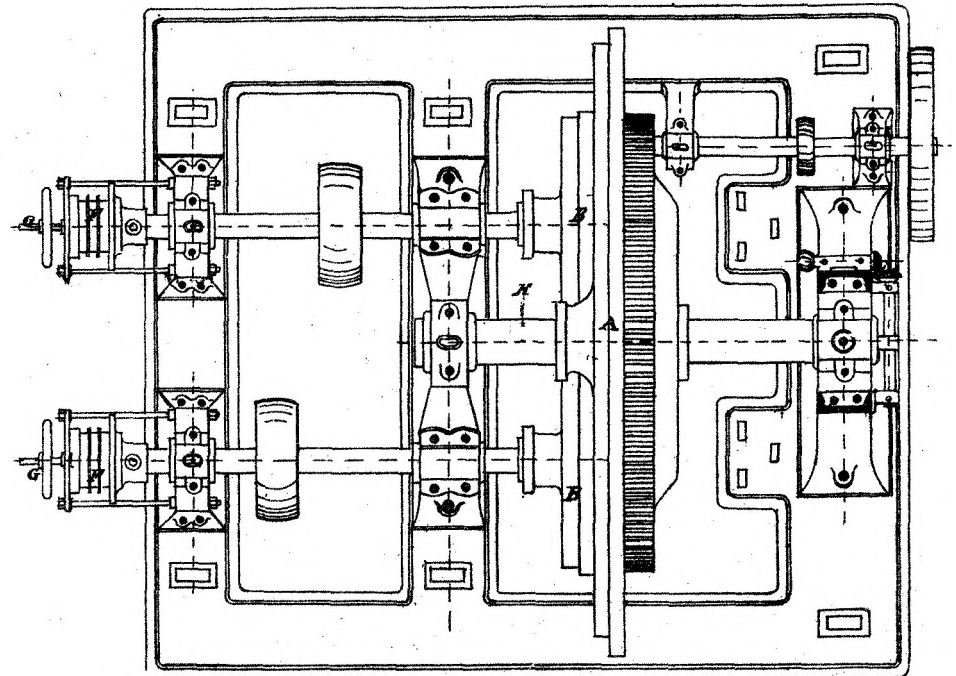


Fig. 1.

This is the Sheet of Drawings marked B referred to in the annexed
 Letters of Registration granted to Carl Wagemann, this second day
 August, A. D. 1862.

Augustus Loftus.

C. Wagemann's—Patent.

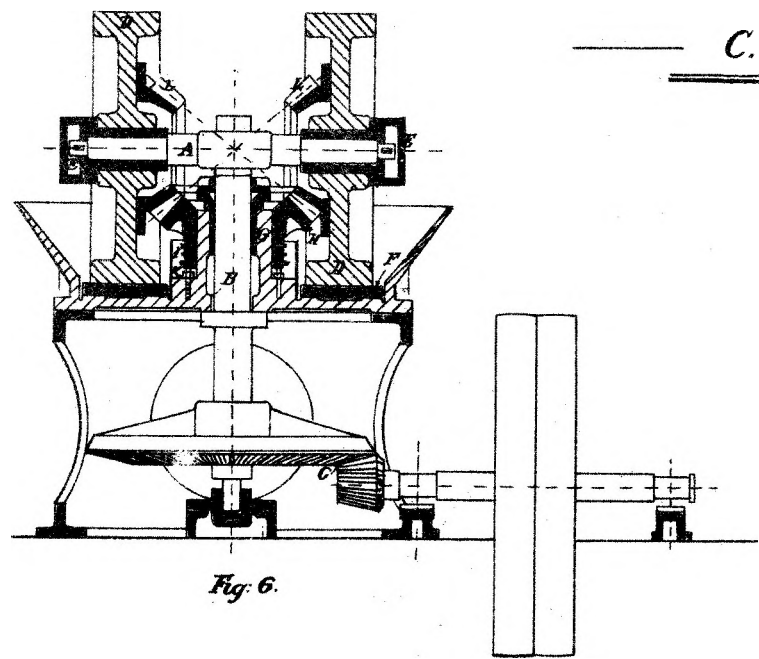


Fig. 6.

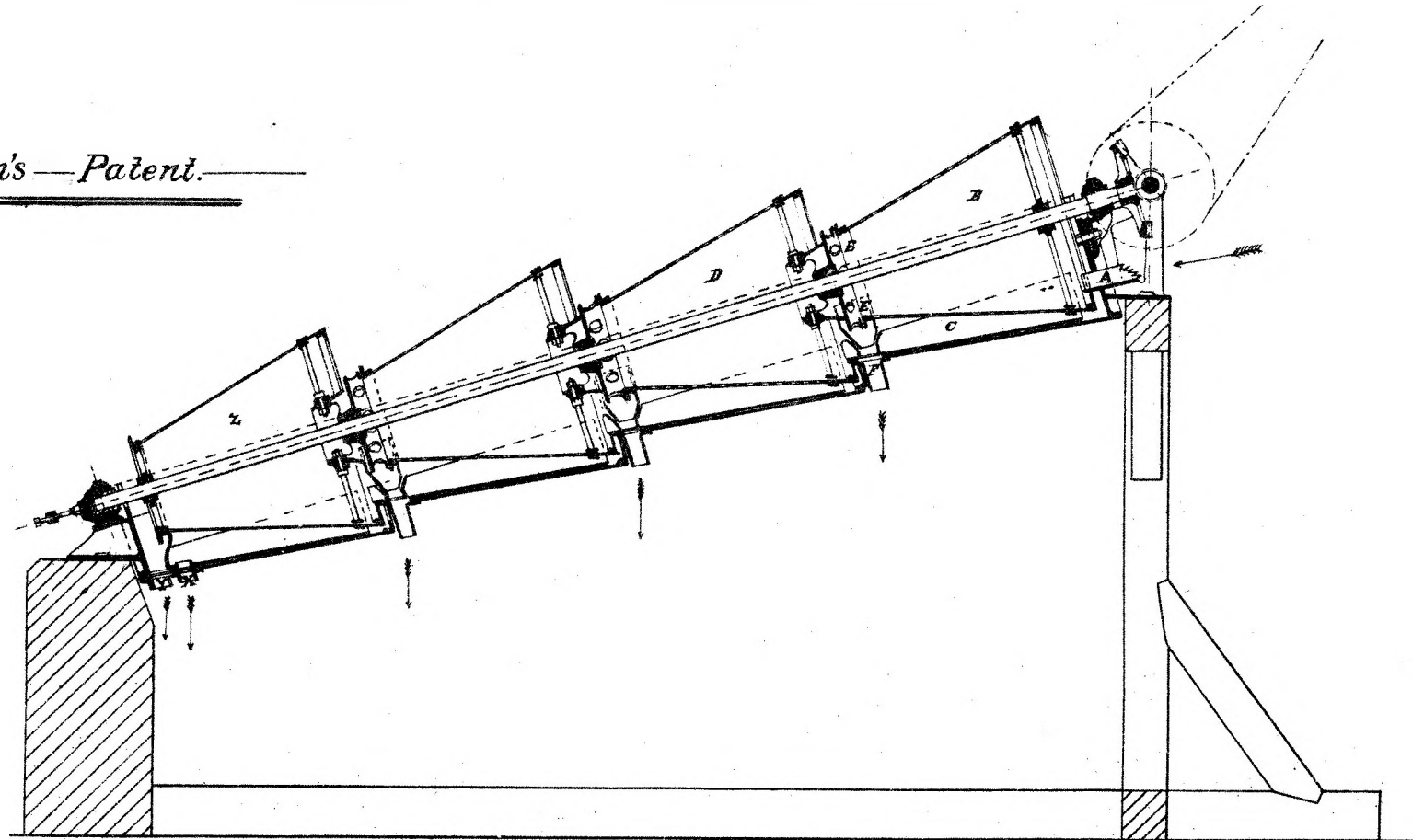


Fig. 7.

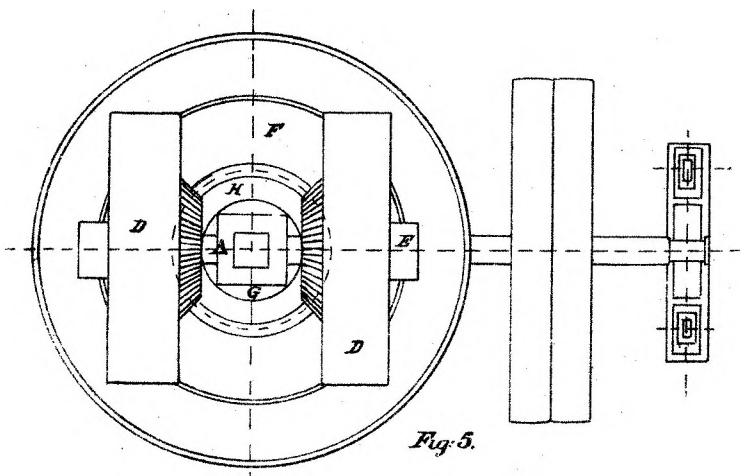


Fig. 5.

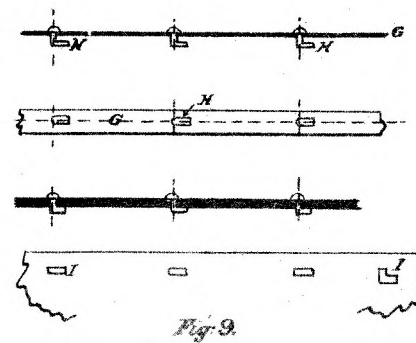


Fig. 9.

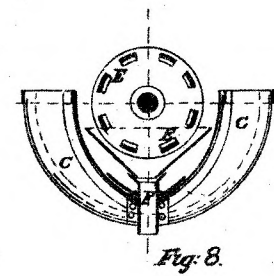


Fig. 8.

PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE, SYDNEY, NEW SOUTH WALES.

This is the Sheet of Drawings marked C referred to in the annexed Letters of Registration granted to Carl Wagemann, this second day of August, A. D. 1881.
Augustus Loftus.

(24.)



A.D. 1881, 2nd August. No. 963.

IMPROVEMENTS IN WORKING BRAKES BY FLUID PRESSURE.

LETTERS OF REGISTRATION to George Westinghouse, junior, for Improvements in Apparatus for working Brakes by Fluid Pressure.

[Registered on the 3rd day of August, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS GEORGE WESTINGHOUSE, junior, of Pittsburg, Pennsylvania, United States of America, engineer, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in Apparatus for working Brakes by Fluid Pressure," which is more particularly described in the specification, marked A, hereunto annexed, and the two sheets of drawings, marked respectively B, and C, which are hereunto annexed ; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four ; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years : And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein, and to report thereon for my information, am pleased with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said George Westinghouse, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof ; to have, hold, and exercise unto the said George Westinghouse, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended : Provided always, that if the said George Westinghouse shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this second day of August, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in working Brakes by Fluid Pressure.

A.

SPECIFICATION of GEORGE WESTINGHOUSE, junior, of Pittsburg, Pennsylvania, United States of Amercia, engineer, for an invention entitled "Improvements in Apparatus for working Brakes by Fluid Pressure."

IN many railway brakes worked by fluid pressure a small pumping-engine on the locomotive compresses air into a reservoir, from which a pipe, which is hereafter called the automatic train pipe, extends throughout the train, being connected from carriage to carriage by suitable couplings. On each brake-carriage there is an auxiliary reservoir containing compressed air, which constitutes a local store of power for working the brakes, and there is a cylinder with a piston connected to the brake-levers, or sometimes, instead of such a cylinder and piston, a collapsible vessel or a flexible diaphragm is employed as its equivalent. The automatic train-pipe is connected to each of the auxiliary reservoirs and brake cylinders or their equivalents through a valve-box, which is commonly known as the triple-valve, which has the following functions:—When the automatic train-pipe is charged with compressed air from the main reservoir on the locomotive, the auxiliary reservoirs are by the action of the triple-valve put in communication with the train-pipe and become also charged with compressed air, but the brake cylinders are at the same time put in communication with the outer air, so that such compressed air as they may contain is discharged and the brakes are released. When, on the other hand, the pressure in the automatic train-pipe is relieved, either purposely by the driver or guard opening an outlet-cock, or accidentally by the fracture of the pipe or the separation of a coupling, the action of the triple-valve is such as to close the escape from the brake cylinder and to open communication from the auxiliary reservoir to the brake cylinder, so that compressed air from the auxiliary reservoir acts on the brake-piston, causing the brakes to be applied.

According to the present invention, this arrangement for working the brakes is combined with an arrangement for working them, also by compressed air conducted directly from the main reservoir on the locomotive by an additional pipe, which may be called the non-automatic train-pipe; and modifications are made in the triple-valve, in the construction and connections to the brake-cylinders and auxiliary reservoirs and in the couplings of the pipes, so as to adapt them to the combined arrangement, as will now be explained with reference to the accompanying drawings.

Figure 1 is a longitudinal section showing part of an auxiliary reservoir and brake cylinder attached to one end of it with the modified valve arrangement attached at the opposite end. Figure 2 is a transverse section of the valve-box on the line X X of figure 1. Figure 3 is partly an elevation of the valve-box, and partly a longitudinal section, on the line Y Y of figure 2. Figure 4 is a section to an enlarged scale of the double-check valve shown in figure 1. Figure 5 is a longitudinal section of an auxiliary reservoir with a brake cylinder attached to each end of it and the valve-box attached at the middle of its underside. Figure 6 is a longitudinal section of a coupling for the train-pipe, the internal parts being shown partly in elevation. Figure 7 is a perspective view, partly in section, of a half-coupling. Figures 8 and 9 are perspective views, and figure 10 is a plan of the internal cap and casing of one of the coupling valves. Figures 11 and 12 are plans to a reduced scale, showing respectively the coupling in its connected condition and in the condition of being connected or separated, the cover in each case being supposed to be removed to show the engagement of the valve-studs with one another, as will hereafter be explained. Figure 13 is a perspective view of a holder for the loose half-coupling at the end of a train.

Referring to figures 1 to 5 inclusive, A is the valve-box, R is the auxiliary reservoir, and C the brake cylinder communicating by a pipe, P¹, with the valve chamber V. The automatic train-pipe is connected to the valve-box A at P, and the non-automatic pipe is connected to the valve chamber V at P². From P there is a line of passages, 1, through the casing 2 of a cock 3, having a notch or recess, 4, communicating with the port 5 in the casing, which leads to an annular passage, 6, communicating by passages 7 and 8 with a chamber, B. From this chamber there is a passage to the cylindrical chamber B¹ in which works the piston G. The stem *g* of this piston extends along a cylindrical chamber, B², and carries loosely between its collar *g*² and its end collar *r* a slide, H, which governs ports *c* and E in the side of the chamber B². The end collar *r* is provided with projecting ribs, which guide its movement in B² but permit free passage of air. The slide H is pressed forwards by a spring, *n*; it has in its face a hollow, *s*, sufficiently long to include the ports *c* and E and a shorter hollow, *s*², which communicates with a passage through the slide fitted with a valve, *e*; the stem of this valve has a head, *e*², which bears against the collar *g*². The port E opens to the outer air and also by a lateral passage *q* to the upper part of the valve chamber V, to which the port *c* opens directly. In the valve-box V is fitted a valve, V¹, provided with double faces, so that it can seat itself at either end of the chamber V. This valve has a tubular stem, *v*, fitted to slide as a piston in the upper part of the chamber, and is prevented from turning by a pin, *x*, engaged in a slit, *x*¹; in this stem there is a hollow, *u*², which in the position of the valve shown forms a communication with *g*, and through the stem are passages, *u*¹. The valve V¹ has at its opposite end a cylindrical part, *v*², with guide wings, *v*³, fitting the lower mouth of the valve chamber. For the purpose of working the brakes by the non-automatic train pipe which is connected to P², this pipe is charged with compressed air. The pressure causes the valve V¹ to seat as shown, cutting off the automatic part of the apparatus, and being communicated through the pipe P¹, acts on the brake-piston so as to put on the brakes. If at this time accidentally or otherwise a less pressure should be communicated from the automatic part of the apparatus, this without shifting the valve V¹ will escape by *u*² and *q* to the open air. For the automatic application of the brakes, the reservoir R being charged with compressed air, the pressure in the automatic train pipe connected to P is reduced, and the pressure in R acting on the piston G forces it backwards. The slide H is thus moved so that its edge *s*¹ passes the port *c*, and compressed air from R passes to the valve-box V, unseating the valve V¹ from its upper seat and seating it on its lower seat, so as to close the passage by P² to the non-automatic pipe. From the valve-box V the compressed air passes by the pipe P¹ to the brake cylinder C, where it acts on the piston to put on the brakes. For taking off the brakes the pressure is again raised in the automatic pipe sufficiently to force the piston G forwards, and when the slide H is thus brought back to the positions shown in figure 1, the compressed air from the brake cylinder escapes by the ports *c* and E relieving the brake-piston from pressure. Such generally is the operation of the valve arrangement for the purpose of working the
brakes

Improvements in working Brakes by Fluid Pressure.

brakes by either the non-automatic or the automatic train-pipe. There are, however, several details provided for by the construction, as I will now explain. When the piston G has by pressure in the automatic train-pipe been forced to the position shown in figure 1, it uncovers a notch, a , by which the compressed air can pass, and this air passing by another notch, a^2 , enters the chamber B², and passes into the reservoir R, keeping it charged with compressed air. Again, the slide H has certain freedom of motion between the collars g^2 and r , but the stem of the small valve e is attached by a pin through its head e^2 to the piston-rod, so that when the piston G begins to move backwards the valve e opens before the slide H begins to be moved back by the collar r , and again, when G moves forwards, the valve e is closed before the slide H begins to advance. Thus, by slight alterations of pressure in the automatic train-pipe causing slight movements of the piston G, the valve e can be opened and closed without moving the slide H, and if that slide be brought to such a position that the cavity s^2 in its face is in communication with the port c , the pressure acting in the brake cylinder can by the movements given to the valve e be very gradually raised and maintained at a moderate amount, as much as may be desired below that in the auxiliary reservoir which supplies it. Furthermore, when the valve V¹ is as already described caused to move downwards, its lower cylindrical stem v^2 closes the passage to P² just before the annular notch u^2 in its upper tubular stem presents itself below the upper seating, and consequently compressed air coming from the auxiliary reservoir by the port c and holes u^1 is not permitted to escape to the non-automatic train-pipe. When it is desired to discharge the air from one of the reservoirs R, as when a carriage is separated in a station, the cock 3 can be turned so as to bring its passage 12 in line with the ports 13 and 14, thus making communication from the valve chamber V to the open air. When again, it is desired to discharge all the auxiliary reservoirs of a connected train, the non-automatic pipe is charged with air at sufficient pressure to seat the valves V¹ against their upper seats as shown in figure 4, and the air being discharged from the automatic train-pipe so that the slides H are shifted back, bringing the ports c into communication with the auxiliary reservoirs, the air from these reservoirs will then escape by the ports c through the slit u^2 and the passages g and E. In order to provide against compressed air accumulating by leakage in the brake cylinder when the brakes are off, a notch, z , is made near the bottom of the cylinder, so that when the piston is in the position shown in figure 1 (which is the position occupied by it when the brakes are off), such compressed air as may find its way into the cylinder can leak by this notch z past the piston and so escape.

In many cases it is convenient to employ two brake cylinders as shown in figure 5, the one for the brakes of the wheels at one end of the carriage, and the other for the brakes of the wheels at the other end. For this purpose a cylinder, C, is attached at each end of the auxiliary reservoir R, and the valve-box A such as has been described is attached to the lower side of the reservoir, with communicating pipes P¹ to each of the brake cylinders. When the carriage has six wheels, one of the cylinders is made of greater length than the other, so that its piston having a longer stroke can work the brakes of two pairs of the wheels. When the carriage has only four wheels the cylinders may be of equal length, as indicated by the dotted lines in figure 5.

The improved couplings for the train-pipes, constructed as shown in figures 6 to 12 inclusive, are intended to fulfil the following conditions:—The last couplings of a train which are not connected to pipes beyond them or the couplings of a carriage purposely detached, are to be automatically closed but capable of being opened when desired. When couplings are connected, the passage through them is to be automatically opened by the act of connecting them, and this without permitting escape of compressed air, and without having to effect the connection forcibly against the air pressure. And finally, when the couplings are violently disconnected, as by the accidental separation of a train, they are to remain open so that the automatic brake action may effect the stoppage of both parts of the train. For this purpose the coupling is made in two parts precisely equal and similar, so that the half-coupling at either end of any carriage can be connected with the half-coupling at the end of any other carriage, and the connection of the two halves is effected by placing the two halves face to face oblique to one another as indicated in figure 12, and then turning them partly round on their common axis till they come in line with one another as indicated in figure 11. By this movement a projecting segmental rib of each half is engaged in a corresponding groove of the other with sufficient firmness to resist any ordinary force tending to separate the halves, but with not sufficient firmness to resist such a strain as would result from the violent separation of the two carriages to which the half-couplings are respectively attached.

So far the construction of the couplings and the mode of connecting them correspond with what is in use on trains having pneumatic brake apparatus. Couplings of the kind referred to have also been made with cocks or valves arranged so that the act of connecting causes these to open, and the act of disconnecting causes them to close. It is principally to the construction and arrangement of valves for this purpose that the present invention in respect of couplings relates, as will be now explained. A is the shell of the half-coupling, having as usual its nozzle for the flexible tube by which it is connected to the train-pipe, and having its projecting segmental rib m which engages in the groove under the flange n . Each half-coupling has its lateral circular mouth provided with its elastic packing ring a , which is pressed against the shoulder of the opening by a hollow cylindrical piece, B, having lateral openings b for free passage of air. The piece B is forced inwards by screwing on the cap A¹. Inside B there is a disc D, which when free can seat itself as a valve against the packing a . The stem of the disc D has a part of its length, d , larger than the part d^1 , so that it presents a shoulder at s against which butts a spring, g , tending to close the valve. Through a hole in d is passed a pin, d^2 , which extends both ways into inclined slots formed in the annular boss B¹ of the piece B. Each of these slots has a curved incline, c , and a level part, c^1 , and both are covered by a cap-piece, D¹, which has at each side two projecting wings, c^2 , that can slide along the sides of the slot, and a protuberance, s^2 , between them. The cap piece D¹ is pressed by a spring, g^1 . The piece B is prevented from revolving by its being firmly tightened in position and also by a stud, i , projecting into a slot, i^1 , cut along the side of B, but the disc D and its stem are free to turn partly round within B as far as permitted by the width of the slot in B¹, in which the pin d^2 is engaged. From each of the discs D three studs, e , project when the disc is seated a little beyond the face of the packing a . These studs are so arranged in each case that when the two half-couplings are brought together face to face as shown in figure 12, the studs of the one enter the spaces between the studs of the other,

Improvements in working Brakes by Fluid Pressure.

other. Then when the half-couplings are partly turned so as to engage with each other as shown in figure 11, the discs D of both are caused by the engagement of their respective studs e to turn partly round. By this partial revolution the pin d^2 in each case is caused to travel along the incline c until it comes to rest on the level part c^1 , the valves D being thus caused to retire from their seats and so to leave a free passage for air from the one half-coupling to the other. On again disconnecting the coupling by turning its halves into the attitude shown in figure 12, the discs D are again turned by the engagement of their studs e , and their pins d^2 pass again along the inclines c , permitting the valves D to be closed by their springs g . If, however, the couplings should be violently separated by a direct pull and without being partly turned to the attitude of figure 12, then the pins d^2 still remaining on the level parts c^1 of their respective slots keep the valves D unseated, so permitting escape of air from the separated pipes.

The studs e are rounded off at those angles which would come in contact in case of violent separation, so that they incur no damage, but slip past each other. In order to prevent the pin d^2 being shaken off the level part c^1 by oscillation, the protuberance s^2 pressed forwards by the spring g^1 offers sufficient resistance to prevent the movement of the pin d^2 from its level seat unless the half-couplings be partly turned by hand for the purpose of separating them. When a coupling has been intentionally separated, its valve can be opened if desired by turning its projecting studs e in the same direction as they would be turned by the act of connecting the coupling, and by a turn in the reverse direction its valve if open can be closed. In putting the parts of each coupling together the pin i engaging the slot i^1 determines the proper position of B, and a pin, o , projecting from the stem d into a slot within B determines the proper position of the disc D, the slot being wide enough to permit the turning of the disc to the extent required. The coupling holder, which can be suspended from the end of a carriage by a chain, h , is made as shown at figure 13, in shape like a half-coupling presenting a recess, q , into which the studs e of a free half-coupling can be inserted for the purpose of protecting them from injury. At the back of the holder studs e^1 may be provided corresponding to those which would be presented by a real half-coupling, these studs being serviceable for turning the valve of a half-coupling so as to open or close it when desired.

Having thus described the nature of my invention and in what manner the same is to be performed,

I claim—

- First—The combination in one brake apparatus of an automatic and a non-automatic train pipe, connected to the auxiliary reservoir, and brake cylinder or cylinders of each brake carriage, through valves so arranged that either pipe can be used to work the brakes, substantially as herein described with reference to figures 1, 2, 3, and 4, of the accompanying drawings.
- Second—The construction of a brake cylinder, auxiliary reservoir, and valve-box, with their connections, so as to form a single structure, substantially as described with reference to figure 1.
- Third—The construction of two brake cylinders and an auxiliary reservoir and valve-box with connections for both cylinders so as to form a single structure as herein described with reference to figure 5.
- Fourth—The use for a six-wheeled carriage of two unequal cylinders in combination with an auxiliary reservoir and valve-box, the smaller cylinder for working the brakes of one pair of wheels, and the larger cylinder for working the brakes of two pairs of wheels, as herein described with reference to figure 5.
- Fifth—The combination of the valve-box A having its piston G, slide H, and appropriate ports, with the valve chamber V, and its double-acting valve V¹, whereby the valve-box is adapted for the operation of the brakes, either by the automatic train pipe or by the non-automatic train pipe.
- Sixth—The combination of the cock 3 and its ports and passages with the valve-box A, and valve chamber V, as and for the purposes herein set forth.
- Seventh—The construction of coupling for the train pipes substantially as herein described with reference to figures 6 to 12 inclusive, each half-coupling having a valve with studs projecting beyond its mouth, arranged to interlock with the studs projecting from the other and each valve stem having a pin arranged to travel along an inclined slot, so that on partly turning the half-couplings on their common axis in the act of coupling or uncoupling the valves of both are unseated, or are permitted to seat themselves.
- Eighth—In couplings of the kind referred to in the preceding claim, making the inclined slot with a spring slide, D¹, having a protuberance, s^2 , arranged to resist accidental displacement of the pin d^2 from its level seat c^1 , and thereby to keep the valves D open notwithstanding oscillation.
- Ninth—The use of the coupling holder herein described with reference to figure 13.

In witness whereof I, the said George Westinghouse, junior, have hereunto set my hand and seal, this thirtieth day of March, one thousand eight hundred and eighty-one.

Witnesses—

GEORGE HARVEY CHRISTY.
ROBERT HYATT WHITTLESEY.

GEO. WESTINGHOUSE, JR.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to George Westinghouse, junior, this second day of August, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

We have the honor to report that we see no objection to the issue of Letters of Registration to Mr. George Westinghouse, junior, for his invention of "Improvements in Apparatus for working Brakes by Fluid Pressure," in accordance with his Petition, specification, and claim, transmitted to us under your B.C. communication, No. 81-5,361, of the 6th instant.

We have, &c.,

Sydney, 16 June, 1881.

JOHN WHITTON.
JAMES BARNET.

The Under Secretary of Justice.

FIG. 5.

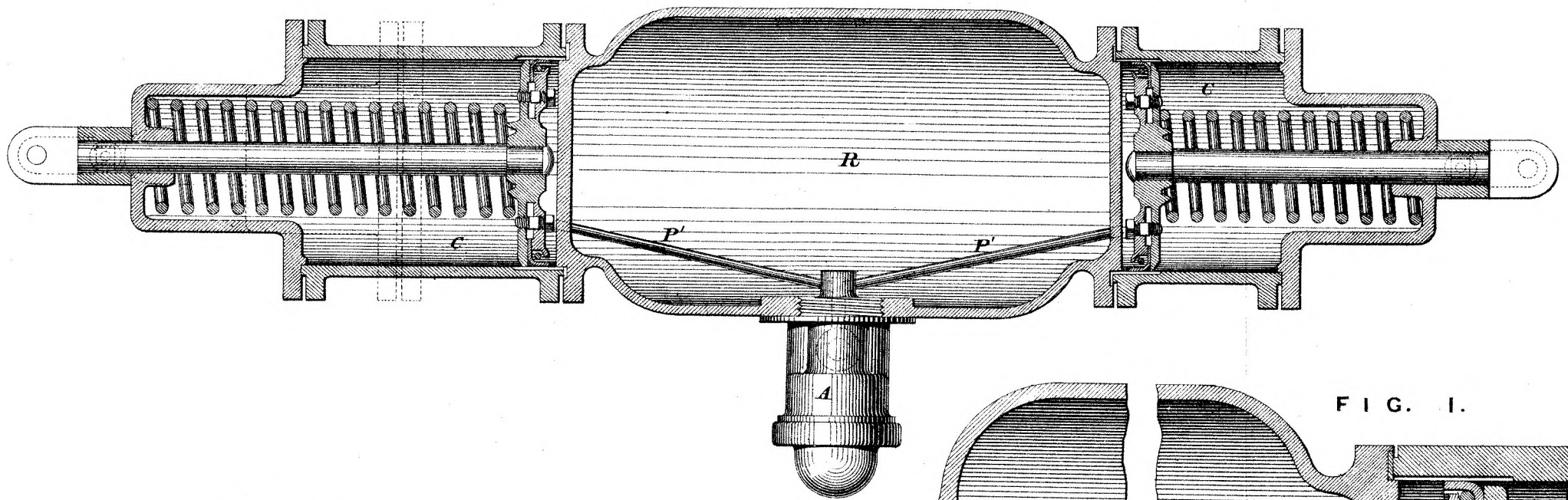


FIG. 3.

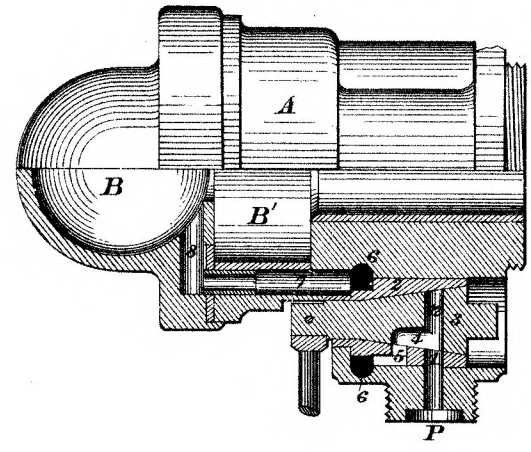
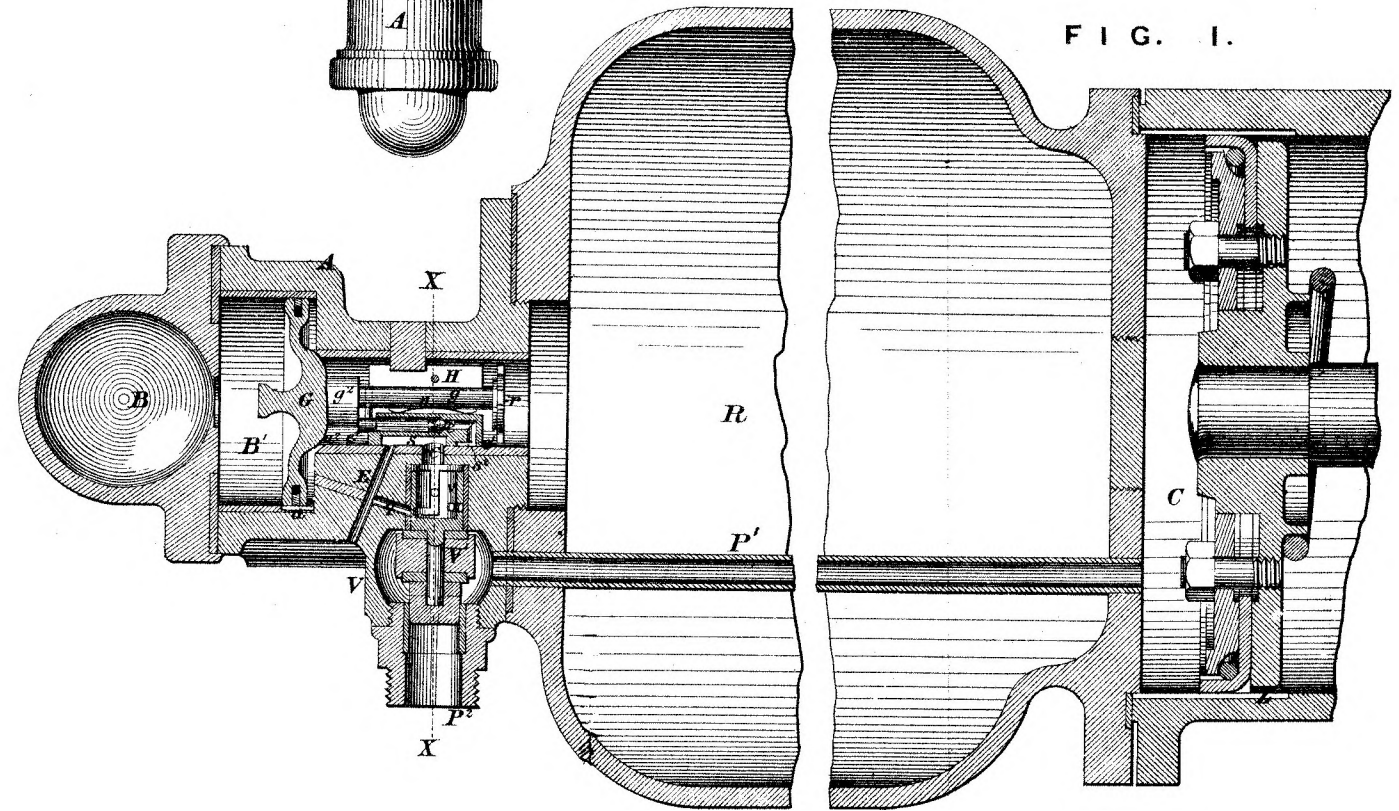


FIG. 1.



*This is the Sheet of Drawings marked B referred to in the annexed
 Letters of Registration granted to George Westinghouse Junior, this
 second day of August, A.D. 1881. Augustus Loftus.*

(Sig. 34)

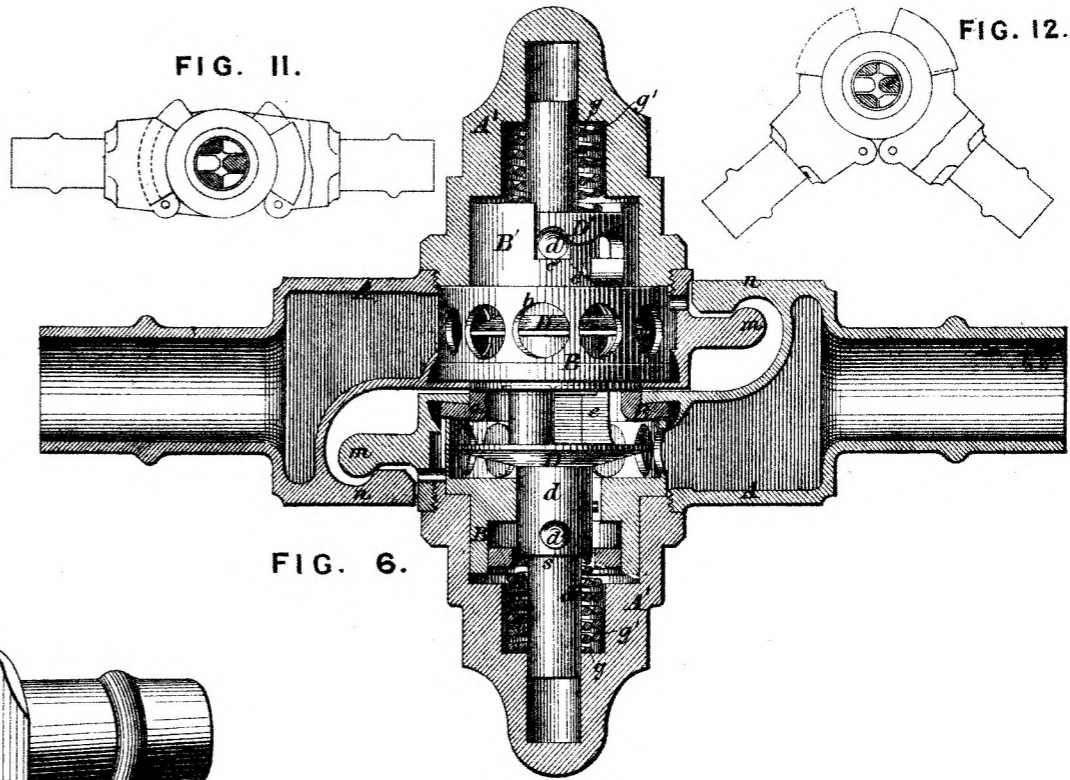
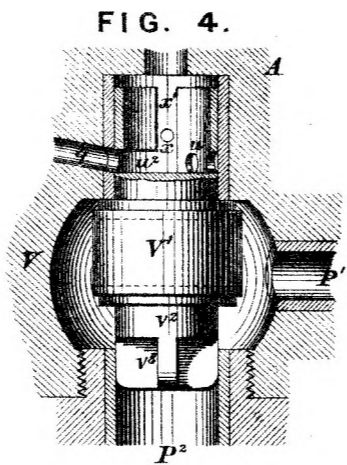
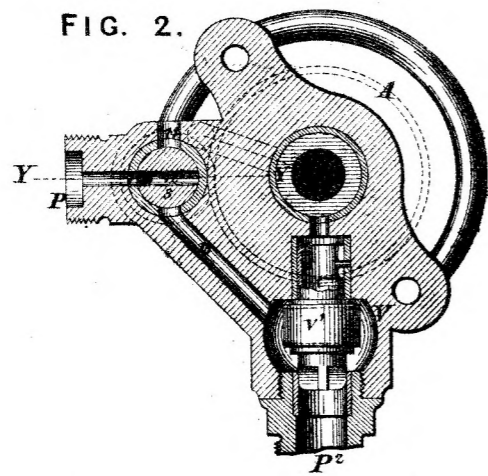


FIG. 11.

FIG. 12.

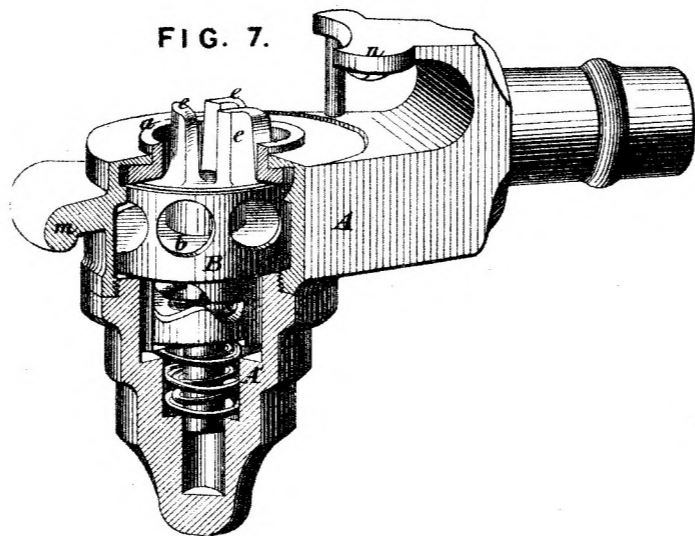
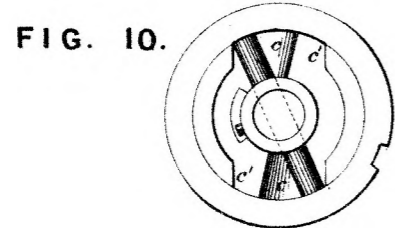
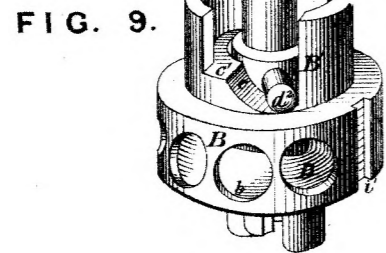
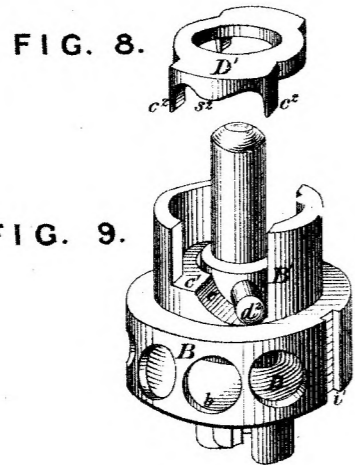


FIG. 7.

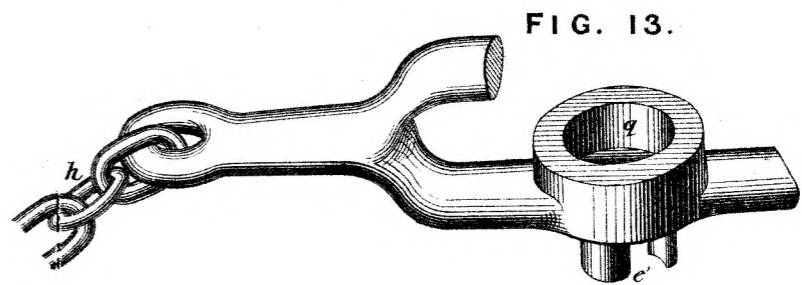


FIG. 13.

This is the Sheet of Drawings marked C referred to in the annexed Letters of Registration granted to George Westinghouse Junior, this second day of August, A.D. 1891. Augustus Loftus.

(Sig. 34-)



A.D. 1881, 2nd August. No. 964.

IMPROVEMENTS IN WIRE-ROPE TRAMWAYS.

LETTERS OF REGISTRATION to Andrew Smith Hallidie, for Improvements in Wire-rope Tramways for transporting articles and substances from place to place, and in the machinery and apparatus connected therewith.

[Registered on the 3rd day of August, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS ANDREW SMITH HALLIDIE, of the city of Sydney, in the Colony of New South Wales, and of the city and county of San Francisco, in the State of California, one of the United States of America, engineer, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in Wire-rope Tramways for transporting articles and substances from place to place, and in the machinery and apparatus connected therewith," which is more particularly described in the amended specification, marked A, and the two several sheets of drawings, marked B and C respectively, which are hereunto annexed ; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four ; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years : And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Andrew Smith Hallidie, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof ; to have, hold, and exercise unto the said Andrew Smith Hallidie, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended : Provided always, that if the said Andrew Smith Hallidie shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in South Wales, this second day of August, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Wire-rope Tramways.

A.

AMENDED SPECIFICATION of ANDREW SMITH HALLIDIE, of the city of Sydney, in the Colony of New South Wales, and of the city and county of San Francisco, in the State of California, one of the United States of America, engineer, for an invention entitled "Improvements in Wire-rope Tramways for transporting articles and substances from place to place, and in the machinery and apparatus connected therewith."

My invention has reference to a new system or method of transporting articles and substances from one place to another. The means which I employ is an endless wire-rope, which is carried upon pulleys, said pulleys being mounted on suitable posts, at convenient distances apart. A single or double line of posts can be used, and the course of the line can be changed as desired; at each end of the line the rope passes around a horizontal pulley, so that the same rope traverses in both directions. The endless rope thus mounted is set in motion either by means of a stationary steam-engine or by other more convenient motive power, so that it will travel around the circuit described by its supporting pulleys.

The substance, article, or thing to be transported I either attach directly to this moving rope or place it in a car, basket, or other carrying vehicle, which is afterward attached to the rope so that it will be carried along to the place at which it is to be delivered.

My invention also includes certain details of construction relating not only to the adjustment and manner of mounting and carrying the rope but also to the construction, arrangement, and application of the carrying vehicles, the whole forming a new transportation system which I call an endless wire ropeway.

In constructing my endless wire ropeway I take no notice of the inequalities of the ground, as the system works equally as well over a hilly and uneven country as it does on a level plain; in fact, one great and important feature of this system of transportation is that it requires no grading, but follows the outline of the country whether the line be straight or crooked.

Having determined upon the course of the route, I plant a line of posts at proper and convenient distances apart, extending from one end to the other of the proposed line. As before stated, I can use either a single or double line of posts, but unless a divergence of one of the branches of the rope is required, a single line of posts is all that is necessary.

A A represent the posts; across the top of each post A, I secure a horizontal cross beam, B, which is properly braced, and at each end of this horizontal beam I mount a vertical rope-bearing pulley, C.

At each end of the line I mount a large horizontal pulley, D, as shown, around which the rope E passes, in order to change its direction.

To the rope E, at suitable distances apart, I attach hangers or suspending rods, F, which depend from the rope and to the lower ends of which the article or substance, or the vehicle in which articles or substances are contained can be connected. The latter can be a basket, box, or car, as hereinafter described.

In order that these hangers may pass the pulleys I connect them with the rope by means of rectangular arms or clips, as shown at figures 27 and 29 of sheet 2. Each rectangular arm or clip is attached to the rope by a band or leaf, G, which forms an extension, X, of the vertical arm.

This band or leaf extends from one side of the vertical arm so that it can pass around the rope and overlap the opposite side of the vertical arm. To place this hanger the band may be heated, or it may be made of steel so thin as not to require heating, and bent around the rope and secured by rivets or other device, and if found necessary it can be secured to the rope by thin steel clasps passing through between the strands of the rope and clinched.

Figures 9, 10, and 11 represent different devices for securing the clip arm to the travelling rope. In figures 9 and 10, the thin steel band G at one end of the arm encircles the rope and is clasped tightly to it by a wedge which enters a dovetail groove, formed on the underside of the leaf G, at its extremity, and a similar or corresponding groove in the arm below. The wedge is driven in horizontally so as to draw the thin leaf tightly around the rope, while a large-headed screw, *n*, which passes through a slot in the leaf and into the arm, keeps them together, while allowing the leaf to move longitudinally when it is drawn upon by the wedge. In figure 11 the thin leaf is made thicker where it overlaps the body of the arm, and this thicker portion lies close to the arm so that it forms a part of it. A slot is made vertically through this thickened portion and also through the arm below, and a wedge, *i*, is driven vertically through the two slots, which are in different vertical planes, and consequently draws the leaf around the rope in the same manner above described.

The chief feature of the clip, however, is the arrangement for clasping the rope below the horizontal part of the body which passes over the pulley so that the flange of the pulley will not interfere with it in passing, and in having the body of the clip extend out horizontally from the rope, while the hanger or suspension rod is attached to its outer end either permanently or loosely, so as to be carried at a distance from the pulleys.

The suspension rods are bent below the rope so as to bring the lower ends directly under the rope or nearly so, so that the weight of the load which is attached to its lower end will hang almost perpendicularly under the rope, and when thus suspended will pass the upright supporting frames without coming in contact with them.

When clips are used they form a permanent attachment to the rope, and the weight to be transported is simply hitched or attached to the lower end of the hanger as they move past the place of loading; but in some cases I shall attach the hangers to saddles, as shown at figure 18, sheet 1, so that the saddles, hanger, and load can be lifted from the rope and placed upon it at any desired point. These saddles I shall usually cover or line on their undersides with India-rubber or other similar yielding or elastic substance that will adhere to the rope, and prevent the saddle from slipping backward in passing up an incline. Instead of the india-rubber or yielding lining, however, I will, in some cases, arrange gripper jaws on the underside of the saddle which will clamp the rope, and thus hold the saddles in place: In this case the jaws of the grippers are placed in the middle of the saddle and immediately below the point where the suspension rods are attached. With a single pair of jaws the saddle must either be of
considerable

Improvements in Wire-rope Tramways.

considerable length in order to avoid the possibility of its turning end over end, or the suspension rods must be attached below the level of the rope instead of above it. When two pairs of jaws are used, the pairs must be placed sufficiently far apart to avoid the same danger.

To pass the saddles over the rope-supporting pulleys I form a projecting hub, figure 19, on both sides of each pulley, and the rims of these hubs I roughen or provide with teeth, as shown at figure 18. The side plates *O'* of the saddles I make vertical, so that they will pass on each side of the pulley. The lower edges of these side plates are made convex, and their curved rims are also roughened or provided with teeth, so that when the saddle arrives at the pulley the toothed or roughened convex edges of the plates will engage with the toothed or roughened edges of the hubs, and the saddle will be lifted and carried over the pulley, and be deposited again upon the rope on the opposite side of the pulley. By connecting two saddles together at a short distance from each other so that one will always rest upon the rope while the other is passing over the pulley, no teeth will be required on the faces of the rings and side plates.

Figure 12, sheet 1, represents the horizontal end pulleys, around which the rope passes at each end of the line. When clip hangers are employed, this pulley may have only a lower flange, *d*, to support the rope, the upper flange being left off to allow the clips to pass around with the rope. The upper part of the pulley will then be a plain cylinder, while the lower part has a single horizontal flange for the rope and clip to rest upon.

When the saddles are used it is not intended that they shall pass around the end pulleys as they are removed from the rope before they come to the end pulleys, and after the buckets are unloaded the saddles with their hangers and empty buckets are placed upon the rope on the opposite side of the pulley to be carried back again.

In this case I can use a grip pulley such as is shown at figure 21, sheet 1, and in figs. 31 and 32, sheet 2, at the end of the line in place of the plain pulley, represented at fig. 12, sheet 1; because the rope has no fixture to pass around it, as in the case of a clip hanger.

The grip pulley is represented at fig. 20, sheet 1, in section, showing how the gripper jaws are applied. This figure represents a segment or section from the rim of a pulley-wheel, and a portion of one of the arms of the wheel. The rim of the wheel is made in two parts, one of which is formed solid with the arm, while the other is bolted or otherwise secured to the rim of the pulley after the gripper jaws have been inserted in their respective pockets, as hereinafter described. A recess is made just below the abutting part of the jaws so that when the strain of the rope or chain comes upon the bottom of the groove formed by the jaws, each jaw will be depressed, thus causing the jaws to draw together and compress or grip the rope, and prevent its slipping or moving while the strain is on; but as soon as the strain is removed, the jaws will work freely in their pockets and allow the rope to open them, and consequently free itself from the pulley.

In some cases I unite the jaws or arms by a hinge or other suitable joint at their meeting edges in the bottom of the cavity, as shown at figure 23, sheet 1, so that they will be held closely together when the strain comes upon them, while the depression of the united or hinged arms will cause the jaws to be drawn together against the rope from a fixed fulcrum.

A rope sustained and moved in the manner above described will be subject to more or less undulatory motion, and this motion is apt to throw it off from its supporting pulleys unless some fender or retaining device be employed to prevent it. To prevent this trouble I either secure a block or guard, as shown at fig. 19A, sheet 1, and fig. 29, sheet 2, or a plain faced upper pulley, as shown at figures 12 and 14, sheet 1, and figs. 27, 28, and 29, sheet 2, above the supporting pulley.

When the block or guard is used it is attached to the frames *H* that support the vertical pulley, and is made so as to overhang the face of the vertical pulley.

The underside of the block or guard is concaved so as to leave sufficient space for the rope and its attached clips to move through between it and the pulley, while its outer end extends down far enough to keep the rope from jumping out of the groove in the pulley, but leaving sufficient space for the passage of the shank of the clip over the outer edge of the pulley.

This block or guard is also in some instances attached to a spring arm, as shown at fig. 19A, sheet 1; so that unusual pressure will force it upward and allow it to be removed from the pulley, but the tension of the spring must be sufficient to prevent it from yielding to the ordinary vibration of the rope. In some cases, in place of the fixed block or guard, I use a small roller or wheel attached to the spring arm as above described.

When the plain-faced pulley is used it is mounted vertically on a horizontal axis above the rope-bearing pulley, so that both pulleys rotate in the same plane, and it serves to keep the rope in the groove and permit the passage of the clip-shank in the same way as the block above described.

Figure 25, sheet 1, represents a ropeway in which the direction of the rope is changed in order to pass around the side of a mountain, or to accommodate three or more different stations located in different directions from each other.

In this case the rope changes its direction of travel after leaving each pulley, and as the vibration of the rope and the weight of the load tend to prevent the rope from keeping in the grooves of the pulleys, some positive means must be employed to compel it to enter and remain in the grooves, also some means are necessary to adjust the pulleys so that the rope will lead directly in line with the groove in approaching the pulleys. This I accomplish by employing on the outer angle of the line vertical pulleys with only an outside flange, combined with horizontal pulleys having only an upper flange, so that the two pulleys rotating in different planes with their flangeless edges in contact, will form a bearing slot and guide for the rope, from which it cannot escape. On the inner angle I mount the pulleys on swinging brackets so that they will adjust themselves to the line of traction in which the rope moves; they will therefore present the grooves of the pulleys fairly to the approaching rope so that it will remain in them. Means could be provided for securing the brackets in a permanent position after they are adjusted to the desired line.

Figure 26, sheet 1, represents the two oppositely moving branches of an endless rope connected at intervals by gearing. This can be done when the two branches run parallel with each other; and it is useful where the line passes over inclines or steep ascents, and where the motion of the rope is derived from

Improvements in Wire-rope Tramways.

from the weight of the load deposited on the downward moving branch. In this case the loaded buckets, cars, or other weight attached to the hangers on the descending side of the rope will furnish the power for hauling up the opposite side of the rope, with its hangers and empty buckets or cars. I therefore extend the axles of the opposite pulleys so that their inner ends will overlap each other, and connect their inner ends by spur gears or other means for transmitting the power, so that the two branches of the rope will be connected at intervals, and the power and motion of the descending branch transmitted across to the opposite ascending branch, thus equalizing the motion and steadying the rope.

The hangers, with various styles of buckets or cars, are represented at figs. 1, 2, 3, 4, 5, 6, 7 and 8, sheet 1.

Figures 3 and 4 represent the hangers connected with the rope by means of clips. In this device the carrier is permanently attached to the lower end of the hangers, and its bottom is hinged so that it can swing open to deliver its load. When closed it is retained by a latch and counter balance.

Figures 5, 6, and 8, represent a clip hanger, with the box or car journalled in a frame at its lower end so that it can be upset on its journals and emptied; a latch operated by a lever serves to retain the box or car in its upright position. Figure 5 also shows the upper pulley for keeping the rope in the groove of the bearing pulley.

Figure 7 represents a compound hanger, in which one part is attached permanently to the moving rope, and the other part is attached to the car or box.

The rope attachment consists of two depending rods, to the lower ends of which a plate is secured either horizontally or at an inclination. The upper edge of this plate is toothed or serrated. The box attachment consists of uprights which are connected across their upper ends by a similar plate, the underside of which is toothed or serrated to correspond with that on the hangers. The connection is made by placing the plate of the box upon the plate of the hanger so that the teeth or serrations will interlock. This provides for an automatic detachment of the box with its load from the hanger, as it is only necessary to lift the box upward to free it from its supporting plate. I therefore construct an inclined platform below the rope at the point where the load is to be detached, and provide the box or car with wheels, so that when the car strikes the platform it will move up the inclined platform until the interlocking plates are disconnected or separated, when the car will move off down the incline to be unloaded or dumped. It is better in this arrangement to incline the interlocking plates in the direction opposite to that in which the rope moves, in order that they may separate more readily when the car strikes the incline.

Figure 27, sheet 2, represents the end frame and its horizontal pulley around which the rope passes at the end of the line where the buckets or cars are loaded, and also an automatic loading device connected therewith by means of which the buckets or cars can be loaded without detaching them from the rope. The pulley frame is stationary, and the end pulley is mounted on a vertical shaft which terminates just above the pulley. A mast or vertical shaft is mounted above the pulley, on which a swinging arm or boom is arranged and properly guyed by brace rods. The bucket represented at figs. 1 and 2, sheet 1, is mounted on this swinging arm or boom so as to travel back and forth on it. K is the loading spout through which the substance to be loaded into the buckets K' or cars on the rope is delivered into the loading buckets of the boom. The boom bucket is run out under the spout and filled. The boom is then swung around so that its loaded bucket will meet the approaching empty bucket on the rope, and as the empty bucket passes around the end pulley the boom bucket is emptied into it without detaching the car or bucket from the rope.

Figure 31, sheet 2, is a plan view of this pulley.

Figure 28, sheet 2, is a vertical elevation of the compensating frame which carries the end pulley at the opposite end of the line. This frame or structure is mounted on wheels which rest on a track the rails of which are in line with the ropeway. A heavy weight is suspended by a chain or other connection from this frame, the connection passing over a pulley in advance of the frame so as to draw upon the frame and keep the rope taut.

Figure 32, same sheet, shows a plan view of this frame and its arrangement. The large horizontal grip pulley around which the rope passes is mounted on this frame, and where the ropeway is run by gravitation this pulley is provided with a large hub or brake wheel on its upper side, around which I apply a band or friction brake, which is tightened by a nut so as to draw the band tight around the hub for the purpose of regulating the speed of the drum.

Figures 29 and 30 represent the intermediate rope-supporting frames and their construction.

Having thus described my improvements in endless ropeways, what I claim and desire to secure by Letters Patent is—

First—An elevated tramway for transporting articles and substances from place to place, consisting of an endless wire-rope, supported on pulleys at intervals, and passing around horizontal pulleys at the ends of the line; said rope having hangers or suspension rods connected with it by clips or thin steel bands for suspending the weight below the rope and passing the pulleys, the whole arranged and operated substantially as herein described.

Secondly—In a wire tramway system where the carriers are attached to the rope by means of clips or bands, the arrangement of upper pulleys or guards for preventing the rope from leaving the grooves of the supporting pulleys, substantially as specified and illustrated in the drawings.

Third—In an endless ropeway or tramway the employment of clips adapted for clasping the rope and suspending the hangers or suspension rods, so that the rods and their attached weights can be carried past the pulleys without interfering therewith, substantially as herein specified and shown in the accompanying drawings.

Fourth—The clip attached to the travelling rope by means of clasps which are adapted to be tightened on the rope by means of a wedge or key, substantially as herein described and shown.

Fifth—The employment in endless wire-rope tramways of saddles, provided with a gripping device, to seize and hold the rope, as herein described.

Sixth—

Improvements in Wire-rope Tramways.

Sixth—Vertical rope-supporting pulleys, with toothed projecting hubs on their sides in combination with saddles having curved toothed side plates, in endless wire-rope tramways, substantially as herein illustrated and described.

Seventh—In an endless wire-rope system, where the two oppositely moving branches of the rope run parallel with each other, extending the axles of the rope-supporting pulleys so that they overlap each other, and then gearing their overlapped ends together for the purpose specified.

Eighth—The combination of a permanently attached hanger as represented at figure 7, sheet 1, with a car that automatically detaches itself, substantially as specified.

Ninth—The mode or method herein described of loading the boxes or cars attached to a moving rope without interfering with the travel of the box, car, or rope, consisting in mounting a supplemental loading bucket on a swinging boom or derrick, the motion of which is concentric with the motion of the bucket around the end pulley, so that the load can be transferred from the loading bucket to the bucket, car, or box which is attached to the rope while it is moving around the end pulley, substantially as described, and illustrated in figure 27, sheet 2.

Tenth—The employment of a loading bucket which is mounted so as to travel a short distance in company with the bucket, car, or box which is attached to the rope, and the load transferred meanwhile from the loading bucket to the rope, attached bucket, car, or box.

Eleventh—The adjustable hinged pulley frame represented at fig. 19A, sheet 1, for changing the angle and plane of the rope-supporting pulley, as specified.

In witness whereof, I, the said Andrew Smith Hallidie, have hereunto set my hand and seal.

ANDREW SMITH HALLIDIE.

This is the amended specification, marked A, referred to in the annexed Letters of Registration, granted to Andrew Smith Hallidie, this second day of August, 1881.

AUGUSTUS LOFTUS.

REPORTS.

Sir,

Sydney, 4 August, 1880.

We do ourselves the honor to report, in reply to your blank cover communication of the 12th July, No. 5,567, that on examination of Mr. A. S. Hallidie's application for Letters of Registration for "Improvements in Wire-rope Tramways," we find that the self-dumping ore buckets and arrangements for loading are similar to those already patented in this Colony; that the driving drum is similar or nearly identical with Fowler's clip drum, patented in England many years ago, and that generally the whole of the arrangements are similar to those known as Hodgson's Wire-rope Tramway. We are therefore of opinion that the prayer of Mr. Hallidie's Petition should not be complied with.

We have, &c.,

JOHN WHITTON.
WILLIAM C. BENNETT.

The Principal Under Secretary.

Sydney, 8 September, 1880.

Hallidie's application for Letters of Registration for an invention and improvements in Wire-rope Tramways.

Sir,

With reference to the further application of Mr. Hallidie's, dated September 3rd, sent for our report, we have to reply that the buckets are similar to those seen by us at work at Mort's Dock. The loading arrangement possesses some slight novelty, and a patent for that portion only could be given.

With respect to the clip drum, the variation (if any) from Fowler's patent is so trifling that we cannot recommend it for protection.

We have, &c.,

JOHN WHITTON.
WILLIAM C. BENNETT.

The Principal Under Secretary.

Sir,

Sydney, 21 September, 1880.

With reference to the further communication of Mr. H. H. M. Smith, No. 80-2,613, for protection for modification of Fowler's clip drum, we have the honor to state that we are still of opinion that it should not be granted.

We have, &c.,

JOHN WHITTON.
WILLIAM C. BENNETT.

The Principal Under Secretary.

Improvements in Wire-rope Tramways.

Sir,

Sydney, 27 September, 1880.

With reference to the further communication of Mr. H. H. M. Smith, No. 80-7,940, respecting Mr. Hallidie's application for protection for modification of Fowler's clip drum, we have the honor to state that we still consider that protection should not be given, and advise, as it is a legal point, that the question be referred to the Honorable the Attorney General.

We have, &c.,

JOHN WHITTON.

WILLIAM C. BENNETT.

The Under Secretary of Justice.

Sir,

Sydney, 4 November, 1880.

With reference to B. C. minute 29-1,080, enclosing further letter from Mr. Smith, *re* Hallidie's application for patent for improvements in Wire-Tramways, we have to report that after the explanations afforded by Mr. Smith, we are of opinion that a qualified protection may be granted; that is, reserving to the public all rights under Hodgson's patent, granted in the Colony, 10th May, 1872, and under Mr. Fowler's patent, or patents, for improvements in clip pulleys or drums, granted in England.

We have, &c.,

JOHN WHITTON.

WILLIAM C. BENNETT.

The Principal Under Secretary.

Sir,

Sydney, 6 January, 1881.

In further reference to the correspondence on Hallidie's patent, and the letter of the Crown Solicitor, pointing out that the qualified protection recommended in our letter of 4th November cannot be given, we have the honor to state that we have carefully compared Mr. Hallidie's claims with Hodgson's patent, and now recommend that protection be given for clauses 3, 4, 6, 10, 11, 12, 13, and 14. The other clauses, except No. 7, are already protected by Hodgson's patent.

With respect to No. 7, we are of opinion that the modification of Fowler's patent is too slight and obvious to justify our recommending protection of that clause.

We have, &c.,

JOHN WHITTON.

WILLIAM C. BENNETT.

The Under Secretary of Justice.

Sir,

Sydney, 16 June, 1881.

The papers relating to Hallidie's application to patent Wire-rope Tramways, &c., are now returned herewith.

We are of opinion that protection might be granted to the claims made in amended specification, though we observe that clauses 1 and 5 of the old specification are still retained.

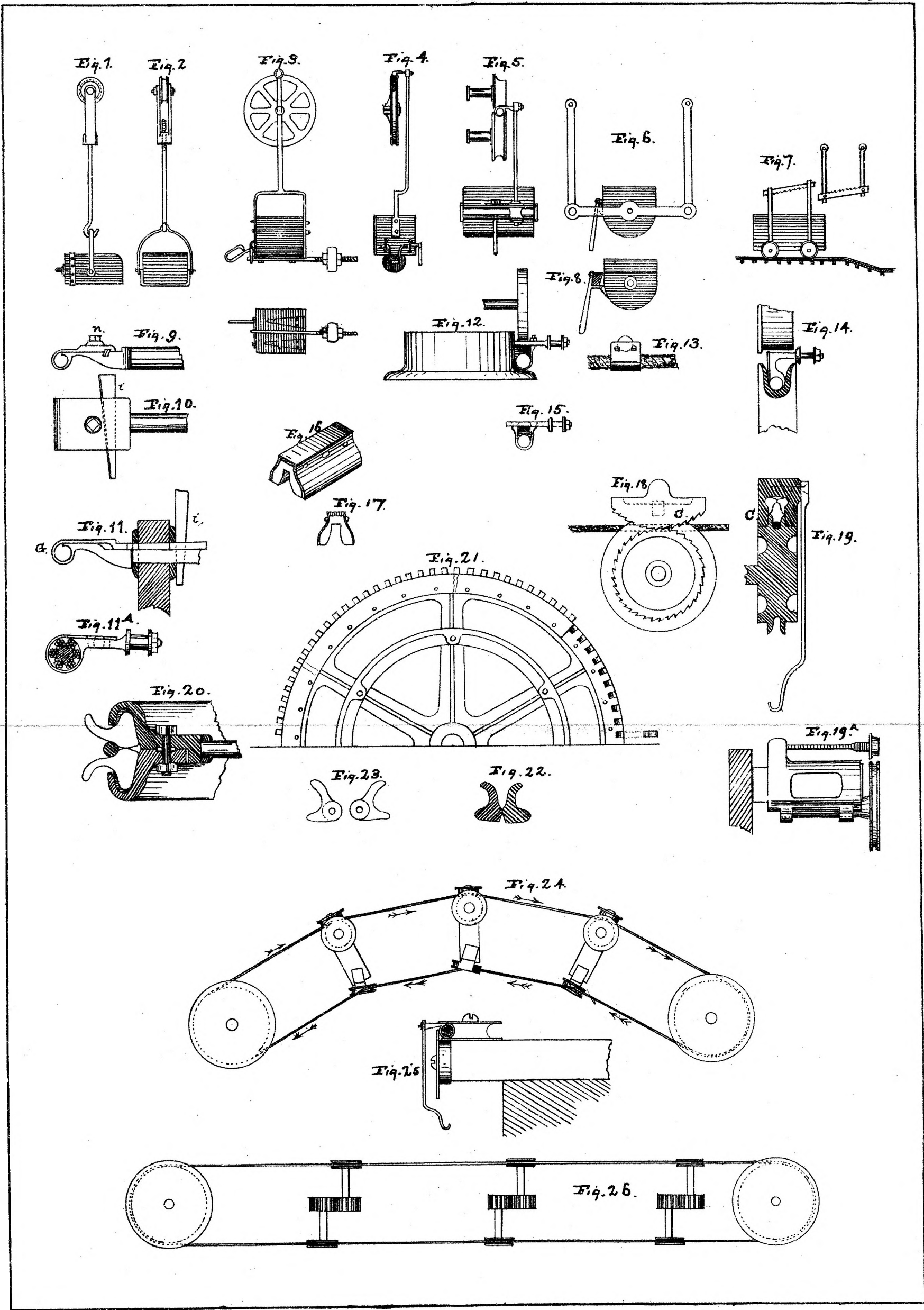
We have, &c.,

JOHN WHITTON.

WILLIAM C. BENNETT.

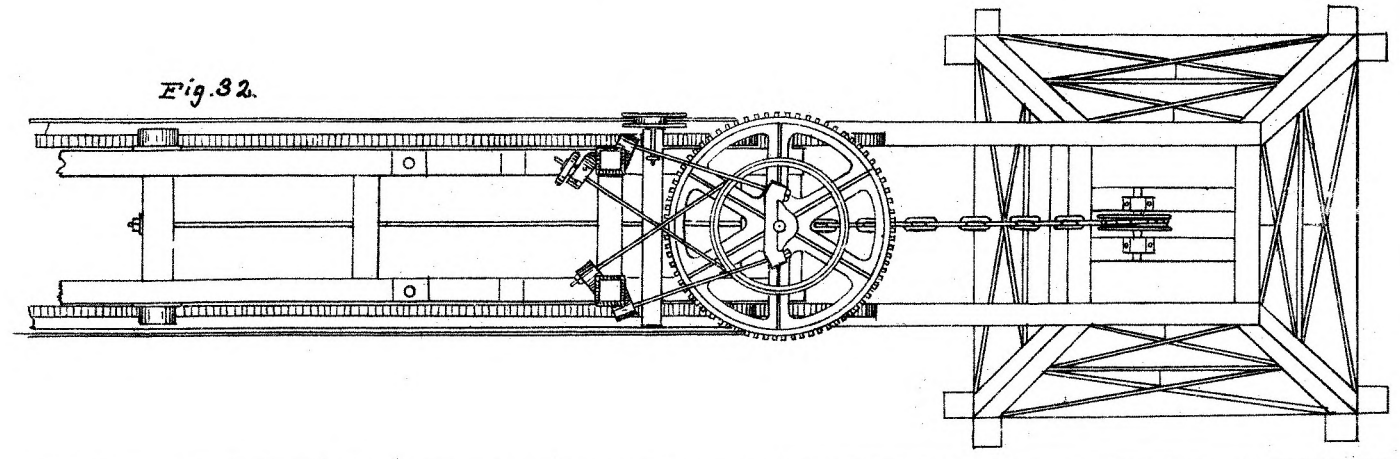
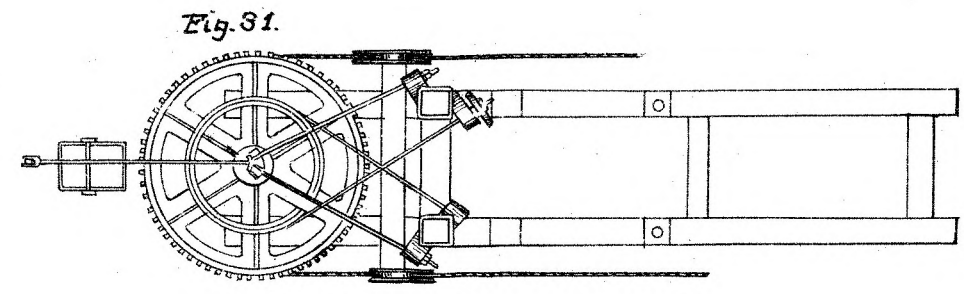
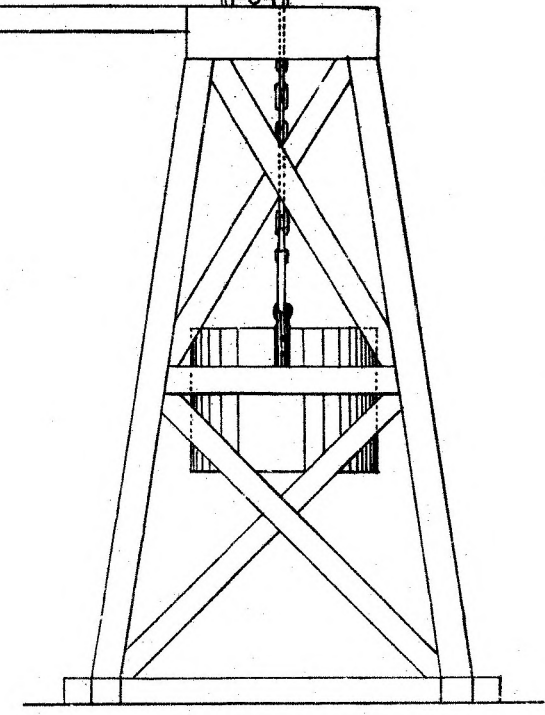
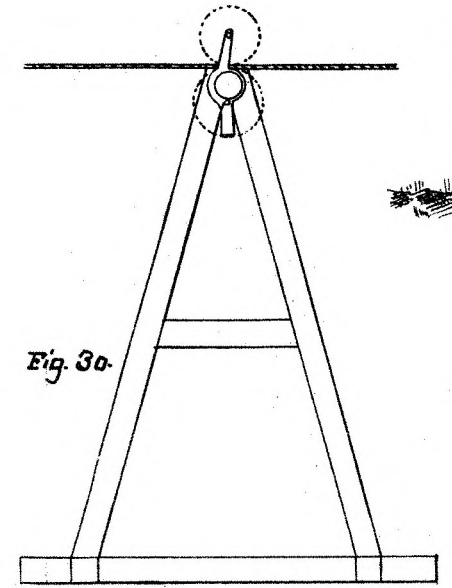
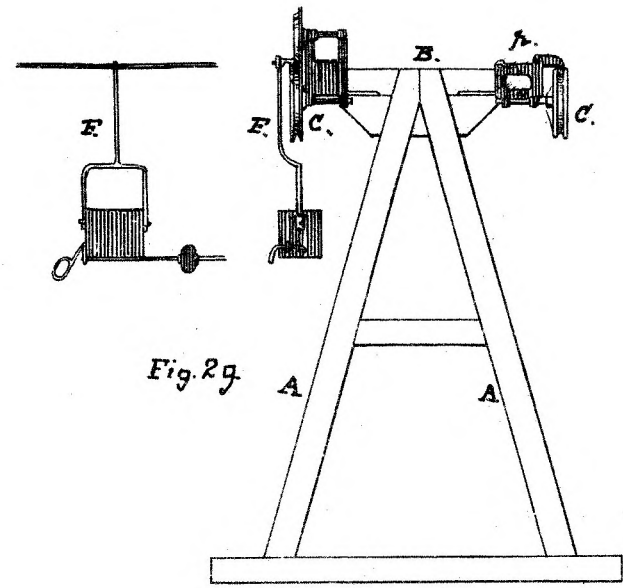
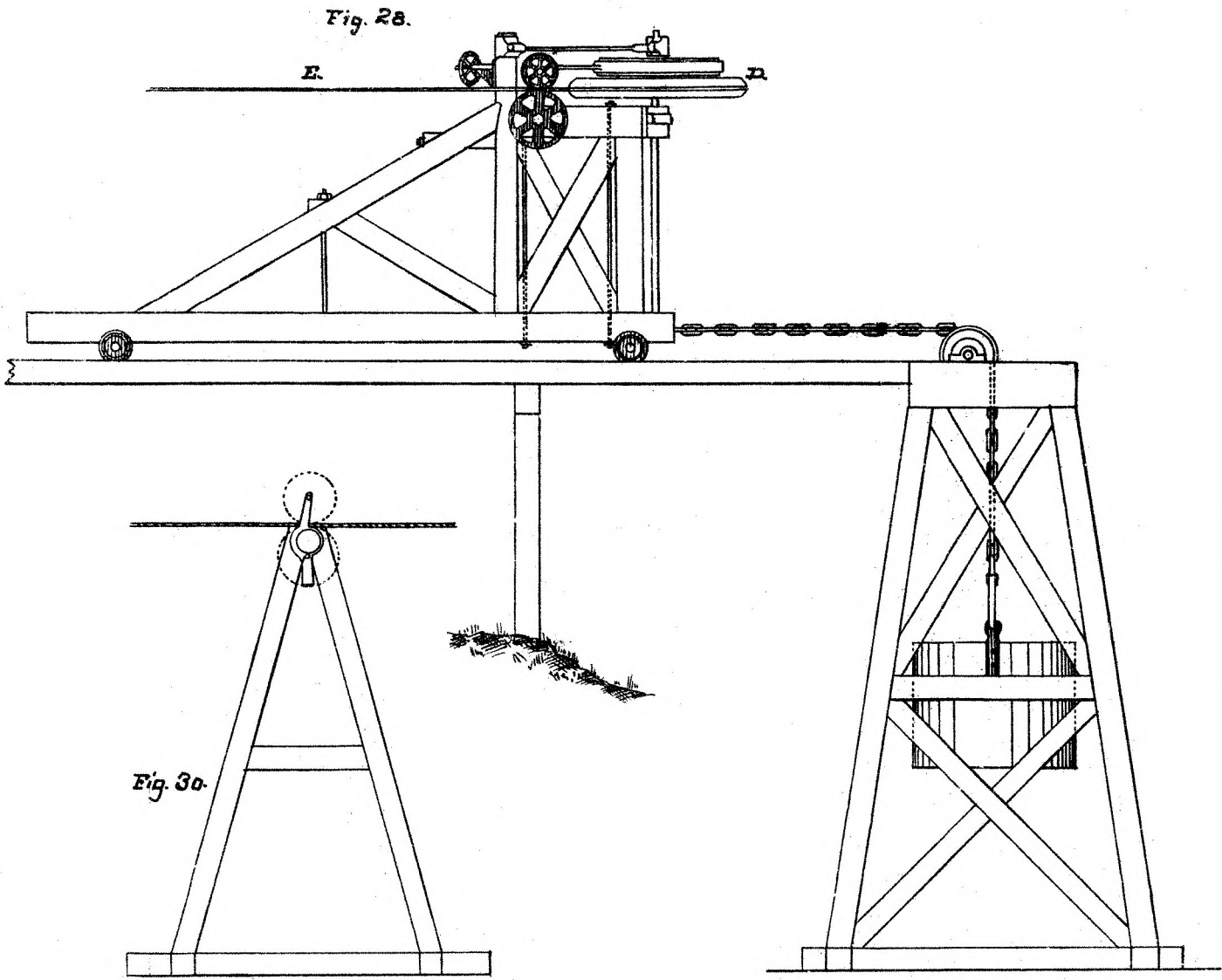
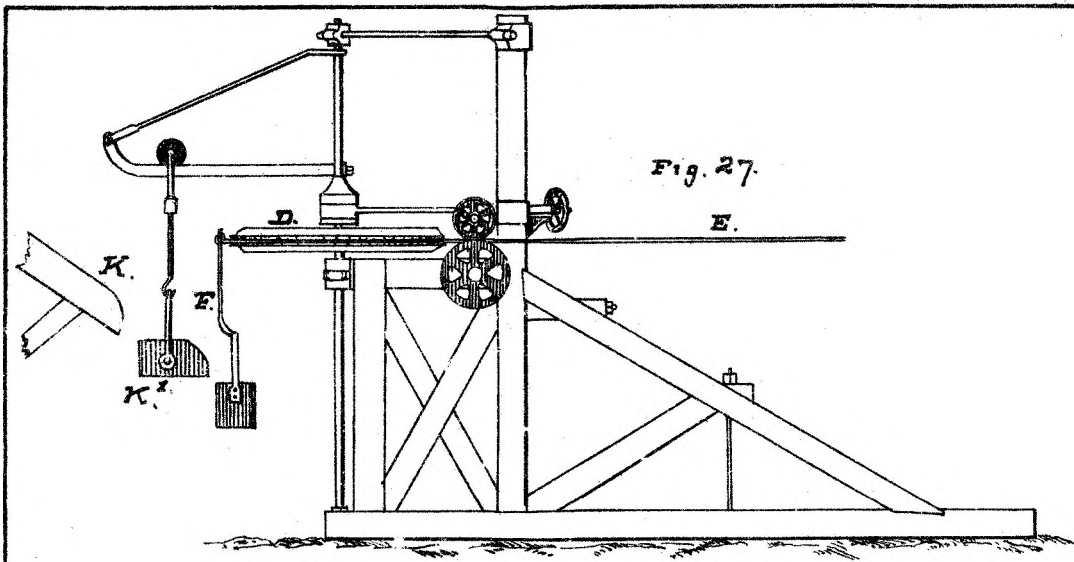
The Under Secretary of Justice.

[Drawings—two sheets.]



This is the Sheet of Drawings marked B referred to in the annexed Letters of Registration granted to Andrew Smith Halliday this second day of August, A.D. 1881.

Augustus Loftus.



(34-)

*This is the Sheet of Drawings marked C referred to in the annexed
 Letters of Registration granted to Andrew Smith Hallidie this
 second day of August, A D 1881.*

Augustus Loftus.



A.D. 1881, 13th August. No. 965.

A CIGARETTE.

LETTERS OF REGISTRATION to John F. Allen and Louis Ginter, for a "Cigarette of which the rice-paper at one end is prepared with an amber saliva-proof substance, preventing the rice-paper sticking to the lips or becoming moist in any way.

[Registered on the 15th day of August, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS JOHN F. ALLEN and LOUIS GINTER, both of Virginia, one of the United States of America, have by their Petition humbly represented to me that they are the authors or designers of a certain invention or improvement in manufactures, that is to say, of an invention entitled "A Cigarette of which the rice-paper at one end is prepared with an amber saliva-proof substance, preventing the rice-paper sticking to the lips or becoming moist in any way," which is more particularly described in the specification which is hereunto annexed; and that they, the said Petitioners, have deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and have humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to them for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration, grant unto the said John F. Allen and Louis Ginter, their executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said John F. Allen and Louis Ginter, their executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said John F. Allen and Louis Ginter shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this thirteenth day of August, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

A Cigarette.

TO ALL TO WHOM THESE PRESENTS SHALL COME, we, JOHN F. ALLEN and LOUIS GINTER, both of Virginia, one of the United States of America, send greeting :

WHEREAS we are desirous of obtaining Royal Letters of Registration for securing unto us Her Majesty's special license that we, our executors, administrators, and assigns, and such others as we or they should at any time agree with, and no others, should and lawfully might, from time to time, and at all times during the term of fourteen years, to be computed from the day on which this instrument shall be left at the office of the Minister for Justice, make, use, exercise, and vend within the Colony of New South Wales an invention or improvement in cigarettès; and as, in order to obtain such Letters of Registration, we must more particularly describe the same: Now we, the said John F. Allen and Louis Ginter, do hereby declare the nature of such improvement to be as hereunder more particularly described and shown in the accompanying specimen or model cigarettes, that is to say:—

SPECIFICATION.

As the luxurious enjoyment of the cigarette depends upon the perfect fabrication of the article, and as, notwithstanding the many attempts to ensure perfection, even the most successful being found to leave room for further improvement, the present successful attempt has been made in this article, which we describe as "a cigarette of which the rice-paper at one end is prepared with an amber saliva-proof substance, preventing the rice-paper sticking to the lips or becoming moist in any way"; and this is the substance of our claim, for which we seek protection.

In witness whereof, we have hereunto set our hands and seals, this day of June, one thousand eight hundred and eighty-one.

JOHN F. ALLEN.
LOUIS GINTER.

By their Agent, HENRY HALLOBAN,
1, Bridge-street Chambers, 9th June, 1881.

This is the specification referred to in the annexed Letters of Registration granted to John F. Allen and Louis Ginter, this thirteenth day of August, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

The application of Messrs. John F. Allen and Louis Ginter for Letters of Registration for "an amber saliva-proof mouthpiece Cigarette," having been referred to us, we have examined the specification accompanying the same, and have the honor to report that we see no objection to the issue of Letters of Registration as prayed for.

Sydney, 1 July, 1881.

We have, &c.,

THOS. RICHARDS.
ARCH. C. FRASER.

The Under Secretary of Justice.



A.D. 1881, 13th August. No. 966.

IMPROVEMENTS IN VEBERMETERS.

LETTERS OF REGISTRATION to Thomas Alva Edison, for Improvements in Vebermeters, or devices for measuring and registering the current flowing through conductors.

[Registered on the 15th day of August, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting:

WHEREAS THOMAS ALVA EDISON, of Menlo Park, in the State of New Jersey, United States of America, electrician, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in Vebermeters, or devices for measuring and registering the current flowing through conductors," which is more particularly described in the specification and sheet of drawings which are hereunto annexed; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Thomas Alva Edison, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said Thomas Alva Edison, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said Thomas Alva Edison shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this thirteenth day of August, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Vebermeters.

SPECIFICATION.

TO ALL WHOM IT MAY CONCERN: Be it known that I, THOMAS ALVA EDISON, of Menlo Park in the State of New Jersey, United States of America, electrician, have invented certain "Improvements in Vebermeters, or devices for measuring and registering the current flowing through conductors," of which the following is a specification:—

My invention relates to apparatus for measuring an electric current, and belongs to the general class of apparatus to which I have applied the name vebermeter in Letters Patent heretofore granted to me.

One part of my invention for this purpose consists in deflecting a definite proportional part of the current to be measured, and passing it through a vessel partially filled with water and floating in the same liquid. The water in the vessel is decomposed by the current, and the gases formed displace a portion of the water in the vessel, lessening its specific gravity and causing it to rise. The rising of the vessel causes the lifting of a lever connected with a registering mechanism, so that, the amount of gases produced being proportional to the current passing through the vessel, and this in turn proportional to the main current, the last may be indicated by the register.

Such arrangement is made that when a definite predetermined amount of decomposition has taken place the vessel will rise to a sufficient height to close an electrical circuit, which will send a current through the gases and explode them, so that they will be recomposed into water, and the vessel again fall; these operations being repeated so long as current passes.

Figure 1 of the accompanying drawings is a view of an apparatus for this purpose. In this, figure A is a tank of water, and B a vessel, also containing water floating therein. 1-2 is the main circuit, from which, by means of the resistance placed at R, a definite portion of the current is deflected into the circuit 5-6. This circuit passes through the water in the vessel B, and returns again to the main circuit. 7-8 is a third circuit from the main one, and is broken at the contact points *a a'*. C is the top of the tank A. It supports a suitable registering apparatus, E, and the contact *a'*; and the wires of the circuits 5-6 and 7-8 pass through it. Also passing through C is the projection *b*, which extends up from the vessel B, operating the lever D of the registering apparatus, and terminating in the contact point *a*.

As above stated, in consequence of the resistance R, a definite portion of the current is deflected from the main current into the wire 5, and passes down through C into the vessel B. The lower portion of this current 5-6 is completed by the water, and the current in passing through it decomposes a portion thereof, which rises in a gaseous form to the surface. As the upper portion of the vessel becomes filled with these gases the specific gravity of the whole is lessened, and the vessel rises, carrying with it the projection *b*, and thus moving the lever D, which operates the register.

When the upper part of the vessel B is entirely filled with the gases it rises to such a height that the contact *a* will meet *a'* and close the circuit 7-8. A current of electricity immediately passes along this circuit, heating the platinum coil *x*, and causing by explosion the recomposition of the gases into water.

The vessel B then falls to its former position, re-opening the circuit 7-8, and the current again passes through the circuit 5-6. This operation is of course continually repeated.

A resistance placed at R' prevents the passage of too large a current of electricity through the circuit 7-8.

Another portion of my invention consists in an arrangement for measuring an electric current, as follows:—

An electro-depositing cell has a metal lining which forms one of the electrodes thereof, being connected in any suitable manner with one of the leading wires. The other electrode is a piece of metal suspended within the cell by a spring, the stress of the spring being so adjusted that the metal piece will be sustained at the top of the cell when there is a minimum of deposition thereon, while the maximum of deposition will cause it to sink to the bottom. An index arm is attached to the metal piece, and a scale provided in connection therewith, so that the amount of deposition will be visually indicated.

The electrodes are also connected with a registering apparatus and circuit reversers, which change the direction of the current through the cell, and consequently reverse the anode and the cathode, so that metal is first deposited on and then removed from the metal piece, causing it to rise and fall, so that the registering apparatus works whenever the circuit is reversed.

This arrangement is similar to that described in Letters Patent heretofore granted to me, differing therefrom only in detail, while the general principle remains the same.

Figure 2 of the drawings represents a form of this meter, adapted to measure large quantities; and figure 3, a simpler form, to be used for small quantities.

A is an electro-depositing cell, made of any suitable material, but lined on the inside with the metal C, which is to form an electrode thereof. At one point the metal lining is continued over the top of the cell, to make connection with one of the leading wires 3, or the wire may be taken through the outer case at any desired point, or the two may be united by a separate piece of metal.

A piece of metal, B, is suspended by a spring, V, to form the other electrode, the stress of the spring being so adjusted that it will sustain B at the top of the cell when there is a minimum of deposition on B, while the maximum of deposition will cause B to sink to the bottom of the cell. Upon the arm D rising from or in the vicinity of A to support V is placed a scale, S, an index arm, E, being attached to B, so that the amount of deposition between the maximum and minimum of deposition may be visually indicated.

From D projects a contact arm, H, while upon A is secured a contact, G.

From an arm, *x*, springing from the cell A, or supported in any other suitable manner, depends a counter-balanced lever, whose inner end is fashioned into a Y, whose inner ends, *yy'*, lie between H and G, while between them takes the prolongation *e* of the index E, so that the rise and fall of B shall cause
yy'

Improvements in Vebermeters.

y' to contact with H or G, as the case may be. I is a reversing and counting apparatus, consisting of the magnets $m n$, between which plays the armature lever L, whose outer end actuates the register K, and whose inner end controls the reverser O.

P Q is the main circuit, the current through which is to be measured. From it two branch circuits lead—one for actuating the reversing and registering apparatus, represented by the broken line circuits, 1, 6, 7, 8; the other for causing electro-deposition, shown in broken crossed lines, 2, 3, 4, 5.

Suppose now the current to be flowing in the direction of the arrow: Between 4 and 5 a resistance, R, is placed, so as to deflect through the vebermeter a certain definite fraction of the current through P Q; such fraction passes by 5 to b , to d , thence by 3 to C, which is now the anode, to the cathode B, causing deposition thereon, by V to 2 c , a , 4 to P. As B becomes weighted it sinks, the arm F finally causing y' and G to contact, whereupon circuit P, 1, E, G, 8, 6, Q, is closed through n , which attracts L, causing it to operate the register K and the reverser O, so that now the circuit is by 5, c , 2, V, to B, which becomes the anode, to C, now the cathode, 3, d , a , 4, P, removing the metal deposited upon B and depositing it upon C.

When B becomes sufficiently lightened it rises, causing y to contact with H, closing circuit through m , which attracts L, causing operation of the register K, and a reversal of the vebermeter circuit. This series of operations proceeds continuously, the register denoting each maximum and minimum deposition, while the index and scale denote the fractional deposition at any one moment.

When only one or two lights are used, and the current to be measured is comparatively small, the cell A and spring-suspended plate, and index and scale, may be used as shown in figure 3, connections being made directly thereto by wires 4 and 5.

As vebers, weight of metal deposited, and the amount of light from a given number of feet of gas of standard quality bear a certain definite relation to each other, the scale S may be arranged to be read in either, whichever one is used, being readily reducible to terms of the others.

Another part of my invention relates to a vebermeter constructed and operating on a different principle from those heretofore described by me.

Generally speaking it consists of a motor to which is given a certain definite amount of work to do, or resistance to be overcome, combined with registering devices which register the amount of work done or resistance to motion overcome.

I have found that the rapidity with which the motor will accomplish its work with a definite loading is proportioned to the amount of current energizing it; hence, if the motor is arranged to have a slow motion, when the amount of current necessary for (say) one translating device passes through the circuit, its speed will be increased proportionately as the number of translating devices using current is increased.

The motor may be placed with its field and armature coils both directly in the main circuit, or both in a shunt circuit, or the field coils may be placed in the direct circuit, and the armature in a shunt thereto.

The loading or resistance may be given in a variety of ways; for instance, fan blades or wings may be connected to the armature shaft by multiplying gearing, or, preferably, blades or wings may be driven in a tank or dash pot filled with a thick liquid, the armature shaft being connected to suitable registering devices, such for instance as is used in gas-meters, by slowing down gearing, or worm and wheel, so that the movement of the registering devices is much less than that of the actuating rotating armature.

Means for accomplishing this are shown in figures 4, 5, 6, and 7 of the drawings; figures 4 and 5 being views showing the motor and fans in elevation; and figures 6 and 7 diagrams giving different methods of connecting the motor in circuit.

In these figures 1-1 is one of the main conductors of the place of consumption, the other not being shown; F is the field of force magnets, and A the revolving armature of an electro motor.

In figures 4 and 5 the coils of F are directly in the circuit 1, while the armature is in a shunt circuit, 4.

In figure 6 both A and F are in a shunt circuit, 2, while in figure 7 both A and F are directly in the main circuit 1.

In figure 4 a is the shaft of the armature A, and upon one end it carries a gear b , which meshes into a pinion, c , on whose shaft is a gear, d , taking into a pinion, e , on a shaft, E, carrying the wings or fan-blades W, which give the load or resistance to motion to the engine. The shafts of the gears and pinions and blades are supported in suitable framing, and by the arrangement shown the rate of motion of A is increased in W, whereby large reduction in size of W is effected.

Upon the other end of the shaft a of A is the pinion f and an index finger, i , the latter passing over a register face, m . In practice this should be the first wheel of a register, such as is employed in gas-meters.

The pinion f meshes with a gear, g , on whose shaft is an index finger, h ; the pinion f and gear g being so proportioned that h shall advance one step or registration to a complete revolution of i .

In figure 5 the shaft a of A carries the fan-blades or wings P P, working in contracted spaces formed in the vessel or dash pot V, by projections, o , extending inwardly from its sides. This vessel or pot may be filled with a liquid, such as glycerine or petroleum, so that the definite work or load for the motor may be given it in a very small space or compass.

Upon a is a screw meshing into a worm upon shaft I, carrying index pointer m , to which may be added carrying devices, as in case of figure 4.

As the load is constant, the rapidity with which work is done will depend upon the energizing of the motor, which in turn is dependent upon the current flowing through 1-1, which is determined by the number of translating devices in use upon the circuit to be measured; hence, as more or less current is used, the registration at the time proceeds faster or slower, with the result that a substantially correct indication of the current used in any given time is obtained.

What

Improvements in Vebermeters.

What I claim is—

- First—In a vebermeter, the combination of a floating electrolytic cell, means actuated thereby for causing the recombination of the water decomposed therein, and means for registering the rise and fall of the floating cell, substantially as set forth.
- Second—The method of measuring an electric current substantially as set forth, which consists in causing a definite proportion of the current to pass through a floating electrolytic cell, arranged to rise as the fluid therein is decomposed, and then upon the decomposition of a predetermined amount of fluid, causing the recombination of the gases and consequent fall of the cell, and registering the occurrence of this sequence of operations, substantially as set forth.
- Third—The vebermeter consisting of a cell, a spring-suspended electrode, and an index and scale, substantially as set forth.
- Fourth—The combination in a vebermeter of a cell, a spring-suspended electrode therein, and means controlled thereby for reversing the circuit through the cell, to cause such electrode to become alternately anode and cathode, substantially as set forth.
- Fifth—The combination in a vebermeter of a cell, a spring-suspended electrode therein, and means controlled thereby for registering the rise and fall of such electrode in the cell, substantially as set forth.
- Sixth—The combination with a suspended plate in a plating cell of means for registering the accurateness of maximum and minimum deposition thereon, and means for measuring the fractional depositions between the maximum and minimum, substantially as set forth.
- Seventh—The combination of the spring-suspended plate, an arm projecting therefrom, a counter-balanced yoke or Y, and two contacts, the arm of the plate controlling the movement of the yoke, substantially as set forth.
- Eighth—The combination with an electric circuit containing translating devices of an electric motor having a definite loading, and apparatus for registering the work done, substantially as set forth.
- Ninth—The combination of an electric circuit, an electro motor, a fan driven thereby, and a registering apparatus for registering, substantially as set forth.
- Tenth—The combination of an electric circuit, an electro motor, a fan or blades driven thereby, a vessel or tank in which the fan or blades are placed, and registering apparatus, substantially as set forth.
- Eleventh—The combination of an electric circuit, an electro-motor, a fan or blades, a vessel or tank filled with liquid, in which the blades or fan are placed, and registering apparatus, substantially as set forth.
- Twelfth—An electric meter consisting of a motor having a definite work to perform or loading to overcome, and registering devices, substantially as set forth.

Signed by me, this 12th day of April, A.D. 1881,—

THOMAS ALVA EDISON.

Witnesses—

CHAS. H. SMITH.
J. HART.

This is the specification referred to in the annexed Letters of Registration granted to Thomas Alva Edison, this thirteenth day of August, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

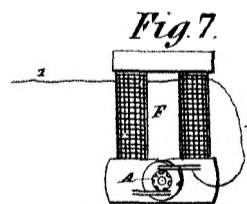
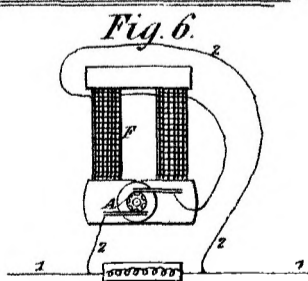
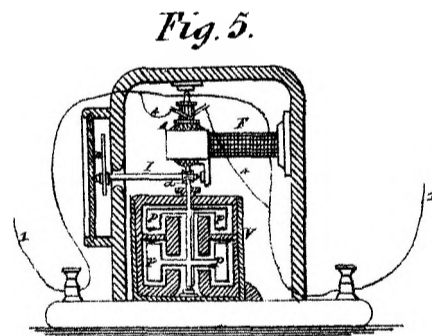
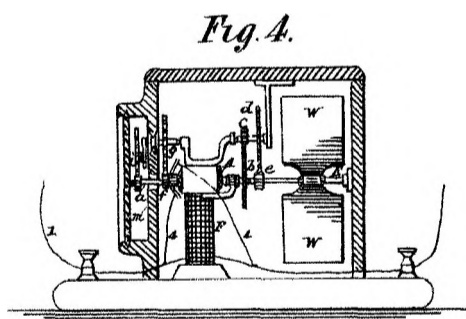
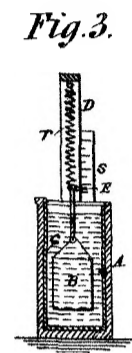
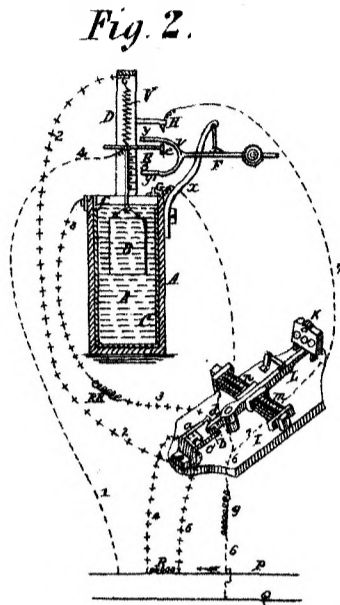
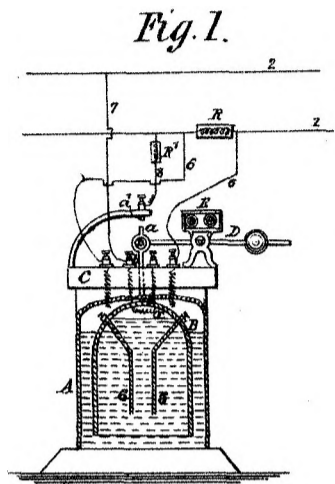
Sir,

We do ourselves the honor to state, in reply to your blank cover communication of the 21st instant, No. 5,861, transmitting for our report Mr. Thomas Alva Edison's Petition, specification, drawings, and claim, for the registration of "Improvements in Vebermeters, or devices for measuring and registering the currents flowing through conductors," that we are of opinion the prayer of Mr. Edison's Petition may be granted.

We have, &c.,
GOTHER K. MANN.
E. C. CRACKNELL.

The Under Secretary of Justice.

[Drawings—one sheet.]



*Witnessed
Charles H. Smith
J. Hunt*

*Thomas Alva Edison
Inventor*

*This is the Sheet of Drawings referred to in the annexed
Letters of Registration granted to Thomas Alva Edison,
this thirteenth day of August, A. D. 1881.*

Augustus Loftus.



A.D. 1881, 13th August. No. 967.

THE MANUFACTURE OF AN IMPROVED GAS.

LETTERS OF REGISTRATION to John Dixon, for the manufacture of an improved Gas, and the apparatus and method therein employed.

[Registered on the 15th day of August, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting:

WHEREAS JOHN DIXON, of 266, Church-street, Richmond, in the county of Bourke, in the Colony of Victoria, but at present also of 15, Water-street, Liverpool, in the county of Lancaster, in England, gas engineer, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "The manufacture of an improved Gas, and the apparatus and method therein employed," which is more particularly described in the specification, marked A, and the five sheets of drawings, marked respectively B, C, D, E, and F, which are hereunto annexed; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said John Dixon, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said John Dixon, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said John Dixon shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this thirteenth day of August, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

The manufacture of an improved Gas.

A.

SPECIFICATION of JOHN DIXON, of 266, Church-street, Richmond, in the county of Bourke, in the Colony of Victoria, but at present also of 15, Water-street, Liverpool, in the county of Lancaster, in England, gas engineer, for an invention of "The manufacture of an improved Gas, and the apparatus and method therein employed," to be as follows:—

My invention relates to the production of improved gas for illuminating purposes by the decomposition or dissolution of the component parts or constituents of certain metals or alloys of metals, earths, or earthy bases, or mixtures of earths or earthy bases, acids or mixtures of acids, carbon and hydro-carbon substances, or liquids or other chemical substances, especially the salts of alkalies and alkaline earths; the dissolution of the substances being carried out by heat, in the manner hereinafter described.

It has long been known that certain chemical substances when strongly heated produce flames of peculiar colours, which when blended together produce a white light. Thus, for instance, sodium compounds colour the flame an intense yellow, whilst potassium salts tinge the flame violet. In like manner other chemical substances produce other colours, the blending of which together can be made to produce a white light.

The following are the particulars of certain stock or chemical mixtures employed according to my invention in the manufacture of gas, which are referred to in the formulæ or receipts hereafter mentioned. In preparing the stock it is essential that the scales, weights, and all utensils, should be thoroughly and chemically clean, as the quality of the gas produced greatly depends upon great care being used in preparing the mixtures and keeping all the apparatus used clean. There should be no water, or moisture or damp, where the chemicals or ingredients are being mixed.

In order to form

Stock No. 1.

I make the following mixtures, the figures corresponding to parts by weight:—

Mixture A.

Take copper wire, very clean	...	...	...	...	...	1
Add nitric acid	...	...	...	...	...	30
Then water...	...	...	...	...	...	44
Total	...	...	...	...	...	75

Mixture B.

Take zinc cut small	...	...	...	...	...	4
Add muriatic acid...	...	...	...	...	...	3
Then water...	...	...	...	...	...	5
Then add of bismuth	...	...	...	...	...	2
" " mercury	...	...	...	...	...	2

One-half the bismuth and one-half the mercury are to be ground together in an iron mortar by a pestle, and kept free from damp or dust, and then added to the above, after the other half of the bismuth and the other half of the mercury have been ground with the zinc.

Add mixture A to mixture B, and evaporate to dryness. Then mix of

Kerosene	...	...	...	...	...	20
And sodium	...	...	...	...	...	4
Then mix of kerosene	...	...	...	...	...	10
And mercury (very dry)	...	...	...	...	...	24
Total	...	...	...	...	...	74

and grind them in a mortar. Then grind together in a mortar all the above mixtures.

Mixture C.

Take of muriatic acid	...	...	...	...	...	480
And of nitric acid	...	...	...	...	...	80
Then take of zinc, very clean (cut in small pieces)	...	...	...	...	...	240

Mix the acids together and dissolve the zinc in the mixed acids. When the zinc is dissolved, strain off the impurities by passing the solution through a porous substance. Then add to the solution

Of kerosene	...	...	...	...	...	8,000
Total	...	...	...	...	...	8,800

Mixture A, as before stated, is mixed with mixture B, and the two are then mixed with mixture C, and the three together form Stock No. 1, which may be kept in a stoppered vessel, and has a full total of 8,949 parts.

Stock No. 2 is thus made:—

Take of bismuth filings (very clean)	...	...	...	...	...	5
Then add of mercury	...	...	...	...	...	5
These are amalgamated together with kerosene	...	...	...	...	...	50
Total	...	...	...	...	...	60

In a dry climate 5 grains of sodium may be added.

Stock

The manufacture of an improved Gas.

Stock No. 3 is thus made:—

Take an iron ladle, perfectly clean, warm it over a fire, put in a little suet to grease it, and which warm put in—

Of mercury	...	...	...	...	...	...	...	5
And of sodium	...	...	...	...	...	...	...	5

forming an amalgam which is cut into pieces about the size of canary seed. In cutting be careful not to touch with the fingers or allow any damp to approach it.

Mix the mercury and sodium well together, and then add

Mercury	5
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and rub the whole thoroughly together in a mortar, and add of

Kerosene	240
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Making a total of 255 for Stock No. 3.

Pour Stock No. 3 as soon as mixed into Stock No. 2, and thoroughly amalgamate them together.

Stock No. 2 will not keep without deteriorating unless hermetically sealed, but Stock No. 2 and Stock No. 3 combined will keep safely in a glass or porcelain stoppered vessel. Care must be taken not to handle the mercury compound. An iron ladle may be used for mixing the several ingredients. When No. 2 and No. 3 are mixed together, they are then mixed with No. 1, and kept ready for use in a suitably closed air-tight vessel.

In carrying out my invention I use retorts which may be of a construction similar to or only slightly differing from those used in ordinary gas-works. Preferably I use an earthenware retort with an iron lining, or iron retorts may be used. These retorts are charged at requisite intervals with certain mixtures hereinafter mentioned, consisting of metals, alloys of metals, metallic earth, silicious earths, carbon, hydro-carbons, alkalies, alkaline earths, and other chemical substances, such mixtures being defined in the following formulæ or receipts.

What I term charge No. 1 is composed of the following component parts, compounded or mixed together as described. It is important that the scales and weights used be chemically clean.

Take of muriatic acid	...	...	...	...	...	...	...	10
Add nitric acid	...	...	...	...	...	...	...	5

These are mixed together, and then are added of

Water	...	...	...	...	...	...	...	5
Bismuth	...	...	...	...	...	...	...	1
Iron filings...	...	...	...	...	...	...	...	1
Zinc...	...	...	...	...	...	...	...	15

The mixture of metals and acids is put into an iron vessel, and heat is applied until the liquors evaporate, and when the mixture is perfectly dry there are added

Of mercury	...	...	...	...	...	...	...	1
And of sodium	...	...	...	...	...	...	...	1

The mixture so formed is ground in a mortar with a pestle, and then there is added

Black oxide of manganese	5,760
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Charge No. 2, which may in some cases be substituted for charge No. 1, is thus made:—

Take of copper wire (very clean)	...	...	...	...	...	...	...	2
Nitric acid	...	...	...	...	...	...	...	15
Water	...	...	...	...	...	...	...	15
Charcoal crushed very fine	...	...	...	...	...	...	...	480
Lime, unslacked, crushed very fine, or silicium...	...	...	...	...	...	...	...	1,920

Total 2,432

Mix these ingredients well together, and add 894.9 parts of Stock No. 1, and 45 parts of Stocks Nos. 2 and 3.

The retort charge No. 1 or No. 2 is put into a retort of the construction hereinafter set forth, and there are supplied to it intermittently mixtures which I term flux mixtures, which are fed in from a vessel, which I term a retort supplier. This vessel is placed at a convenient height above the retorts. The mixtures, which are of the nature of fluxes, will be hereinafter described.

THE FLUX MIXTURE

Is composed of the following component parts, compounded or mixed together as described, being intermingled or held in suspension by a vehicle, such as kerosene, petroleum, naphtha, or turpentine. Kerosene is the best, and it can be recovered by distillation.

Take of bismuth...	...	...	3 (dissolved by nitric acid.)
Add antimony	...	...	1 (dissolved in hot hydrochloric acid.)
And sodium	...	...	1 (held in kerosene.)
And tin	...	...	4 (dissolved in nitric acid.)

Mix all the above and evaporate to dryness, then add $\frac{1}{10}$ of Stock No. 1 and $\frac{1}{4}$ of Stocks Nos. 2 and 3, and to this add kerosene to any required extent, and put this flux mixture into the retort supplier, from whence it is injected intermittently into the retorts, as hereinafter shown. The retorts and their contents should be heated to not less than a cherry-red heat to give the proper quantity and quality of the gas. The best working heat for the flux mixture for injection is 80 degrees; if under 50 it is very lazy; if over 100 it is volatile.

Gas of a greatly improved character as compared with that ordinarily used is then generated, and it will be found very suitable for being used as illuminating gas for lighting purposes.

After

The manufacture of an improved Gas.

After generation in the retorts the gas is led through a pipe or main, answering to the hydraulic main of ordinary gas-works, and the condensed vehicle is led to a recoverer. The function of this recoverer is to extract as far as possible the kerosene or other vehicle used in the retort supplier. The gas is led from the main to a purifier consisting of a series of network or fine-meshed filters, which are formed of wire network sieves, covered with red oxide of iron one part, hydrate of lime five parts, mixed well together and spread lightly over the sieves about an inch thick. Entering the purifier at the bottom and issuing from the top, the gas is then led to and stored in a gasometer of any suitable construction, such as those used in ordinary gas-works, from whence it is supplied through mains for general use.

I would define my improved gas to be a metallic gas derived from the dissolution of ingredients such as those contained in the foregoing formulæ.

I have found that gas produced by my invention is of a dry nature and nearly incondensable, and is not affected by extreme cold.

I will now proceed to more particularly describe and illustrate how the gas according to my invention is produced, and for that purpose I have hereunto attached five sheets of drawings illustrative thereof, which are marked with letters and figures of reference corresponding with those in the following explanation, like letters and figures being used to denote the same or corresponding parts throughout the various views and figures.

DESCRIPTION OF THE DRAWINGS.

Figure 1 is a sectional elevation of a retort-house fitted with appliances and apparatus suitable for carrying my invention into practice. Figure 2 is an end elevation of figure 1. Figure 3 is a plan of figure 1. Figure 4 is an elevation of purifier house. Figure 5 is a plan of figure 4. Figure 6 is an elevation of a gasometer. Figure 7 is a plan of figure 6. These figures, 1 to 7 inclusive, illustrate the general plan of the positioning of the appliances described in the following details. Figure 8 is an enlarged view of figure 1. Figure 9 is an enlarged view of figure 2. Figure 10 is an enlarged view of figure 3. Figure 11 is a front elevation of one group of retorts showing up-take pipes and main. Figure 12 is a side elevation of figure 11 shown partly in section. Figure 13 is a sectional elevation of a retort constructed according to my invention. Figure 14 is a detail of injection nozzle shown at figure 13. Figure 15 is a side elevation, partly in section, of a supplier cistern and valves, according to my invention. Figure 16 is a plan of figure 15. Figure 17 is an end elevation of figure 15. Figure 18 is a detail of valve and gear shown at figures 15 and 16. Figure 19 is a sectional elevation of recovering or distilling apparatus. Figure 20 is a plan of figure 19. Figure 21 is a sectional elevation of purifier according to my invention. Figure 22 is a plan of figure 21.

REFERENCE TO THE DRAWINGS.

First.—In the carrying out of my invention I use retorts such as A, which are set in a retort bench, A', as shown in figures 8, 9, 10, 11, and 12. For detail of retort A see figure 13. The retort A shown is an earthenware retort with an iron lining. The retorts A are charged to about one-third of their depth with one of the retort charges, as previously set forth.

Second.—In the carrying out of my invention I use retort suppliers or cisterns, F, which are located above the retort bench A', as shown at figures 8 and 9. For detail of retort suppliers or cisterns F see figures 15, 16, and 17. The cistern F is by preference lined with lead or other non-corrosive substance, and contains certain of the more powerful of my agents, as previously set forth; for example, the cisterns contain the flux mixture as specified.

The supplier cisterns F communicate with the retorts A by means of the pipes E. In the example shown the retorts A are double-ended, and the pipes E enter the retorts at each end, where they are provided with injection nozzles E'. See detail, figure 14, and retort detail, figure 13. The nozzle E' is preferably coated with a fire-resisting muffle, such as plumbago or asbestos. Reference to figures 15, 16, 17, and 18, it will be seen that at the junction of the pipes E to the cisterns F the pipes E are provided with stop-cocks G and with valves E''. The valves E'' are mounted on the spindles I, which work in the guides I'. The valves E'' are actuated by the cams J on the shafts J' by the cams J lifting the spindles I through the tappets I'. The shafts J' are driven by the gearing J'' J'''. The valves E'' are used to give an intermitted supply of the materials in the cisterns F to the retorts A. The retorts A are provided with the uptake pipes B having the throttle valves B', and being provided with suitable cleaning doors, as shown. The uptake pipes B deliver into the mains C, which are provided with water-jackets, as shown. H is a pipe leading from the mains C to the apparatus illustrated in figures 19 and 20, which is used for recovering the kerosene or vehicle that condenses in the mains C. The mains C are provided with the pipes D, which lead the gas from the mains C to the purifiers N which are constructed as shown at figures 21 and 22, and hereafter described.

The recoverer illustrated at figures 19 and 20 consists of a tank, K, into which all liquor and residue condensed and deposited from the gas in the mains C is led by the pipe H. K' is a cock for drawing off the heavier residue. The lighter residue or kerosene overflows from the tank K through the pipe H' into the vessel L, which is steam-jacketed and which evaporates the liquor, or forms it into vapour, which passes through the pipe H'' into the coil H''' in the vessel M. The vapour is condensed in the coil H''' by cold water being kept constantly circulating through the vessel M. The condensed liquid in the coil H''' runs into the chamber M', from whence it can be again pumped through the pipe H''' to the supplier cisterns F, as will be understood. The residuum can be withdrawn from the vessel L through the cock L', and with the residuum drawn from the vessel K can be again placed in the retorts at suitable times.

The purifier illustrated at figures 21 and 22 consists of a vessel, N, having a water-sealed cover, N', and purifying trays, N'', formed of wire network covered with the filtering medium N''', consisting of red oxide of iron and hydrate of lime mixed well together. The gas from the main D enters the purifier N at the bottom, passes through the filtering medium and passes from the purifier through the pipe D', to the gasometer illustrated at figure 6. N'''' is a drain-pipe with cock.

In the operation of my invention the retorts A, with their charge are brought to a cherry-red heat by gaseous fuel or coal in the retort furnaces, as will be understood. The secondary or intermittent charge is injected through the pipes E and nozzles E' into the retorts A. Gas is generated and passes through

The manufacture of an improved Gas.

through the pipes B into the main C, where it is cooled, and the liquid forming the vehicle is separated or condensed from the gas, which then passes through the pipe D, purifier N, and pipe D', to the gasometer, from whence it can be led for use through mains like ordinary coal-gas. The liquid condensed in the hydraulic main C is led through the recoverer as before stated.

Having now described my invention, and practically illustrated how the same may be put into operation, I claim as my invention and desire to secure by Letters Patent—

First—Generating illuminating gas from metals, earths, earthy bases, acids, carbon, and hydro-carbon substances or liquids, and other chemicals, such as herein defined, by subjecting such materials, or some of them, to a cherry-red heat in closed retorts and intermittently injecting mixtures, such as are above mentioned, conveyed in solution by kerosene or other equivalent as a vehicle, as herein described, and as shown in the drawings hereto annexed.

Second—Generating illuminating gas from hydro-carbon liquids, such as kerosene in combination with certain metals, earths, earthy bases, acids, carbon, or other chemicals, such as herein defined, by the chemical heat resulting from the combining of such ingredients, or some of them, in closed retorts, subjected to a cherry-red heat, as herein described and shown in the drawings hereto annexed.

Third—The use in the manufacture of gas of the several mixtures for the primary charge of the retorts, substantially as herein described.

Fourth—The use in the manufacture of gas of the secondary charge, substantially as herein described.

Fifth—Recovering the vehicle, such as kerosene, used in the generation of illuminating gas as herein set forth, by extracting such kerosene from the gas in the hydraulic or first main, and afterwards distilling and re-using the vehicle and the residuary products, as herein described, and shown in the drawings hereto annexed.

Sixth—The construction and arrangement of retorts used for generating gas, as herein described and shown in the figures or series of figures in the drawings hereto annexed, that is to say, in figures 8, 9, 10, 11, 12, and 13.

Seventh—The construction and arrangement of retort supplier cisterns, and the connection and combination of such retort supplier cisterns with the retorts, as herein described and shown in the figures or series of figures in the drawings hereto annexed, that is to say, in figures 8, 9, 12, 13, 14, 15, 16, 17, and 18.

In witness whereof, I, the said John Dixon, have hereto set my hand and seal, this twenty-sixth day of April, 1881.

JOHN DIXON.

Witness—

FRANCIS T. MADDOCKS,
Notary Public, Liverpool, England.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to John Dixon, this thirteenth day of August, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

We have the honor to state that we have carefully examined the specification and drawings accompanying an application from Mr. John Dixon for Letters of Registration for the manufacture of improved Gas, and the apparatus and method therein employed, and we see no objection to Mr. Dixon's Petition being granted.

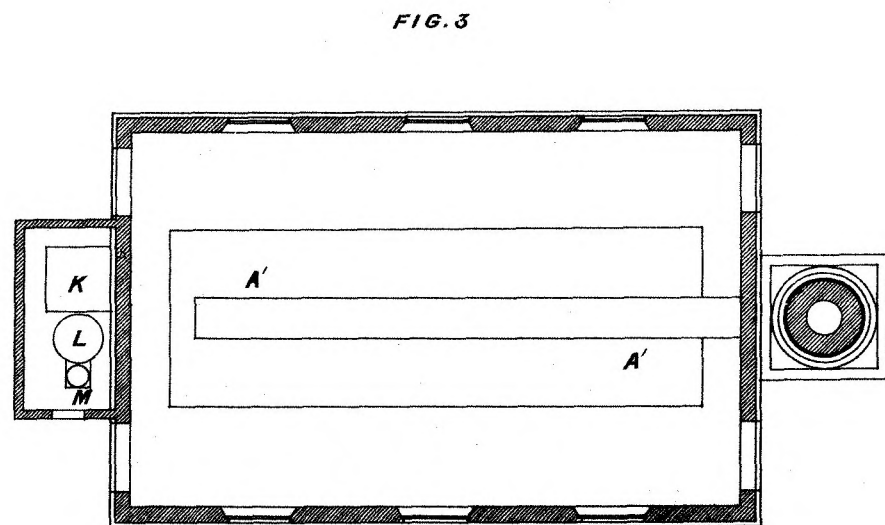
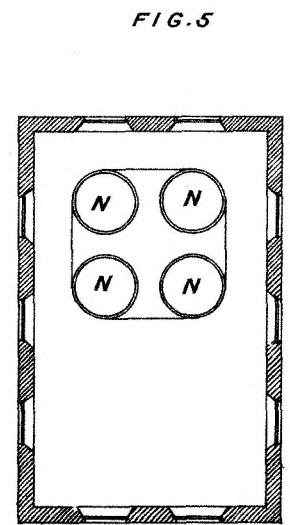
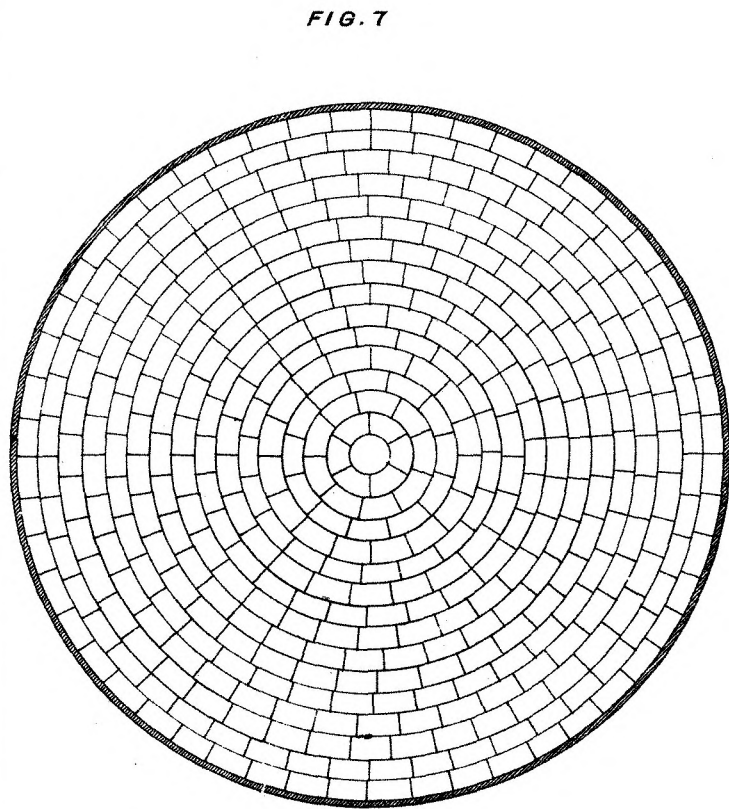
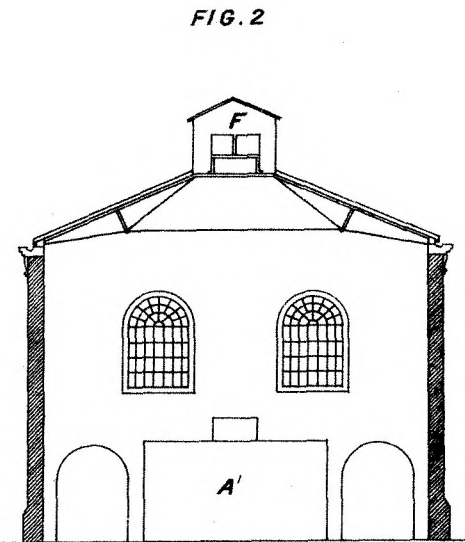
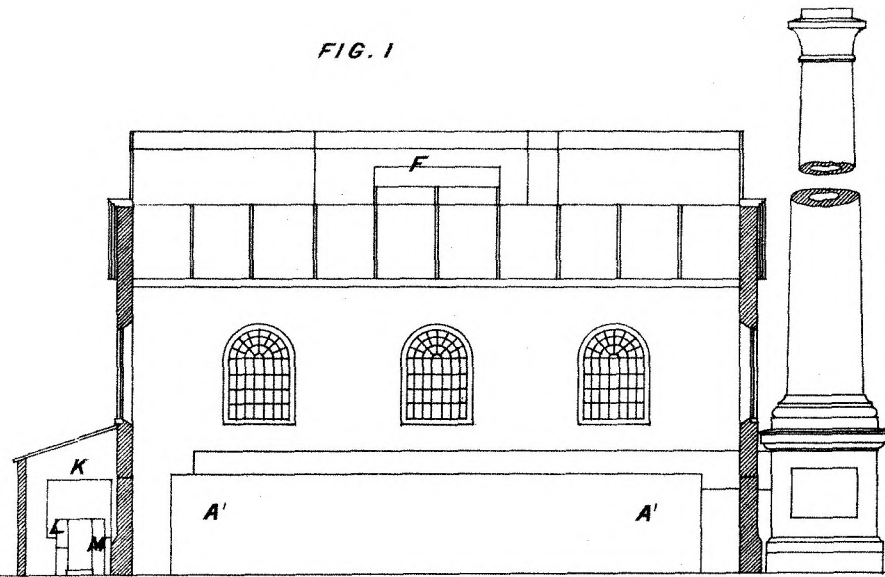
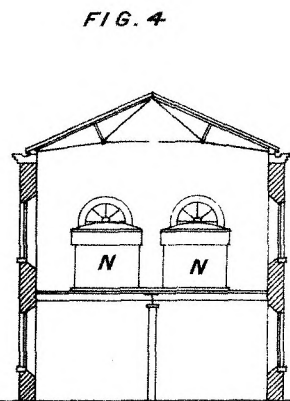
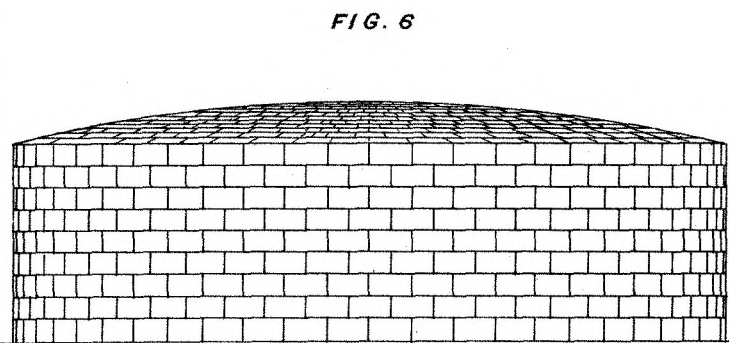
The Under Secretary of Justice.

Sydney, 30 June, 1881.

We have, &c.,

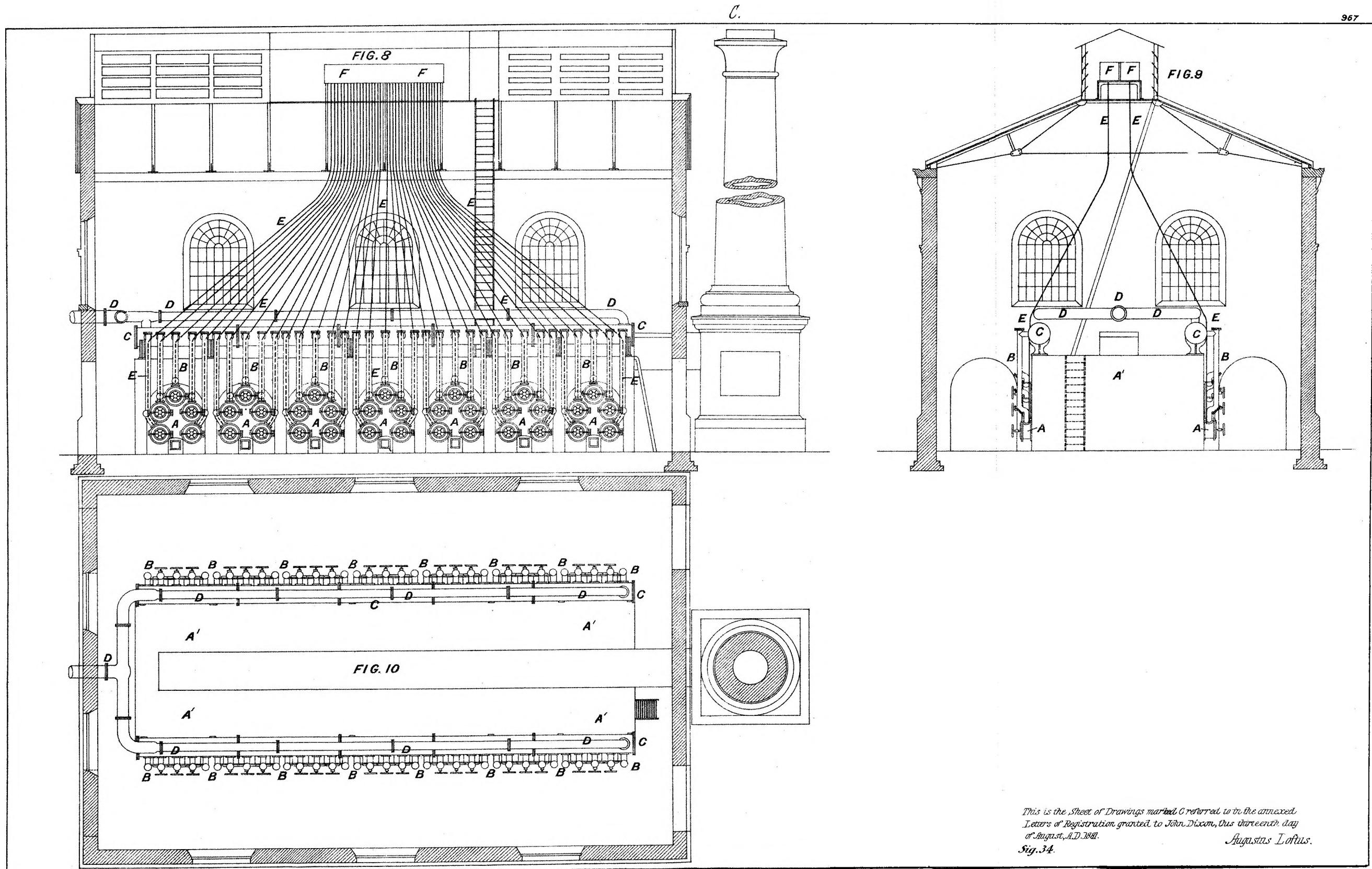
JAMES BARNET.
E. C. CRACKNELL.

[Drawings—five sheets.]



This is the Sheet of Drawings marked B referred to in the annexed
 Letters of Registration granted to John Dixon, this thirteenth day
 of August, A. D. 1881.

Augustus Loftus.



*This is the Sheet of Drawings marked C referred to in the annexed
 Letters of Registration granted to John Dixon, this thirteenth day
 of August, A.D. 1861.
 Sig. 34. Augustus Loftus.*

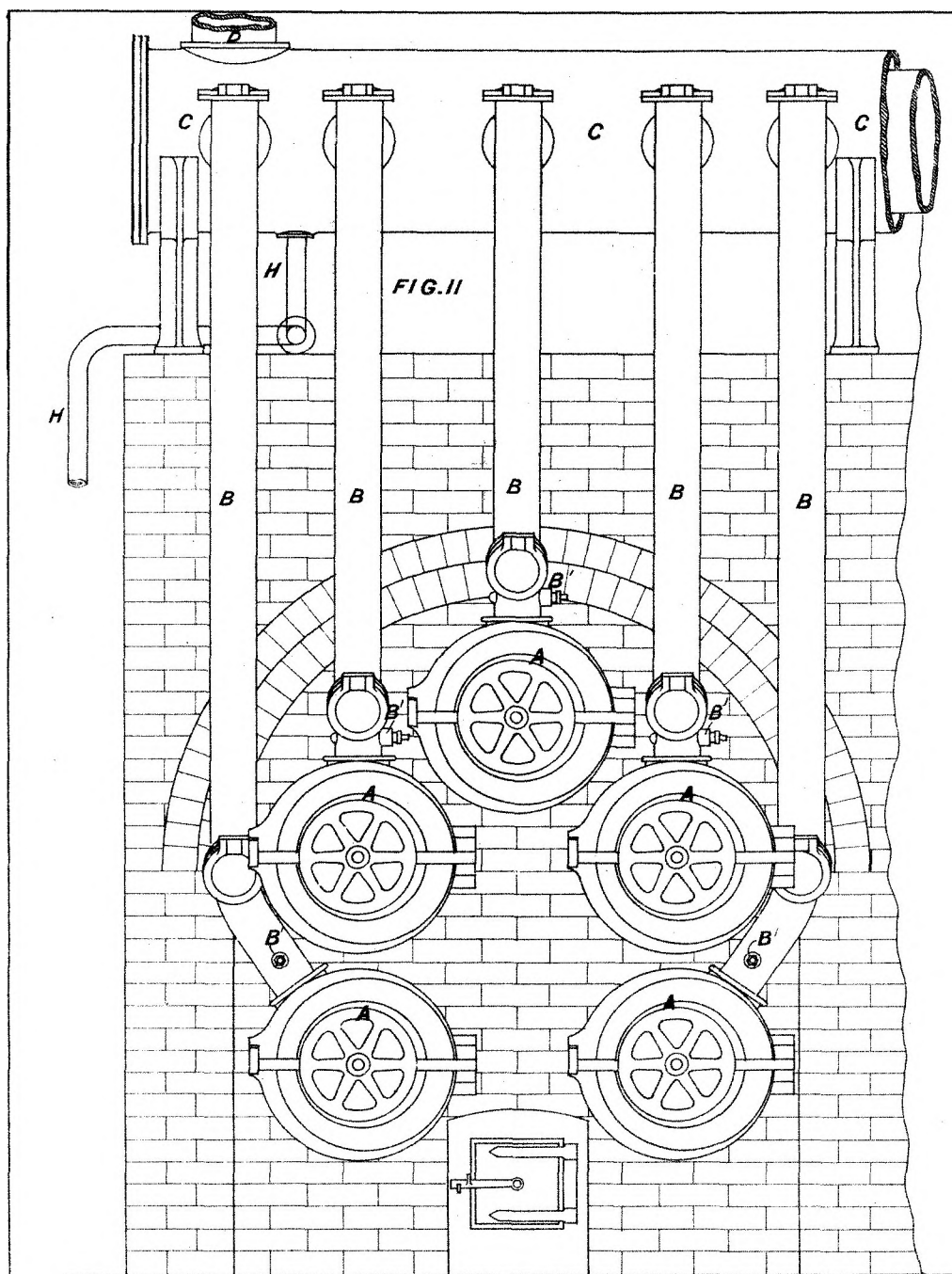


FIG. 11

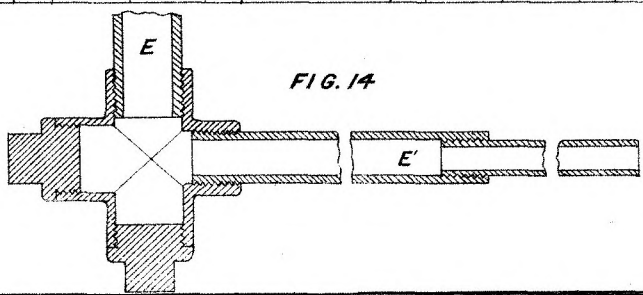


FIG. 14

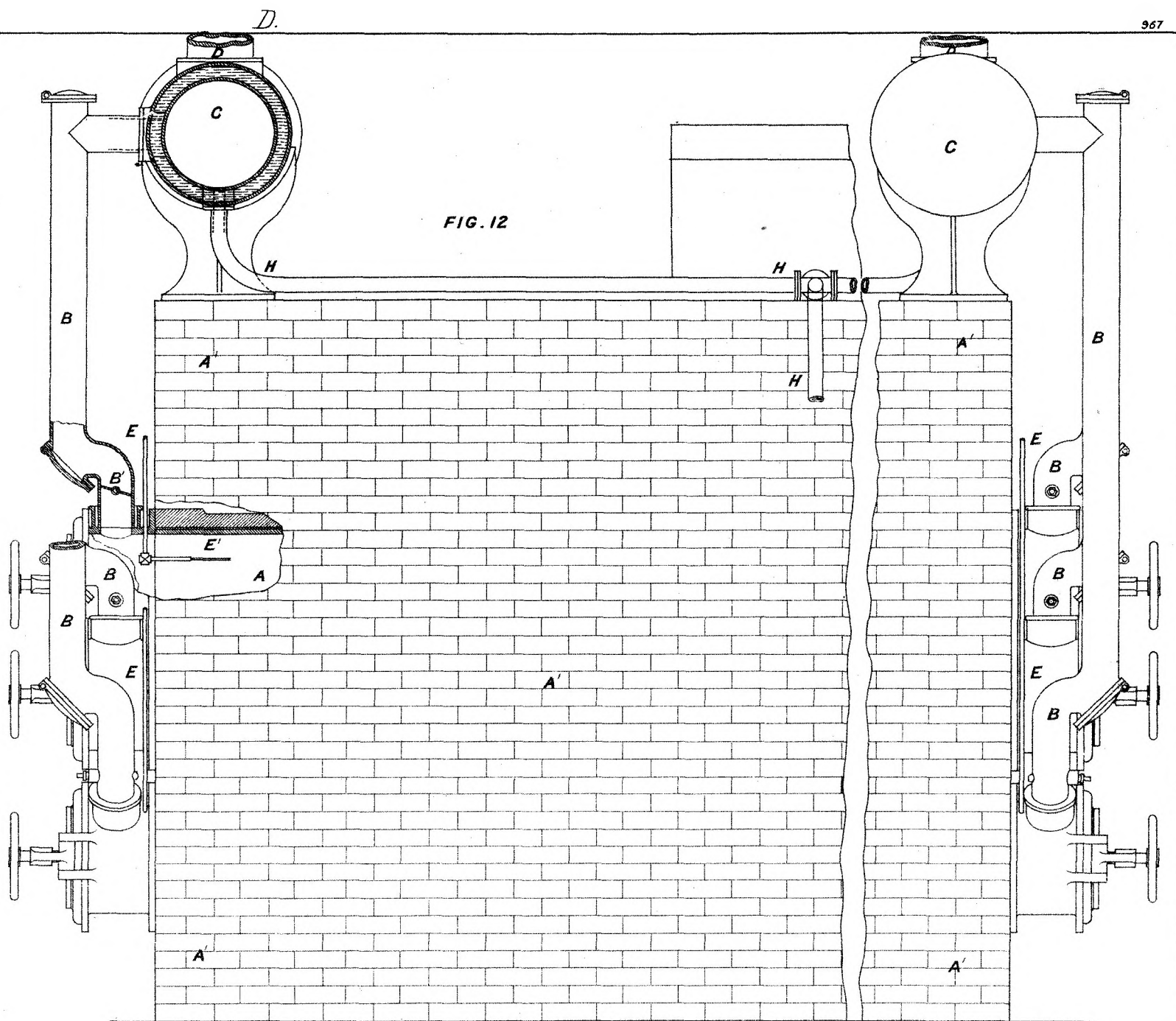


FIG. 12

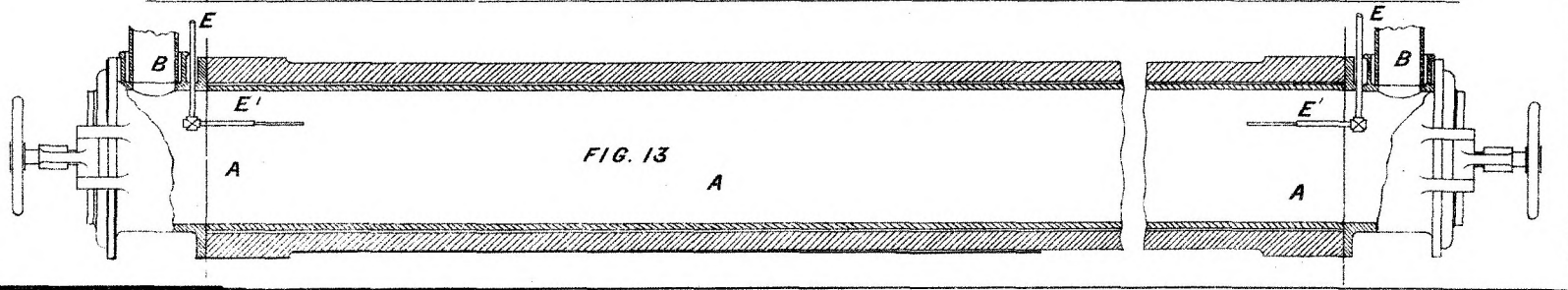


FIG. 13

PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE, SYDNEY, NEW SOUTH WALES.

This is the Sheet of Drawings marked D referred to in the annexed Letters of Registration granted to John Dixon, this thirteenth day of August, A.D. 1882.
Augustus Totius.

E.

967

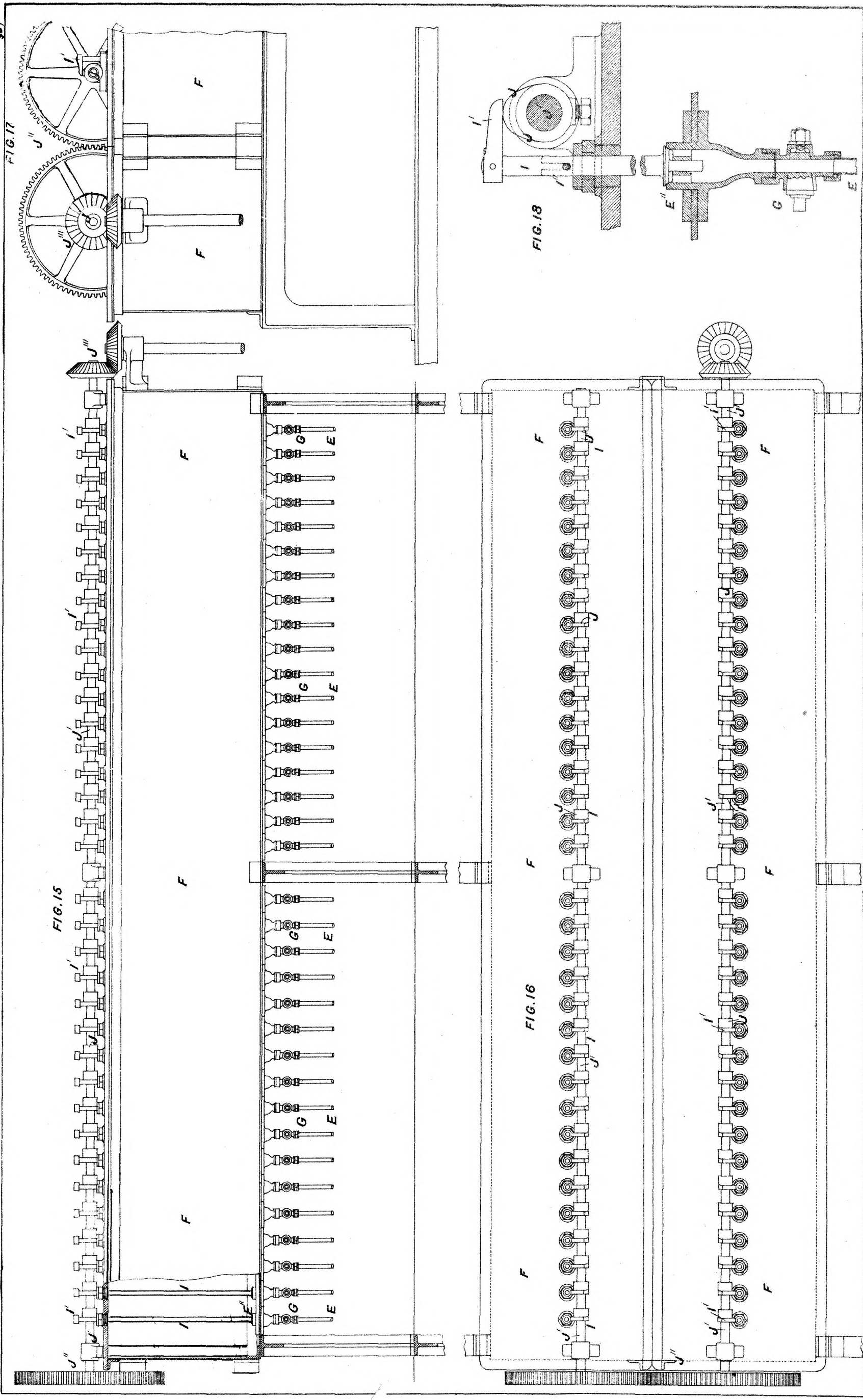


PHOTO-LITHOGRAPHED BY THE DEPT. OF PRINTING OFFICE,
 UNITED STATES GOVERNMENT.

This is the sheet of Drawings marked E. 967 and the corrected
 Letters of Registration granted to John Thayer, his heirs and assigns,
 of August 4, 1881.
 Sig. 34.
 Augustus Loftus.

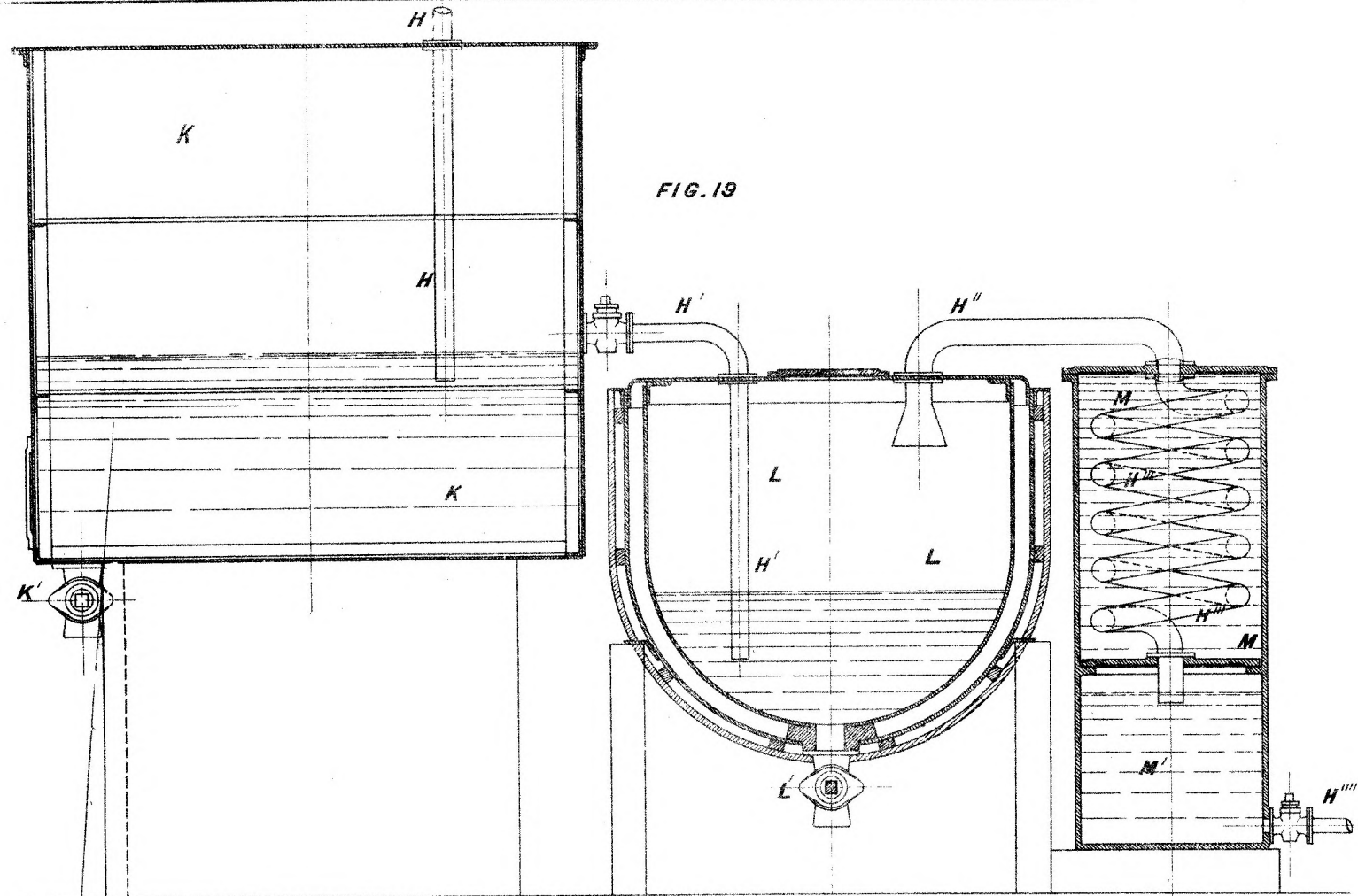


FIG. 19

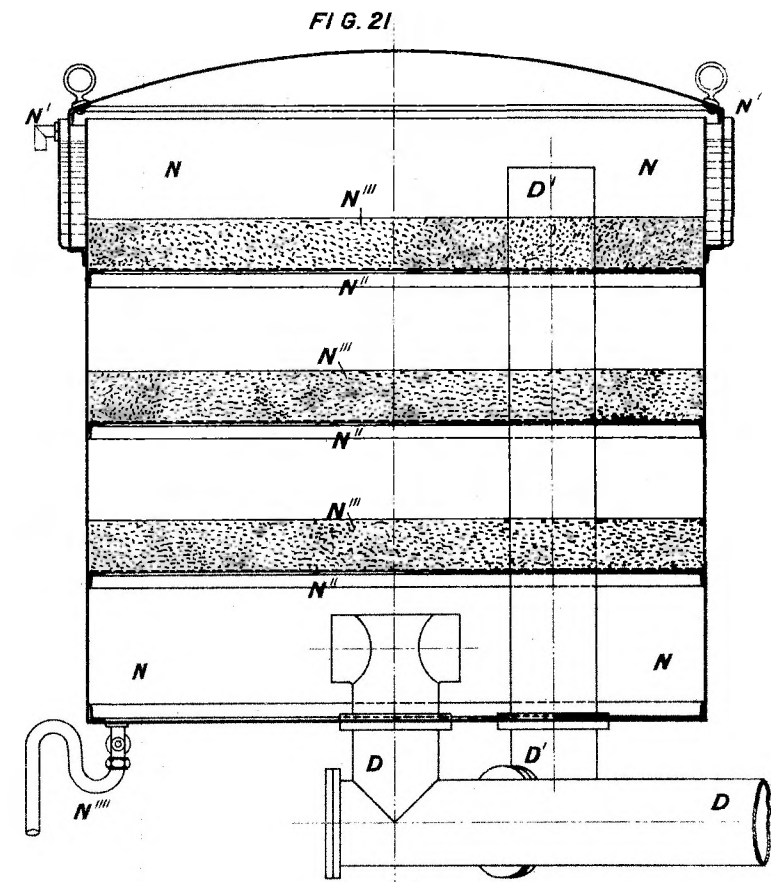


FIG. 21

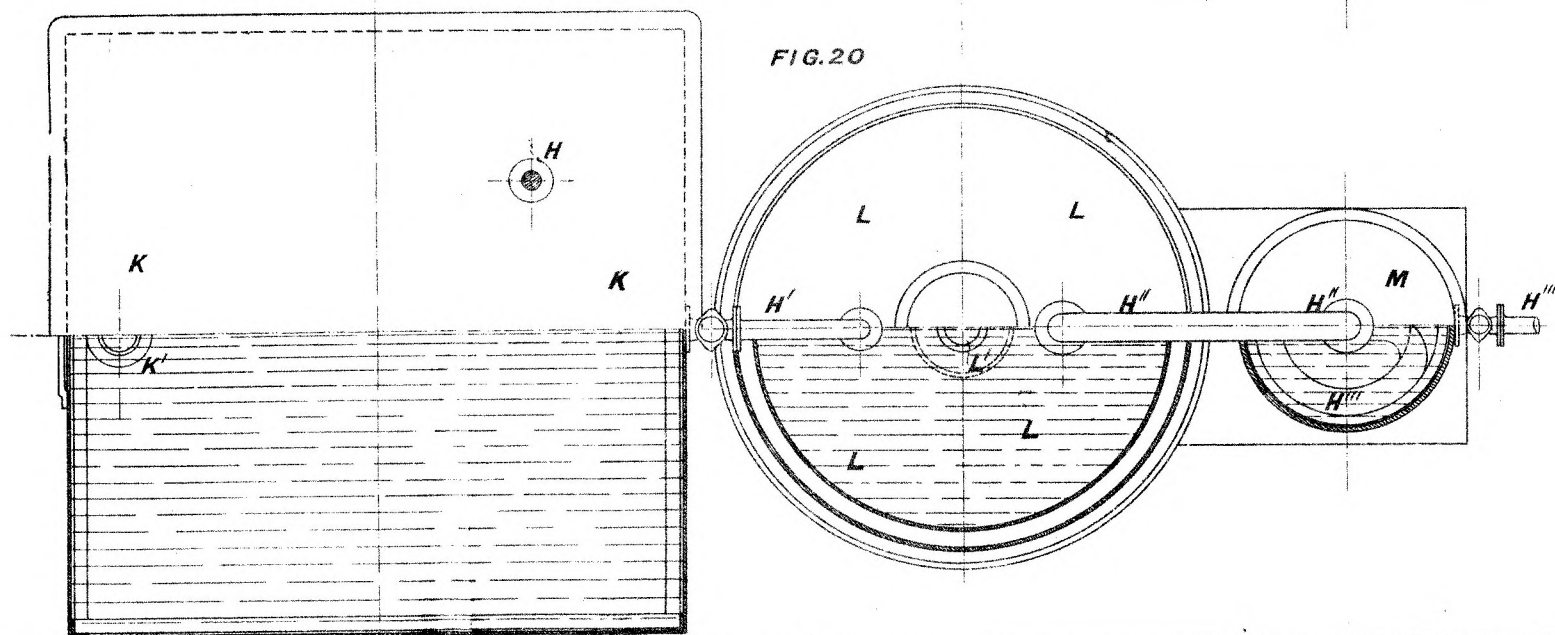


FIG. 20

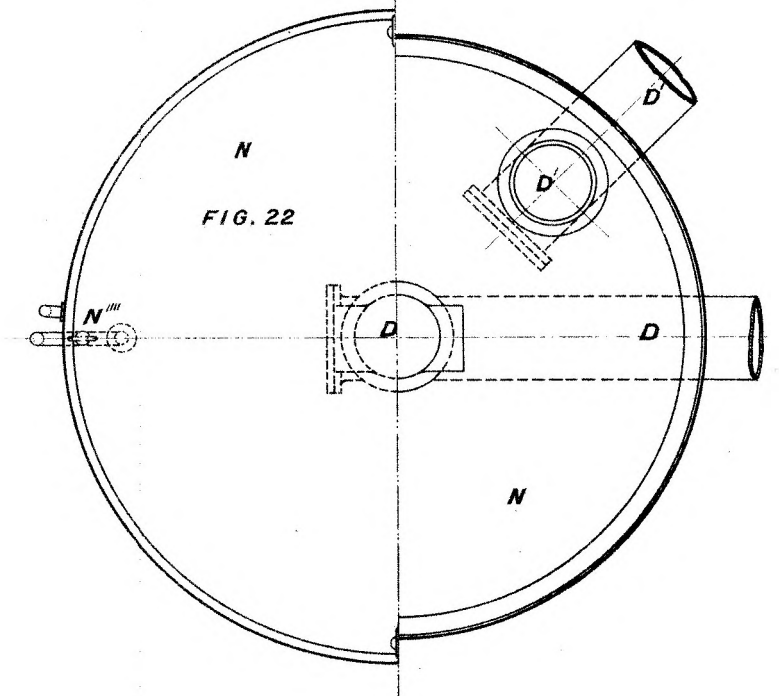


FIG. 22

PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE, SYDNEY, NEW SOUTH WALES.

This is the Sheet of Drawings marked F referred to in the annexed Letters of Registration granted to John Dixon, this thirteenth day of August, A.D. 1881.
Augustus L. Otis.
Sig. 34.



A.D. 1881, 13th August. No. 968.

IMPROVEMENTS IN ELECTRIC LIGHTING, ELECTRIC LAMPS, &c.

LETTERS OF REGISTRATION to Thomas Alva Edison, for Improvements in systems of Electric Lighting, in Electric Lamps, and in constituent parts thereof, and in means and methods of manufacture connected therewith.

[Registered on the 15th day of August, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS, (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS THOMAS ALVA EDISON, of Menlo Park, in the State of New Jersey, United States of America, electrician, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in systems of Electric Lighting, in Electric Lamps, and in constituent parts thereof, and in means and methods of manufacture connected therewith," which is more particularly described in the specification, marked A, and the two sheets of drawings marked respectively B and C, which are hereunto annexed ; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four ; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years : And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council to grant, and do by these Letters of Registration grant unto the said Thomas Alva Edison, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof ; to have, hold, and exercise unto the said Thomas Alva Edison, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended : Provided always, that if the said Thomas Alva Edison shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this thirteenth day of August, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Electric Lighting, Electric Lamps, &c.

A.

SPECIFICATION.

TO ALL TO WHOM THESE PRESENTS SHALL COME: Be it known that I, THOMAS ALVA EDISON, of Menlo Park, in the State of New Jersey, United States of America, electrician, have invented certain "Improvements in systems of Electric Lighting, in Electric Lamps and in constituent parts thereof, and in means and methods of manufacture connected therewith," of which the following is a specification:—

One object of this invention is to furnish a method or process by which pure and flexible carbon may be manufactured in any desired shape, which method is particularly applicable to the manufacture of carbon conductors for incandescent electric lamps. Thin sheet-metal which will stand high temperatures, for instance, sheel nickel or cobalt, is cut or formed into the shape desired for the finished carbon, or shaped wire may be used.

One or several such formed pieces of metal are suspended in a closed flask, which is then heated to a high temperature. While in this heated condition the vapour of a volatile carbon is passed through the flask, with the result that the carbon is deposited upon the metal shapes.

For this purpose the vapours of the bisulphide of carbon, the chloride of carbon, the volatile paraffines, or of a naphtha is preferable.

The vapour is passed through the flask until a sufficient thickness of carbon has been deposited upon the forms, when the flask is allowed to cool.

When cool the carbon-plated shapes are immersed in some acid having an affinity for the metal used, and the metal thereby eaten away, leaving the pure carbon in the desired shape.

This process is especially applicable to the manufacture of carbons for incandescent electric lamps, in which case, if desired, the metal used may be in the shape of wire or ribbon bent into the proper form, or may be cut from a sheet, as before described.

Another method of producing carbon of any desired shape, say in sheets, bows, or other flat forms, or in the form of crucibles, dishes, or other hollow-ware, is as follows:—

For sheets of carbon of any desired size a number of sheets of paper are placed between plates of metal capable of withstanding a high degree of temperature. The whole is then heated in a suitable flask or retort until all the constituents of the paper except carbon are driven off, leaving the carbon in sheet form flexible and of high non-conductive properties; exceedingly suitable for all uses where a cheap and effective non-conductor is needed.

Where special flat forms of carbon are desired the paper is cut into the shape desired, but of a size somewhat larger than that of the desired carbon, so as to allow for the shrinkage attendant upon carbonization.

The shaped paper is placed between plates, one of which preferably should be provided with a groove of corresponding form. The whole is then carbonized, as above described.

For hollow-ware, such as crucibles, dishes, &c., paper may be pressed into a mould by a plunger (the plunger and mould having the shape desired for the interior and exterior of the article) and carbonized between the moulds; or paper pulp or dampened paper may be struck up by a plunger and mould, then dried, and afterwards carbonized, as before set forth.

By this method I have been able to produce carbon in flexible sheets of any desired size, flat carbons in any desired special shape, and carbon hollow-ware articles.

The object of another portion of my invention is to furnish a method by means of which the hydrogen may be removed from the incandescing conductors of electric lamps. This element is the most difficult to eliminate from the carbon, as it cannot be removed even at the highest temperature to which the flask can be brought without melting it.

My method of accomplishing this result is as follows:—

Chlorine gas, or some gas which combines readily with hydrogen, but not with carbon, is passed through the flask while the same is heated. The chlorine unites with the hydrogen, ensuring its removal.

If desired, the process of carbonization may take place in one flask, and the carbons then removed to another flask, where the chlorination may be effected.

For incandescent electric lamps it is essential that every trace of oxygen, so far as possible, should be removed from the enclosing globe, in order to prevent the disintegration or consumption resulting from heating a conductor in contact with air.

While a very high degree of vacuum is attainable by the means employed by me—a degree sufficient to ensure a long life to the conductor did it not contain any air—experience has shown that enough air is occluded in the conductor itself and in the clamps, which is given off when the conductor is brought to the high degree of heat necessary for incandescence, to endanger if not eventually destroy it, both by oxidation and electrical carrying.

This portion of my invention consists in a method of treating carbon conductors to obviate this difficulty.

The parts of the lamp are assembled and united together in the manner which has been heretofore described by me, and the lamp is then attached to the exhausting apparatus. When the proper degree of exhaustion has been reached a current has passed through the carbon preferably in such way as to gradually heat it to incandescence, the operation of the exhausting apparatus being meanwhile continued, until it is judged that practically all or as much as possible of the air is expelled by the heat and removed by the exhausting apparatus.

The first heating will ordinarily throw out all gas and air included in the body of the conductor itself; but at the clamps this is not so, as they are heated slowly, and then only by conduction; hence the operation should be continued long enough for the clamps and clamped portions of the conductors to become hot enough to drive out the occluded air and gas therefrom.

In addition to the occluded air and gas there is always, especially at the enlarged clamping ends, an amount

Improvements in Electric Lighting, Electric Lamps, &c.

amount of watery vapour occluded. In order to get rid of any harmful effect therefrom the heating should be carried to a degree somewhat or much higher than necessary to give the incandescence for the candle power intended normally for the lamp. It follows that if the lamp thereafter be used at a less temperature than that at which it was treated there will be nothing left therein to be effected by such less temperature.

The lamp is then sealed by a fusion of the glass itself, or by other suitable vitreous seal.

Some different means are sometimes desirable to properly remove the occluded gases from the clamps and clamped portions of the carbon, which may not be sufficiently heated by the passage of the current. To do this, I concentrate on the clamps the heat from some external source, as, for instance, from the sun or from a voltaic arc lamp, which has the effect to drive off the occluded gases therefrom, and these gases are then absorbed by a quantity of heated charcoal, the globe afterward being sealed off.

This is illustrated in figure 1 of the drawings, which is an apparatus for this purpose, and figure 2, which is a modification thereof.

C is the enclosing globe of the electric lamp, *c* being the carbon, and *a a* the platinum clamps in which the enlarged ends of the carbon are held. The lamp is attached at *x* to the mercury pump A.

B is a glass bulb containing a quantity of charcoal, preferably a dense cocoa-nut charcoal; this bulb is arranged so that it may be heated by means of a lamp. A is the mercury pump, by means of which air is exhausted from the lamp. After as great a degree of vacuum as possible has been produced in this way the carbon is heated to incandescence by means of a current of electricity, and the occluded gases therein are thus driven off.

There still, however, remains, as stated, a quantity of gas in the clamps and in the enlarged ends of the carbons, which are never heated to incandescence by the passage of the current.

D is an electric arc lamp, having a reflector, *n*, placed behind the light, and a lens, *m*, placed before it, so that the full force of the rays will be concentrated on the clamps *a a*, and they will be heated to a high degree, driving out the occluded gases, which as they are driven out are removed by the mercury pump.

But a small amount of gas will still remain in the globe, and to remove it another operation is necessary.

The bulb B is heated to a very high temperature, after which the lamp and bulb are sealed off from the pump at *x*. They are then laid aside for twenty-four hours, during which time the carbon filament *c* is occasionally heated, after which the carbon in the bulb will be found to have absorbed the residual gases from the globe while cooling off. The lamp and bulb may then be separated at *e* by sealing off.

The bulb B may be used for another lamp, the absorbed gas therein being driven off by the application of heat to the bulb.

In figure 2 an arrangement is shown which takes the place of the bulb B, and which may be a permanent fixture of the pump A. E is a glass bulb, and *f* an arc composed of a large piece of cocoa-nut charcoal, which is the absorbing material in this case. This does not require a lamp to heat it, as an electric current may be used instead. Of course the chamber E need not necessarily be permanently attached to the pump, but may be sealed off and again attached, as in the case of the bulb B.

It has been heretofore fully explained by me that exceedingly desirable carbons for the incandescent conductors of electric lamps may be made of fibrous vegetable materials, especially those like the bamboo and other members of the family of gigantic grasses, in which the body is composed of a large number of exceedingly fine fibres lying parallel to each other, and having a minimum of foreign or extraneous matters. In the manipulation of such attendant upon their conversion into carbons it often happens that one or more of the ultimate or unitary fibres or fibrillæ, composing what is known as *the fibre*, becomes ruptured or injured. This rupture is usually invisible to the eye, but when the finished carbon is put to use an arc is apt to form thereat, which increasing finally destroys the carbon. The object of this part of my invention is to furnish a method of and means for treatment of the carbons so as to greatly reduce or practically eliminate such danger. The carbons used are preferably constructed with enlarged ends for clamping, small holes being constructed in the enlarged ends for the reception of the clamping screws. The fibres so constructed and carbonized are hung in a suitable frame by means of pins passing through the screw-holes referred to. The frame is placed in a flask capable of sustaining a high degree of heat (for which purpose nickel is the best adapted), and a stream of vapour from a carbon compound passed therethrough, while the flask and its contents are subjected to an intense heat. The carbon vapour is one which will be decomposed by high heat, the result being that there is a deposition of carbon upon the carbonized fibres, filling any breaks and uniting the disjointed ends of any ultimate or unitary fibres which have been ruptured or injured.

Figure 3 represents, partly in elevation and partly in section, an apparatus for this purpose, while figure 4 is a view of the frame or rack detached from figure 3.

C C C are carbons made with enlarged ends, in which are screw-holes, through which are passed the pins *p p*, by which the carbons are suspended in a rack or frame, F, made of suitable side-pieces, *f f*, supported on legs *l l*.

On any suitable base, B, is placed the piece T, which forms the bottom of a flask, whose other portion is the cover or case H, within which is placed the frame F, loaded with carbons, as seen in figure 3.

In a water-tank, T, is a reservoir, R, filled with a carbon compound capable of vaporization. From R a pipe, D, provided with a stop-cock, leads to the interior of the flask H.

The tank T¹ may be heated in any suitable manner, as shown; a faucet, F¹, admits hot water therein, which causes the vaporization of the liquid in R, while F² may be used to admit cold water for lessening or entirely checking the production of vapour.

Vapour is caused to pass through D into H, the surplus burning at *o*. At the same time the flask and its contents are heated in any suitable furnace, the heat causing a decomposition of the carbon vapour and a consequent deposition.

By this arrangement the vapour has free access to all parts of the carbonized fibres, so that the carbon may be deposited upon the entire surface. Another method by means of which carbon may be deposited upon a weak or defective point to build it up so that its resistance will be the same as that of the rest of the filament is as follows:—

Improvements in Electric Lighting, Electric Lamps, &c.

The carbon is heated by focussing on the defective point the rays from an external source of heat, such as the sun or a voltaic arc lamp, while at the same time a carbon vapour from heated naphthaline crystals or other carbon compound which is solid at ordinary temperatures, and which are placed in a glass bulb connected by a tube with a lamp, is forced into the globe which contains the carbon filament, and from which the air has been exhausted. The vapour will deposit carbon upon the heated point, which will then become a part of the carbon filament.

Figure 5 of the drawings is a view in section of an appropriate apparatus for this purpose.

A is the incandescing electric lamp containing the carbon filament B, which has been found defective at the point *a*. C is the mercury drop for forming the vacuum in the lamp.

D is a glass bulb connected with the lamp by the tube *b*. It contains crystals of naphthaline or other carbon compound of a similar nature, and it may be heated by means of the lamp E. F is a voltaic arc lamp, the rays from which, by means of the reflectors *c* and *d*, may be focussed upon the defective point *a* of the carbon B.

Heat being applied to the bulb which contains the carbon compound, it is volatilized, and the vapour passes through the tube *b* into the lamp, where it deposits an amount of carbon on the heated point of the filament. The rest of the vapour is then removed by means of the mercury drop.

It is obvious that sources of heat other than that described, including the rays of the sun, may be used.

If desired, a small amount of naphthaline crystals may be placed in the bottom of the enclosing globe of the lamp, which will, when the lamp is in use, become heated and volatilize gradually and continuously, supplying the waste of carbon due to the process known as electrical carrying.

The lamp is sealed off at *x*, and is then ready for use.

The body of the carbons being a mere filament or threadlike body, it is necessary that they be provided with ends greatly enlarged, in order to afford a good electrical contact at the clamps in which they are secured. With some materials, such as paper, wood, bamboo, &c., it is possible to make these enlarged ends integral with and a part of the carbon itself by suitably shaping the material prior to carbonization.

Other fibres, however, such as monkey bast, are simple filaments, and the enlarged ends have to be built upon them. The object of another portion of this invention is to furnish a method and means for making the necessary enlarged ends, and to that end it consists as follows:—A carbon is so attached to electrical conductors that a current shall be passed only through the portion or portions which it is desired to enlarge; it is then placed in a glass globe or receiver having a small opening in its top.

Connected with the globe are means for generating and passing into the globe a stream of hydro-carbon vapour capable of decomposition under high heat. The vapour is allowed to pass through the globe until all the air therein is displaced, the excess of vapour being burnt at the opening in the top of the globe.

The circuit being closed, the portions of the carbon through which it passes are heated thereby to incandescence, decomposing the vapour contiguous thereto, with the result that the carbon therefrom is deposited upon the heated portions of the conductor.

The process is kept up until the portions referred to are sufficiently enlarged.

In figure 6 of the drawings is shown an arrangement of means well calculated to carry into effect the invention, although the invention is not limited to the employment of the precise means therein illustrated.

H is the glass globe or holder, having an aperture, O, in its top, while the bottom thereof is sealed by the stopple S, through which passes the support of the carbon C.

The carbon C is secured in temporary clamps B, *a*, *a'*, of which *a* is connected to conductor 1 and *a'* to conductor 2 of a circuit of any suitable source of electricity, while the clamp B connects both limbs of the carbon, so that the circuit is *via* 1, *a*, B, *a'*, 2. The distance between B, *a*, and *a'* is equal to the portion of the carbon which it is desired to enlarge.

Connected with H by a pipe, P, is a retort or vessel, R, provided with means for heating, in this case a lamp, L.

In the pipe P is a cock, *r*, or other means of regulating flow between R and H, while the neck *o* is likewise provided with a cock, *o'*.

In R is placed a quantity of any suitable hydro-carbon, either liquid or solid. Heat being applied thereto by means of L, and the cock *r* opened, vapour flows through H, expelling the air at *o*, at which point the surplus vapour should be burnt.

While vapour is passing through H the circuit through 1, 2 should be closed (there being in the circuit any desired means of regulating it), which heats the portions *a a'* of C included in the circuit, causing a deposition of carbon thereon, and consequent enlargement thereat.

The vapour may pass through in a continuous stream, or when it is certain that H is well filled with vapour the heat may be removed from R and the cock *o'* closed.

Instead of the carbons being heated by the passage of a current, they may be heated by concentrating upon the portions desired to be enlarged the rays from a voltaic arc lamp, the sun, or any other suitable source of heat, by means of a lens or lenses properly arranged, the arrangements for surrounding the carbon during the process with carbon vapour remaining the same.

This modification may be reduced to practice by the use of the portion D of figure 1 with the part H of figure 6.

In such case the carbon upon which it is desired to build up the enlarged ends would be placed in H of figure 6, and carbon vapour passed therethrough, while the rays of the lamp in D, figure 1, or of other exterior source of heat, would be concentrated thereupon.

Still another means of increasing the size and electrical conductivity of the ends of the carbon, in order to give more bearing surface to the clamps and secure perfect contact at the clamping electrodes, is as follows:—An iron flask has a tightly fitting cover, and is divided by a partition into two unequal parts. A number of the carbon filaments are placed in the flask, the larger portion of each being in one compartment,

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compartment, while the ends project through slits in the partition into the other. The flask is then heated, after which carbon vapour is passed through the compartment containing the ends, and carbon is deposited thereon, increasing their size.

This is illustrated in figure 7 of the drawings, in which B is an iron flask or mould, having a cover, A, which fits tightly thereon. The flask is divided by the partition *g* into two compartments, *c* and *d*.

A number of carbon loops are placed in the flask, as shown, the larger part of each being in the compartment *c*, while the ends pass through slits in the partition *g*, and project into the compartment *d*. The cover is then placed on the flask, and the whole is heated to a high temperature in any suitable manner, after which, and while the carbons are still very hot, the carbon vapour is forced into the pipe *f*, and passes across the compartment *d*, and out of the pipe *e*.

During its passage across the ends of the heated carbons it will be decomposed and will deposit other carbon thereon, which will become a part thereof, thus enlarging the ends without increasing the size of the rest of the loop, unless it is desired that this should be done, in which case an aperture of the proper size may be left in the partition, to allow a portion of the vapour to pass through into the other compartment.

Another method of ensuring more perfect electrical conductivity at the clamps consists in plating the enlarged ends of the carbon with a suitable metal. A galvano-plastic cell containing a solution of the metal is used, having a support for the carbon so arranged that it may be suspended with one or both ends submerged in the liquid. An electrical circuit passes through the liquid, of which the ends of the carbon form the cathode, a suitable anode being placed in the circuit. Figures 8 and 9 of the drawings illustrate this.

In both figures, A is an electro-depositing cell, containing a suitable solution of the desired salt, say nickel. 1, 2 are the conducting wires, 1 leading to the anode B, while 2 connects with the carbon C, which forms the cathode.

In figure 8, D is a post upon an arm, *d*, of which is supported a saddle, E, on which the carbon C is supported, so that both ends may be plated at once. A number may be suspended from the saddle and plated simultaneously.

In figure 9, a clamp, F, is shown, in which one enlarged end of the carbon is secured, the other dipping into the plating solution.

If desired to lessen the resistance in the circuit, it is evident that clamps may be used, taking upon the carbons just above the solution, so that the most of the resistance of the not-to-be-plated portion of the carbons is cut out of the circuit.

As the plating takes in all the minute inequalities which may exist upon the surface of the enlarged ends, it is in the best possible contact therewith, owing to the tension of deposited metals, and a very perfect contact can be made between the clamps and the metal coating, while at the same time the plating preserves the enlarged ends from injury due to the clamps being pressed forcibly thereon.

After the incandescing conductors are carbonized it is found sometimes that they vary in resistance, and it is therefore necessary to reduce the resistance of some, in order that they may all be alike. The larger the carbon or the greater its mass, the lower the resistance, and consequently the way to reduce the resistance is to increase either the size of the carbons or their mass, or both.

To do this, I first test the resistance of various carbons when cold, and find those in which it is lowest.

The others must be reduced to nearly the same point. This is done by heating them while they are exposed to a carbon compound in a gaseous state, which will be decomposed by the heat, and will deposit other carbon on the carbon filaments until their size is increased and their resistance diminished to the proper point.

Figures 10, 11, and 12 illustrate this invention, figure 10 being a perspective view of the apparatus, figure 11 a plan or top view, and figure 12 an end view of the mould or flask in which the carbons are placed.

A is a flask or mould made of nickel, platina, or carbon (the last being deemed preferable, because it can be made of paper and carbonized into the proper shape), having a tightly fitting cover, B, a portion of which in the drawing is broken away to afford a view of the carbons *a*. The mould is supported on pillars C D E, which rest on a suitable base, F.

G H are pipes, through one of which vapour is admitted to the carbons *a*, and is removed from the other.

The carbons being placed in the mould, as shown, an electric current is passed through the wires 1, 2, the pillars C D, and the mould A, heating the mould, and consequently the carbons, to a very high temperature.

The carbon vapour is then allowed to enter the pipe, and circulating around through the mould deposits carbon on the heated filaments until their resistance becomes sufficiently reduced.

The time necessary for the operation may be determined by experiment, carbons originally of high resistance requiring a longer time than those of greater conductivity. Afterward the cover is taken off and the carbons removed, when the mould may be used again for other carbons.

It is not essential that the gas should be passed through the mould, as shown, by means of pipes; but instead, crystals of naphthaline or other carbon compound of similar nature may be placed in the mould, and when it is heated they will vapourize and deposit their carbon upon the filaments. Or the cover B may be dispensed with, and the mould placed in a receptacle filled with the vapour, the carbon of which will be deposited upon the filaments when they are heated.

Another part of the invention in this case relates to the connection of the wires and the carbon filament, and is intended as a substitute for the clamps referred to.

It consists in uniting the carbon to the wires in any suitable manner, and then electro-plating the point of union, thereby making permanent the union, and at the same time making perfect electrical contact between the two.

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The union of the carbon filament and the wires in the first instance may be accomplished in several ways. For instance, the end of the wire may be slightly flattened and then split, the end of the carbon filament inserted in the forked opening, the sides thereof pressed down upon the carbon filament, and the place of union then plated with any suitable metal, the deposited metal serving to hold the split ends in position upon the carbon filament, preventing it from loosening therefrom, and securing good electrical connection between the wire and the carbon.

If preferred, the wire may be given a turn or two around the end of the filament, and then the union plated, or the wire may be laid against the carbon and secured thereto by a wrapping of fine wire, the union being then plated, with the same results as stated in the first instance; or any other suitable method of uniting the wire and the filament in the first instance may be used, the essential feature being that the point of union be then plated to secure the results hereinbefore set forth.

In figure 13 of the drawings is illustrated suitable means for carrying this into effect. Referring thereto, G represents a depositing cell, made open at the bottom, a rubber or other suitable stopple, F, being used to close the orifice. E is a supporting tube, such as is used in my lamps, to receive the conducting wires 1, 2, which are sealed therein, the tube being provided with the enlargement D, for sealing into the neck of the enclosing globe of the lamp.

At their upper ends the wires 1, 2 are secured to the carbon C at the enlarged or clamping ends *c c*, by any desirable means, say, as first described, by flattening and splitting the ends of 1, 2, and inserting the ends *c c* in the forks so formed, the sides being then pressed down upon *c c*. The tube E is passed through an aperture in the stopple F, until the point of union is just covered by the plating solution in G, as shown in the drawing. Connections 3, 4 are then made to the wires 1, 2 and to the plate A from any suitable source of electricity, a battery, B, being, for ease of illustration, shown in the drawing, the plate A forming the anode, and the ends *c c* the cathode of the depositing cells. It is to be noted that the portions of the wires 1, 2 below the ends *c c* are to be covered with varnish, wax, or other substance preventing deposition thereon. The plating is to be allowed to proceed upon *c c* until the wires are thoroughly secured thereto.

In using my electric lamps it is preferable that in a system supplied from one central station a lamp should be adopted as a standard, that is, one having a definite area of radiating surface and a definite resistance, so that with a current of a definite electro-motive force or "pressure" the standard candle-power of light shall be given by a definite amount of energy for each lamp, all the lamps used in the system being made to approximate the conditions of the standard, an approximately uniform result is obtained.

In such a system each lamp is placed in its own separate derived or multiple arc circuit; and experience has shown that a lamp giving a light equal to about a 16-candle-power gas jet is the best adapted to average general use.

It is desirable, however, sometimes to connect in one multiple arc or derived circuit a series of lamps each giving the same amount of light as the standard lamp of the system, say 16 or 18 candle-power, so that all the lamps in such circuit, say a chandelier circuit, could be controlled by one circuit closer.

The object of this invention is to furnish a method and means for accomplishing this result.

To this end it consists, generally speaking, in making the density of the carbons, where a series of lamps are to be used, proportionately greater than that of the standard lamp, their conductivity increasing and resistance decreasing proportionately, so that, with the standard amount of energy and the standard amount of electro-motive force or pressure, each lamp of such series shall give the standard amount of light, the radiating surfaces of each remaining approximately at the area of radiating surface of the standard lamp.

The proportions in which the density or conductivity must be increased and the resistance diminished when it is desired to connect a series of lamps in one multiple arc or derived circuit of a system may be expressed approximately by a fraction whose numerator is one and whose denominator is the square of the number desired to be so connected.

Figure 14 of the drawings represents diagrammatically a number of multiple arc circuits.

1, 2 are the main conductors; 3, 4, 5, and 6 are multiple arc circuits.

In 3 is shown one lamp which would have the standard conditions of the system.

In 4, 5, and 6, two, three, and four lamps respectively in series are shown.

Applying the rule before stated, the density of the carbons in B B' should be such that their resistance is one-fourth that of the standard A, while the resistance of the three in circuit 5 and the four in circuit 6 should be one-ninth and one-sixteenth that of A respectively.

By thus changing this one condition of the standard of the system, radiating surface and electro-motive force remaining unchanged, it is possible to place in one multiple arc a series of lamps, each giving the standard candle-power of light, and all capable of being controlled by one circuit closer, which is typified by S in each of the multiple arc circuits, but which may be placed in any desired and convenient position for operation.

It is evident though that when desired a circuit controller or key may be placed at each lamp, and arranged so that the operation of any one shall control all the lamps in the circuit.

From this it appears that the condition to be changed is the density or mass of the incandescent conductor.

This may be effected in several ways; for instance, standard carbons may be taken and carbon deposited therein from carbon vapours by heat, in the manner well known from the researches and experiments of Berthollet upon the deposition of carbon from carbides of hydrogen and other decomposable carbon compounds, until their density be so increased that their resistance is brought down to the desired degree.

Carbons may be dipped in syrups or other carbonaceous material and then re-carbonized, the process being repeated until the required density is attained; and the number of dippings or soakings in a solution of a given strength and re-carbonizations to produce a definite result may be accurately determined, so that this process may be carried on with great certainty. Where

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Where very dense carbons of great electrical conductivity are required, they may be made of graphitic carbon, sometimes called plumbago, moulded under great pressure, or they may be cut by a punch and die from a sheet of moulded graphite of proper thickness.

It is evident that the density or mass and resistance may be varied in many other ways, any of which may be used in practising this invention.

It is also evident that for the result of increased conductivity for the purposes herein set forth an increase in area of cross-section is equivalent to increase of density, though the latter is preferable, unless the former can be practised without materially affecting the area of radiating surface.

The arrangement herein described is conducive also to economy, in that owing to the greater mass or density per unit of incandescing surface of the carbons their life is lengthened.

As is well known, the lamp devised by me and used in my system consists of a strip or filament of incandescing material of high resistance bent into a loop, now commonly known as the "horse-shoe carbon," hermetically sealed within a glass-enclosing globe.

It is well known that carbon expands by heating, especially with the very high heat necessary to incandescence.

This proved in the past a serious difficulty to the successful use of carbons in lamps, as the carbons then known were inflexible, and consequently after short use either the carbons were fractured or else the connections between the carbons and the conductors thereto were destroyed by the expansion.

The carbons of my invention, however, in addition to possessing all the other qualities needed, possess the quality of flexibility, the carbons made by the processes before made known by me being exceedingly flexible, as well as of high resistance.

By the use of such a carbon I am enabled to effect the object of one portion of this invention, which is to make a lamp in which the light-giving portion is in a straight line, in order to give a straight line of light instead of a circular or elliptical one. To do this, I extend the glass neck in which the carbon is held upward in a vertical arm, so that the lower end of the carbon is held as usual, and the upper end supported by a suitable arrangement at the top of the arm, along which one of the conducting wires passes to the upper end of the carbon.

This is illustrated in figure 15 of the accompanying drawings, in which A is the enclosing globe of glass, preferably cylindrical in shape, with a dome-shaped top, the lower end being drawn into a neck, N.

A glass support, B, is made with its lower end fashioned into a supporting neck, *b'*, the upper part into a bulb, *b*.

These parts are united at the line *x, x*.

Upon the bulb *b* is secured a glass arm, D, rising to a little greater height above *b* than the length designed to be given to the carbon to be used, the arm D then turning at about a right-angle, as shown at *d*.

A conductor, 2, is secured to the arm D either by being fused therein through its length or at intervals, *a a*, or by being bound thereto, or in any other convenient manner.

The conductor 2 has at its inner end a clamp, C', in which is secured one end of the straight flexible carbon filament C, whose lower end is in clamp *c*, upon the inner end of conductor 1. Conductors 1 and 2 pass through and are sealed into *b*.

In the manufacture of the lamp, the supporting arm, the conductors, and the carbon are first placed in position upon *b*, B and A being then united, and A exhausted in the manner more fully described in prior Patents granted to me.

This construction furnishes a lamp in which the incandescent material is in a line giving a straight line of light, the arm D supporting the upper end at a proper height.

The carbon being flexible bows slightly upon expansion under the influence of heat, avoiding the danger of fracture of the carbon or the destruction of its union with the conductors, which has beset former attempts in this line.

As the conductors which lead to the carbon are metallic, and therefore comparatively good conductors of heat, they may in use be heated to a considerable degree where they are sealed into the glass, when, owing to difference in the rate of expansion of the wire and glass, there may be danger sometimes of their separation at the point of union, which would result in the destruction of the vacuum, and consequently of the lamp.

In the lamps ordinarily made by me there is a minimum of danger on this score, owing to the fact that by the proper adjustment of the resistance of the carbon an exceedingly small conductor is used. In some cases it is desirable to still further reduce this danger, and also to provide lamps in which larger conductors, either for a greater number of carbons in multiple arc or of lower resistance, may be used with a minimum of danger from the source referred to.

This may be accomplished by interposing a larger interval between the clamps of the carbons and at the point at which the wires are sealed in the glass-enclosing globe, so that the length of the wire between the two points is such that heat enough to be dangerous will not be conducted through the wire to the point of sealing.

As the carbons are flexible, and the conductors, even of the largest size, are so small as also to be flexible, it is desirable that the conductors should be supported very near to the clamps, in order to give to the carbons and their supports the necessary stability. The object of another portion of this invention is to furnish a lamp in which these desired results may be accomplished, and it consists in placing a support for the conductors at a distance above the point where they are sealed into the glass, the conductors being sealed to this support, so that they will be held in an erect position.

This part of the invention is illustrated in figure 16 of the drawings.

A is the glass-enclosing globe, with its lower end fashioned into a neck, A', left open when first made.

B is the incandescing conductor of flexible high resistance carbon attached to clamps *b b*, on the terminals of conductors 1, 2.

The conductors 1, 2 are fastened to a glass rod, C, either along the entire length of the rod or at intervals.

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The rod with the attached conductors and carbon is then passed into the open neck A', which is sealed around the rod at a distance from its upper end. By this means the points of sealing which guard the vacuum are removed to a distance from the source of heat, while the carbons and conductors are suitably supported.

In some locations may be desired a simple lamp, capable of being suspended or swung, divested of all parts not necessary, in order that it may be cheaply made.

To this end another portion of my invention consists in a lamp composed of an incandescing conductor, a hermetically sealed glass sphere, and protruding conductors, by which it may be readily attached to other conductors and be suspended therefrom.

In the drawings, figures 17 and 18 represent such a lamp.

A is the glass-enclosing globe, made round, but with an aperture left at the point *a*; B is the carbon attached to clamps, *b b*, on the terminals of the conductors 1, 2; *c*, figure 17, is a glass disc, in which are sealed the conductors 1, 2. It may or may not be provided with a handle of glass, *c'*.

The wires 1, 2 being sealed in the disc and the carbon properly attached, the disc is passed into the globe through the aperture at *a*, the edges of which are then hermetically sealed upon the disc.

In figure 18 the conductors, 1, 2, with the attached carbon, are fastened temporarily upon or to a handle or support, C, and then passed into the globe, the handle or support C keeping the conductors in their proper relative position. The aperture at *a* is then hermetically sealed by fusion at its edges, and the support or handle C removed.

The object of another portion of this invention is to furnish a device by means of which the light of a single lamp of an electric lighting system may be increased or diminished without affecting any others of the series; and to this end it consists in the interposition in the circuit of the lamp of a resistance the force of which may be varied at the will of the operator by simply turning a key.

This resistance consists of a piece of stiff, heavy carbon of a suitable shape, and having at various points of its surface a number of metal contact pieces. An arm, which forms part of the circuit, is arranged so that it may be turned in such a way as to touch one or another of the contact pieces, thus placing more or less of the carbon in the circuit, and increasing or decreasing the resistance.

This is illustrated in figures 19 and 20, the former being a view of a lamp in which this invention is used, and the latter a detail view of the resistance.

1, 2 are the wires of an electric circuit, passing up through the base of the lamp to the carbon C, A being the globe in which the carbon is contained; B is the hollow base which supports the lamp and contains the resistance E E' (figure 20). This resistance is of the shape shown, and is made of stiff, heavy carbon. Attached to it at various points are metallic contacts, *a a' a''*, &c.

The wire 1, through which the current passes to the light, extends to the metal arm F, in the centre of the resistance. The current thus normally passes through the wire 1, the metal arm F, the contact piece *a*, and around through the carbon C, to the wire 2.

But if it is desired to decrease the force of the light, the arm F may be turned back until it reaches the contact *a'*, thus requiring the current to pass through the portion G of the carbon, and interposing so much additional resistance in the circuit. If a still further diminution of the light is desired, the arm may be turned back to the contact *a''*, and the resistance thus doubled, and so until the whole of the carbon E E' is included in the circuit 1, 2.

For convenience of manipulation, the key D projects out and terminates in a thumb-screw, so that the arm may be easily turned.

E E' being made, as stated, of a stiff, heavy carbon, furnishes a considerable resistance to the passage of the current, and as each succeeding section is placed in the circuit the force of the current is decreased, and the brilliancy of the light correspondingly diminished; and as the key is again turned back the resistance decreases and the light increases.

In these incandescing electric lamps difficulty is sometimes experienced from the fibre bending and falling over.

The object of this portion of my invention is to obviate this difficulty by constructing a device which will hold the carbon in an upright position, and the invention consists in employing a supporter made of glass or other insulating material, having a support at its upper end by which the carbon is held erect. This supporter extends upward from the glass neck in which the wires are sealed.

Figures 21, 22, 23, and 24 are views of different forms of this device, and figure 25 is a view of a carbon which may be used.

1, 2 are the wires passing through the glass neck N, and terminating in the clamps *b b*. In each of these clamps is inserted one end of the carbon A A, which is bent into a loop.

The glass N is continued upward in the form of a long stem, B (as in figures 22 and 23), which has attached to its end a suitable device for holding the carbon erect.

In the form shown in figure 22 a projection extends out laterally from near the top of the stem B, and carries the clamp *d*, made of platinum or other metal not easily affected by the current, in which is inserted the loop of the carbon A A, at the point *a*.

With such construction it is preferable to construct the carbon with an enlarged part, as shown at *a*, figure 25, in order to give a larger bearing surface for the clamp *d*.

In figure 23 the stem B is shorter and is not bent, and the projection extends directly upward from its top. The clamp at the end of this projection holds the Y-shaped piece *c*, preferably of platinum, between the prongs of which the carbon loop passes, and is thus kept from falling over sideways.

In the form shown in figure 24 a loop of glass, *c c*, extends upward, being placed at right-angles with the carbon loop.

The projections *n n*, extending upward from the glass loop, are arranged one on each side of the carbon, and so keep it from bending or falling.

In figure 21 the carbon is differently formed, extending up from the clamps in straight lines meeting at *d*. The stem of glass B extends up between the carbons a short distance, and then branches off into a loop, *e e*, which passes around above the point of junction of the carbons; and directly above this point a glass stem projects downward, having on its end the clamp *d* which holds the ends of the carbons.

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The object of another portion of my invention is to furnish a different means for retaining a vacuum in the enclosing globe of the lamp. A socket of wood or other insulating material has a glass piece set into it, which is somewhat in the form of the letter W, the central arch thereof extending up within the enclosing globe, and having the conducting wires passing through and sealed within it.

The enclosing globe sets into this glass piece, both being ground so as to fit tightly together. The remaining space is partly filled with mercury, and a packing of rubber is used to keep the mercury in place.

Figure 26 of the drawing is a sectional view of a lamp constructed in this way. W is an insulating base, usually of wood; A is the glass socket fitting therein.

It is, when seen in section, somewhat of the form of the letter W, the central limb being extended upwardly and forming a support for the wires leading to the clamps, the wires being suitably sealed therein, this central portion extending up within the body of the globe B.

The socket A is ground at *a*, and the globe B correspondingly ground at *b*, so that they fit tightly together. A space, C, is thus left, which is filled in with mercury, forming a liquid seal. Above the mercury is placed a rubber ring, D, which fits tightly, and prevents the mercury from escaping.

1, 2 are the wires of the circuit by which electricity is supplied to the lamp. These wires terminate in the platinum clamps *c* which hold the carbon. A portion of the circuit is formed by the screw *d*, which may be drawn back to break the circuit and extinguish the lamp, or *vice versa*.

After the globe B is blown a stem remains at *x*, by means of which the air is exhausted, and the globe is then sealed and the stem broken off, leaving the globe perfectly air-tight.

Hitherto in manufacturing my lamps, as disclosed in prior patents, it has been the custom to blow a bulb upon the end of the supporting tube, the conducting wires passing through and being sealed into the bulb. In such construction the wires were in sealed contact with the glass for a length equal only to or a little more than the thickness of the glass of the bulb. It seems desirable sometimes to provide for a larger sealing, the accomplishment of which forms another portion of this invention.

This is done by heating the end of the tube which is to form the inner or supporting end in the finished lamp, with the conducting wires laid therein, so as to be equally heated until a welding heat is made, when the end is welded together for a suitable distance by pressure applied by squeezers, clamps, or other suitable devices, the wires being sealed hermetically between the portions of the glass so brought together.

This is illustrated in figure 27, which is a view of an entire lamp, and figure 28, which represents the inside stem.

A is the enclosing globe, and B the central support, through which the conducting wires 1, 2 pass, they being sealed therein. This support is hollow, and in those lamps previously made has a bulb blown at its upper extremity; but in this case this extremity is formed into the solid, flat piece of glass *a*.

Before the central tube is placed within the globe the conducting wires are laid therein, after which its end is heated in a blow-pipe flame until the glass becomes soft, when it is pressed down by squeezers or clamps, so that it is flattened around the wires for a suitable distance.

This form of construction is of easy and economical application, secures the wires firmly in place, and affords a seal so large that danger of breaking at the points of sealing in is greatly lessened.

What I claim as my invention is—

- 1st.—The improved method herein described of forming carbon in definite shape, consisting in depositing the carbon upon a metallic blank, and then removing the metallic portion, substantially as described.
- 2nd.—The method of forming carbon articles of a definite desired shape, consisting in cutting or shaping the articles from paper, and then carbonizing the shaped paper, substantially as herein set forth.
- 3rd.—The method of removing hydrogen from carbons, consisting in passing a stream of chlorine or equivalent gas through the flask containing the carbons heated to a high temperature, substantially as set forth.
- 4th.—The method of treating carbon conductors for electric lamps herein described, consisting in enclosing the conductor in a glass case or globe, exhausting the air therefrom, heating the conductor by an electric current, and then hermetically sealing the glass case or globe, substantially as set forth.
- 5th.—The method of treating carbon conductors for electric lamps herein described, consisting in enclosing the conductor in a glass case or globe, exhausting the air therefrom, heating the conductor by an electric current to a higher degree than that at which it is intended to ordinarily raise the conductor in use, and then hermetically sealing the glass case or globe, substantially as set forth.
- 6th.—The within-described method of removing the occluded gases or vapours from the incandescent conductor of an electric lamp, consisting in heating the same in vacuum in the presence of a material which will absorb the gases or vapours thereby eliminated, substantially as set forth.
- 7th.—The within-described method of removing occluded gases or vapours from the enlarged ends and clamps of the incandescent conductor of an electric lamp, consisting in heating such parts by external heat focused or centred thereon, in the presence of a material which will absorb the gases or vapours thereby eliminated, substantially as set forth.
- 8th.—The combination of an incandescent electric lamp, means for producing a vacuum within its enclosing globe, means for concentrating external heat upon the incandescent conductor, and means for absorbing any gases or vapours given off by the incandescent conductor, substantially as set forth.

Improvements in Electric Lighting, Electric Lamps, &c.

- 9th.—The method of treating carbonized conductors for incandescent electric lamps, as herein described, consisting in subjecting the shaped carbonized conductors to the action of high heat and a carbon vapour in a closed flask, wherein the vapour has free access to every portion of the carbonized conductors, substantially as set forth.
- 10th.—The within-described process of building up or strengthening a defective point in an incandescing conductor for electric lamps, consisting in heating that point to a high temperature by concentrating thereon the heat from an external source, and at the same time allowing a carbon vapour to enter the globe and deposit additional carbon on the heated point, substantially as set forth.
- 11th.—The combination with the carbon filament and its enclosing globe of a chamber containing a solid carbon compound volatilizable at low heat, and means for concentrating or focusing a high degree of heat upon any portion of the filament, substantially as set forth.
- 12th.—An electric lamp consisting essentially of a carbon filament, enclosing globe, and conducting wires, provided with a solid carbon compound, volatilizable at low heat, substantially as set forth.
- 13th.—The method of treating filamentary carbons consisting in heating a portion desired to be enlarged while in an atmosphere of hydro-carbon, by the means substantially as described.
- 14th.—The combination of a source of heat, L, a retort or vessel containing hydro-carbon, the lamp-enclosing globe H and pipe P, provided with means for regulating the flow from R to H, substantially as set forth.
- 15th.—The within-described process of enlarging and increasing the electrical conductivity of the clamped ends of the incandescing conductors of electric lamps, which consists in passing over these ends a current of hydro-carbon vapour while they are at a high temperature and separated from the rest of the carbon.
- 16th.—A flask or mould divided by a partition into two parts, one of which is provided with inlet and outlet pipes for the passage of hydro-carbon vapour, substantially as and for the purpose described.
- 17th.—A carbon for the incandescing conductor of an electric lamp, having plated ends for clamping, substantially as set forth.
- 18th.—The hollow mould or flask of an interior shape corresponding to the carbons to be treated, and provided with means for passing therethrough a stream of vapour, substantially as set forth.
- 19th.—The combination with a hollow mould or flask for holding carbons to be treated as described of circuit connections for heating the mould or flask by electrical incandescence, substantially as set forth.
- 20th.—The method of uniting the carbon filament and conducting wires thereto in an electric lamp, consisting in first uniting them mechanically in any ordinary manner, and then securing the union by electro-plating thereon, substantially as set forth.
- 21st.—The combination of a carbon filament, the conducting wires leading thereto, and an electro-plated union or joint, substantially as set forth.
- 22nd.—An incandescent electric lamp in which the union of the incandescing carbon conductor and the conducting wires leading thereto is secured and perfected by an electro-plated union or joint, substantially as set forth.
- 23rd.—An electro-plating cell, provided with a perforated bottom for receiving the support of the article to be plated, so that the joint of plating may be controlled, substantially as set forth.
- 24th.—The combination with one multiple arc or derived circuit of two or more incandescent electric lamps arranged in series therein, the density and electrical conductivity of the carbons of the lamps being increased proportionately, substantially as set forth.
- 25th.—The method of arranging a series of incandescent lamps in a multiple arc or derived circuit, consisting in increasing the density and electrical conductivity of the individual carbons approximately in the proportion to the number to be placed in the one circuit, substantially as set forth.
- 26th.—The combination with one derived circuit of two or more lamps, each of a fractional resistance of the resistance of the standard lamp, but with approximately the same radiating surface, substantially as set forth.
- 27th.—In a system of electric lighting, the combination with a main circuit of several multiple arc or derived circuits, some containing a standard lamp, and some containing a series of lamps, two, three, or more, the electrical conductivity and density of the carbon in any one derived circuit in the latter instance increasing as the number of lamps used in such circuit increases, substantially as set forth.
- 28th.—The combination with one derived circuit and one circuit controller of two or more lamps, each of a fractional resistance of the resistance of a standard lamp, but with approximately the same radiating surface, substantially as set forth.
- 29th.—An incandescing conductor for electric lamps made of compressed graphitic carbon, substantially as set forth.
- 30th.—An electric lamp formed of a straight flexible high-resistance filament enclosed in an hermetically sealed glass globe, substantially as set forth.
- 31st.—The combination with the carbon-supporting bulb of a glass arm rising above the bulb, and supporting one end of a straight carbon, and the conductor leading thereto, substantially as set forth.
- 32nd.—The combination with the glass-enclosing globe and incandescing conductor of an electric lamp of a support hermetically sealed to the globe, and supporting the carbons at a distance above the point of sealing, substantially as set forth.

Improvements in Electric Lighting, Electric Lamps, &c.

- 33rd.—The combination with the conductors of an incandescent electric lamp of a glass support, to which the conductors are sealed at two or more points, one near the clamps, and one where the conductors enter the enclosing globe, so that the latter point is removed a little distance from the former, substantially as set forth.
- 34th.—The electric lamp consisting of an hermetically sealed sphere, an incandescing conductor, and protruding conductors, substantially as set forth.
- 35th.—The combination with the incandescing conductor of an electric lamp and the key for controlling the circuit thereof of an adjustable resistance cut in or out of circuit in any desired proportion by the key, substantially as set forth.
- 36th.—A carbon resistance, made substantially as described, and provided with a series of metallic contacts, in combination with a key, having an arm for completing circuit at any desired contact, substantially as set forth.
- 37th.—The combination with the incandescing loop of an electric lamp of a support arranged to maintain the loop in its normal position, substantially as set forth.
- 38th.—The supporting neck in which the wires leading to the loop are secured, provided with an arm for maintaining the loop in its normal position, substantially as set forth.
- 39th.—The central tube, conductor, or support for the incandescing conductor, formed with a chamber at its base and fitted to receive tightly therein the neck of the enclosing globe, substantially as set forth.
- 40th.—In an incandescing lamp, the combination of the chambered central tube or support and the enclosing globe, ground or adapted to fit tightly, substantially as described.
- 41st.—The combination in an incandescing lamp of the chambered central tube or support, adapted to hold a liquid seal, the enclosing globe having a neck fitted to the chamber, and a packing for securing the liquid seal, substantially as set forth.

Signed by me, this eighth day of April, A.D. 1881,—

Witnesses—

CHAS. H. SMITH.
J. HART.

THOMAS ALVA EDISON.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to Thomas Alva Edison, this thirteenth day of August, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 30 June, 1881.

We do ourselves the honor to state, in reply to your blank cover communication of the 21st instant, No. 5,865, transmitting Mr. Thomas Alva Edison's Petition, specification, drawings, and claim for the registration of an invention entitled "Improvements in systems of Electric Lighting, in Electric Lamps and in constituent parts thereof, and in means and methods of manufacture connected therewith," that we are of opinion the prayer of the petitioner may be granted.

We have, &c.,

E. C. CRACKNELL.
GOTHER K. MANN.

The Under Secretary of Justice.

[Drawings—two sheets.]

No. 969.

[Assignment of No. 958. See page 207.]

B.

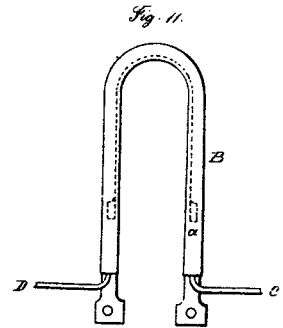
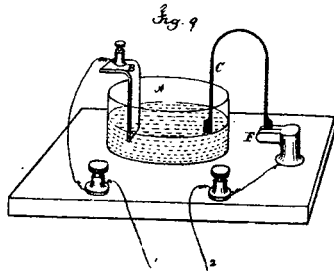
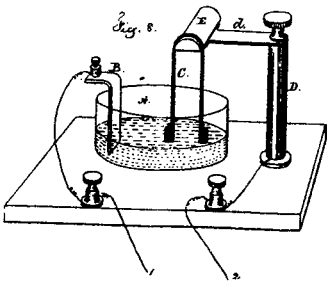
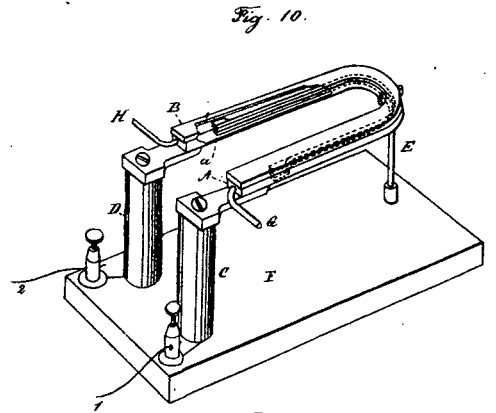
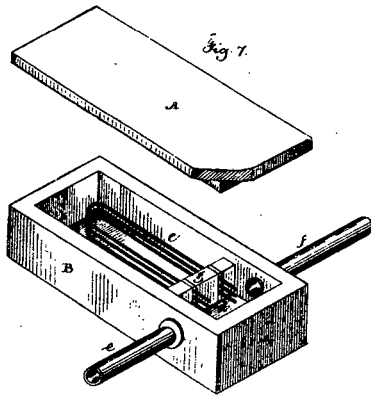
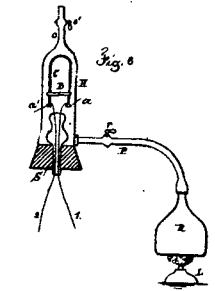
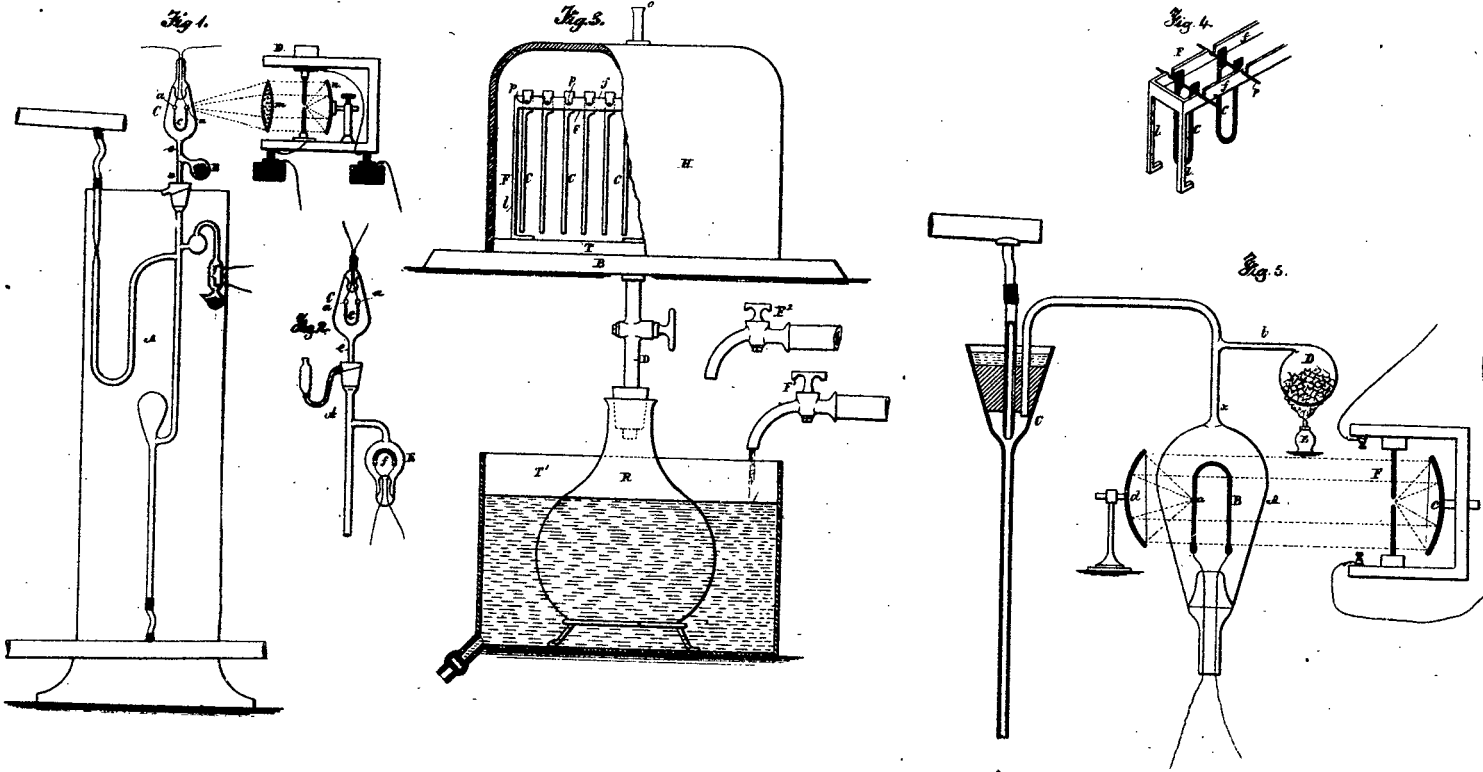


PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE SYDNEY, NEW SOUTH WALES.

Witness

Chas. Smith
J. Hall

Thomas Alva Edison
Inventor.

This is the Sheet of Drawings marked B referred to in the annexed Letters of Registration, granted to Thomas Alva Edison this thirteenth day of August, A.D. 1881.

Augustus Loftus.

C

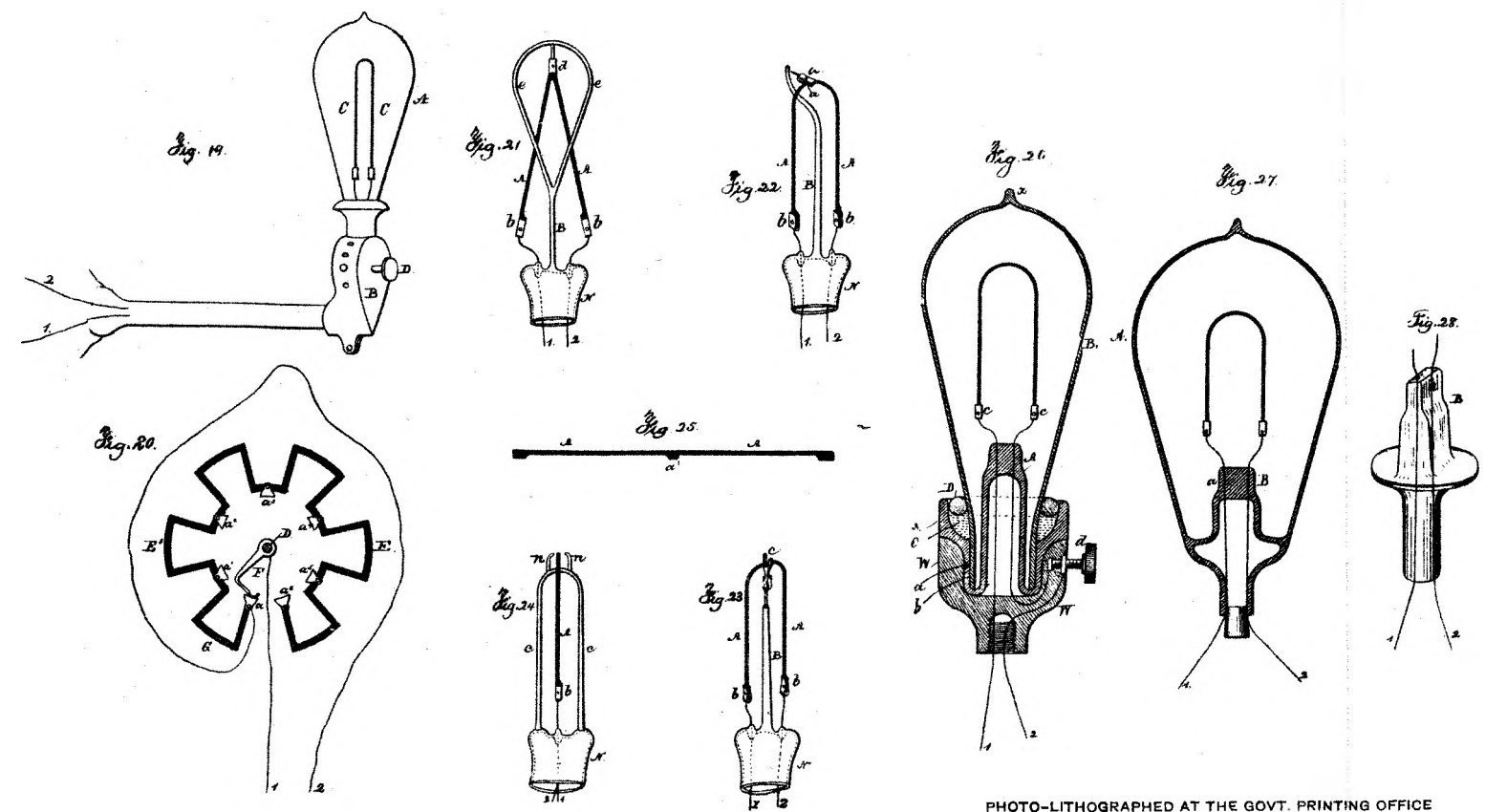
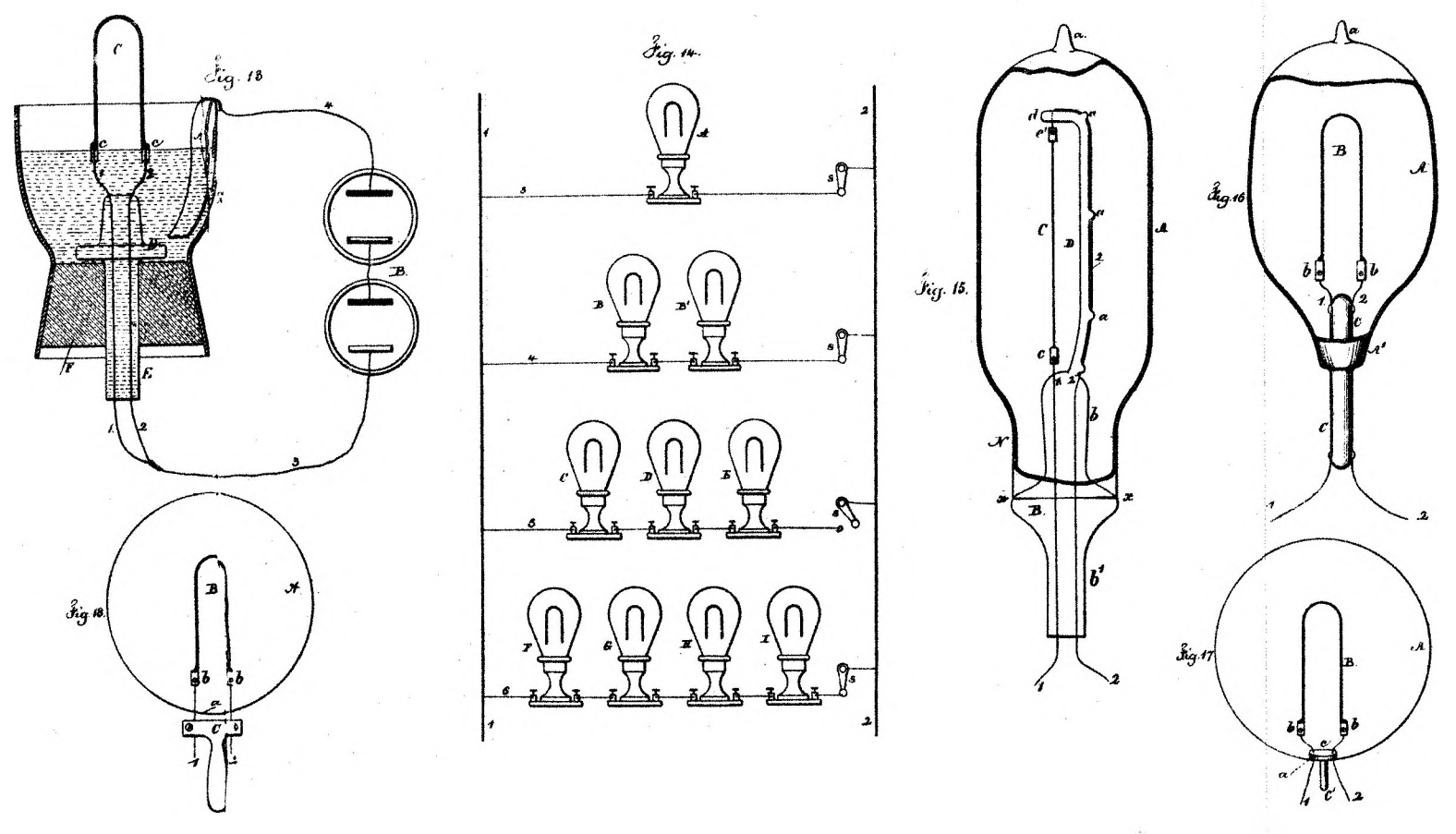


PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE SYDNEY, NEW SOUTH WALES.

Thomas Alva Edison
Inventor

Witness
Charles
J. Hall

This is the Sheet of Drawings marked C referred to in the annexed Letters of Registration, granted to Thomas Alva Edison this thirteenth day of August, A. D. 1881.
Augustus Loftus.



A.D. 1881, 16th August. No. 970.

**IMPROVED CONTRIVANCES FOR ARRESTING AND EXTINGUISHING SPARKS
FROM STEAM-ENGINES.**

**LETTERS OF REGISTRATION to Peter Tyrer, for Improved contrivances for
arresting and extinguishing Sparks from Steam-engines.**

[Registered on the 16th day of August, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS
(commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of
the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-
Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS PETER TYRER, of No. 425, King-street, Melbourne, in the Colony of Victoria, engine-driver, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improved contrivances for arresting and extinguishing Sparks from Steam-engines," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Peter Tyrer, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said Peter Tyrer, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said Peter Tyrer shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this sixteenth day of August, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improved contrivances for arresting and extinguishing Sparks from Steam-engines.

SPECIFICATION of PETER TYRER, of No. 425, King-street, Melbourne, in the Colony of Victoria, engine-driver, for an invention entitled "Improved contrivances for arresting and extinguishing Sparks from Steam-engines."

My invention has been designed mainly for the purpose of arresting sparks in their passage from the fire to the funnel or flue of a steam-engine; and secondly, in extinguishing such as may succeed in reaching the funnel or flue.

My improved contrivance for arresting sparks in their passage from the fire to the funnel or flue consists of a peculiarly constructed cage, the lowest part of which is made to fit the top of the blast-pipe, and the upper or highest part to fit the bottom of the funnel, but instead of a constant widening of such cage from top to bottom, it consists of a gradual widening and then a narrowing, then another gradual widening and another narrowing, and so on, like a series of funnel-shaped cages one above the other, the whole terminating in a flat ring attached to the bottom of the funnel.

My improved contrivance for extinguishing such sparks as may succeed in reaching the funnel or flue consists of a perforated circular pipe for supplying water spray to any part of the funnel, but placed by preference just around the bottom of the funnel and above the cage.

In order however that my invention may be clearly understood I will now refer to the drawings hereto attached, and which form part of this specification. Figure 1 shows side view (partly in section) of my invention; figure 2, plan thereof, on the line *aa* in figure 1; whilst figure 3 shows (on a smaller scale) face view of the smoke-box and funnel of a locomotive with my invention attached.

A A are rings of wire separate from each other and with their ends joined by brazing. These rings fit loosely in holes in the side standards or framing B B, of which I think four are sufficient, but of which there may be less or more if so preferred. These standards are mortised into ring C at the top and C' at the bottom; D is the ordinary blast-pipe, and E the ordinary circular steam jet pipe around its mouth; F is my circular water-pipe, so perforated as that the jets therefrom converge towards the centre, as shown in figure 3. This circular pipe obtains its water from an accumulator which is supplied from the feed-pipe of the pump.

I find my cage quite effective when made stationary and with each ring separate as shown, but if preferred it might be made to revolve, and the wires of the cage might be made continuous and spiral instead of in separate rings. I desire also to state that I have used my cage alone without the water spray on a locomotive engine on the Victorian Railways when burning coal, and have found it a perfect success, but think it probable that when burning wood, or when used on portable engines engaged in farm work, the water spray may be found useful and necessary.

I am aware that a cage of vertical wires has been tried in the same position and for the same purpose as mine, but without success; I do not therefore claim the use of wire cages generally placed between the blast-pipe and the funnel of the engine, but I do claim my improved cage for arresting sparks from steam-engines, placed between the top of the blast-pipe and the bottom of the funnel, and made in a succession of funnel-shaped sections, increasing in diameter from bottom to top, and with horizontal wire rings or a wire spiral, and either with or without the water spray, substantially as herein described and explained, and as illustrated in my drawings.

In witness whereof, I, the said Peter Tyrer, have hereto set my hand and seal, this twenty-ninth day of April, one thousand eight hundred and eighty-one.

Witness—

EDWD. WATERS, Melbourne, Patent Agent.

PETER TYRER.

This is the specification referred to in the annexed Letters of Registration granted to Peter Tyrer, this sixteenth day of August, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Having examined the specification and plans accompanying the Petition, we have the honor to recommend that Letters of Registration should be issued to Peter Tyrer, for an invention entitled "Improved contrivances for arresting and extinguishing Sparks from Steam-engines," as shown in the drawings and described in the specification attached to his Petition.

Sydney, 7 July, 1881.

We have, &c.,

JOHN WHITTON.
E. O. MORIARTY.

The Under Secretary of Justice.

TYRER'S PATENT.

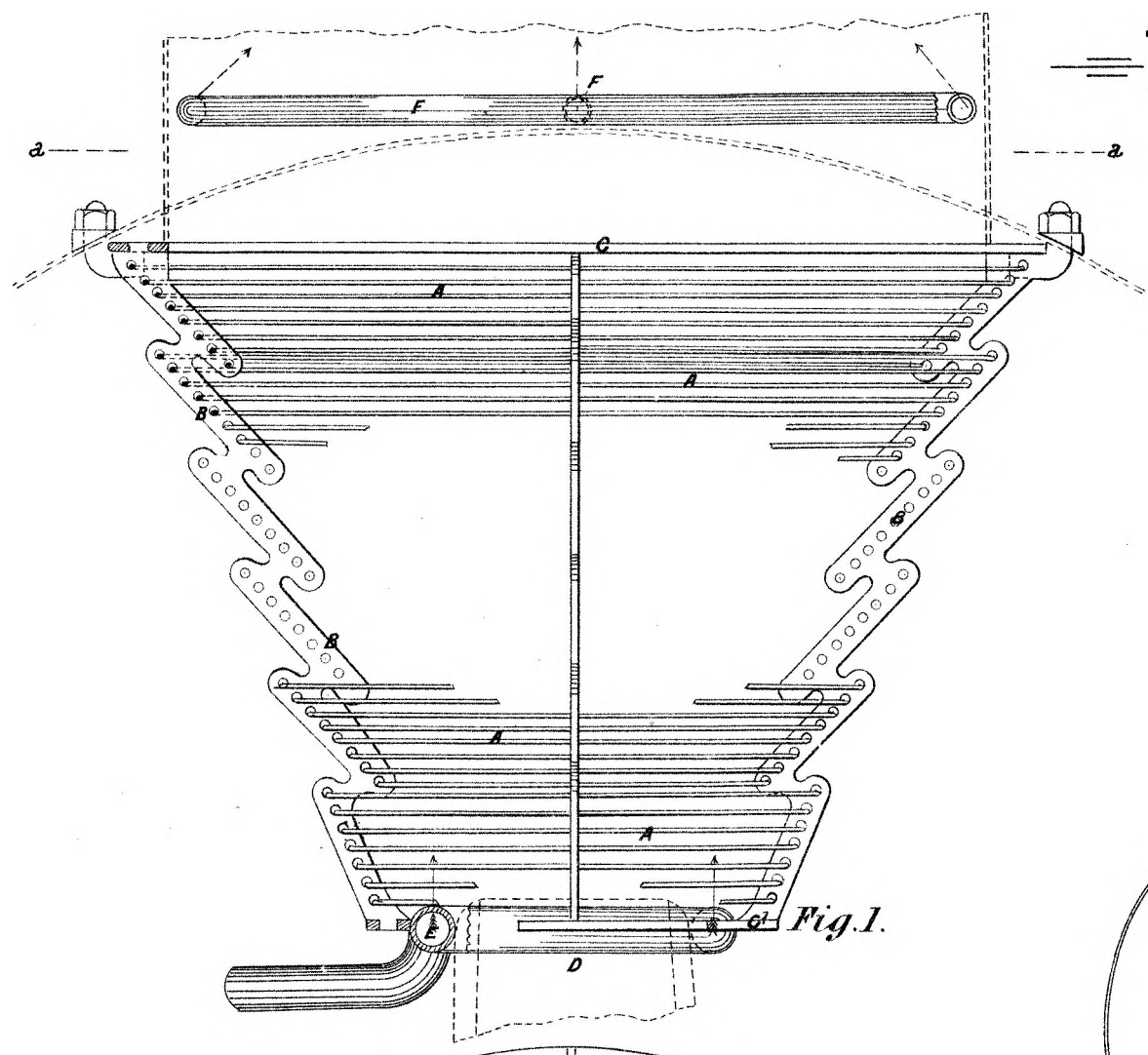


Fig. 1.

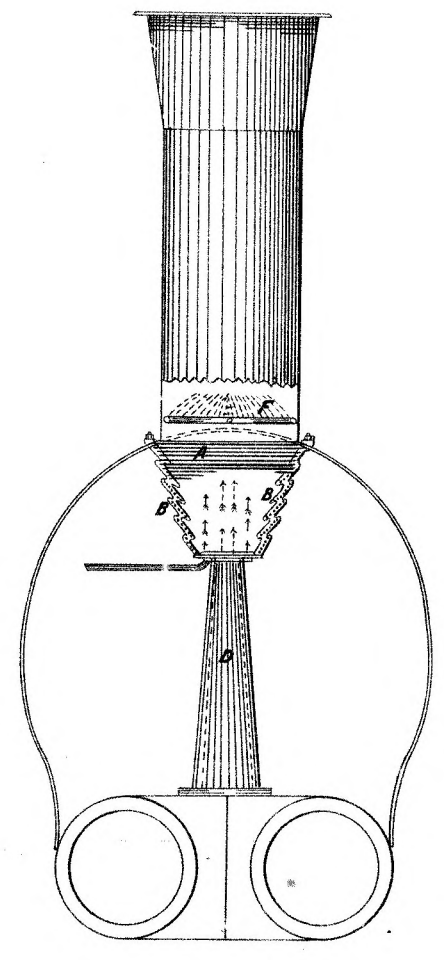


Fig. 3.

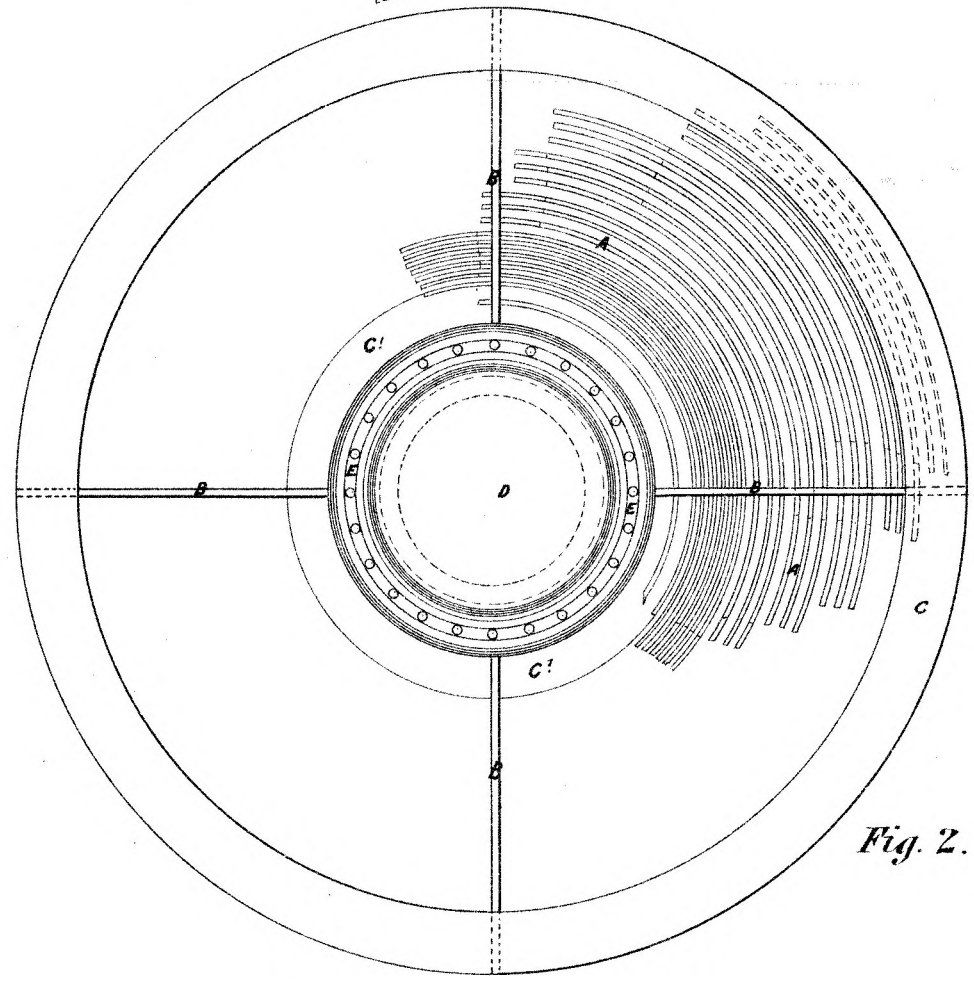


Fig. 2.

*This is the Sheet of Drawings referred to in the annexed
 Letters of Registration granted to Peter Tyrer, this sixteenth
 day of August A. D. 1881.*

Augustus Loftus.



A.D. 1881, 16th August. No. 971.

IMPROVEMENTS IN ROCK-DRILLS.

LETTERS OF REGISTRATION to John Mitchell, for Improvements in Rock-drills.

[Registered on the 16th day of August, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS JOHN MITCHELL, of Eaglehawk, near Sandhurst, in the Colony of Victoria, engineer, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in Rock-drills," which is more particularly described in the specification and sheet of drawings which are hereunto annexed ; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four ; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years : And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said John Mitchell, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof ; to have, hold, and exercise unto the said John Mitchell, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended : Provided always, that if the said John Mitchell shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this sixteenth day of August, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Rock-drills.

SPECIFICATION of JOHN MITCHELL, of Eaglehawk, near Sandhurst, in the Colony of Victoria, engineer, for an invention entitled "Improvements in Rock-drills."

THIS invention consists of certain improvements in percussive rock drills, which have one cylinder and piston, made of iron, steel, brass, or other metal, and worked by compressed air or steam.

Referring to my drawings, figure 1 shows an elevation of a rock-drill constructed according to my invention; figures 2 and 3 show respectively top and bottom view thereof; figure 4 is a centre section of figure 1; figure 5 shows an elevation of my improved piston and thimble; figures 6, 7, and 8 are horizontal sections on lines *a a*, *b b*, *c c*, respectively, in figure 4; and figure 9 shows side and edge views of my drill point.

The cylinder A has no steam chest, port-ways, slide, or other valve to regulate the admission and discharge of steam. The annular chamber or belt B is for the purpose of supplying air or steam, and the annular chamber or belt C for exhausting. The belts B and C are also for the purpose of surrounding the piston E with equal pressure, thereby causing the piston E to swim and reduce friction, and also for economizing pressure by getting the source of supply as near to the piston E to be operated on as possible.

The pressure enters the belt B through a stop-cock at B¹, and after operating on the piston E is discharged at C¹.

The piston E is turned to fit accurately into the cylinder A, with or without spring rings, and is its own supply and discharge valve. There are one or more holes or ports, F and G, drilled into the piston E. The holes or ports F, when at the annular chamber or belt B, supply the back end of the cylinder A with pressure to force the piston E in the direction of the rock. When the holes F reach the annular chamber or belt C the pressure is discharged, and the holes G are then at the belt B, supplying the front of the cylinder A with pressure to force the piston E from the rock until the front of the piston E reaches the belt C, when the pressure is discharged; the holes F are then again at the belt B receiving a fresh supply to force the piston E again towards the rock, thereby keeping up a constant reciprocating motion.

The piston rod E¹ is supported by a neck and stuffing-box, A¹, at the front of the cylinder A, and the drill tool is held in the end of said piston rod by a clamp.

The piston E attached to the piston-rod and drill-tool has not only a reciprocating but also a rotary motion, and for this purpose it has a hole drilled up the centre into the piston rod E¹. A long thimble, E², screwed into the piston E; a bar, H, with a ratchet wheel, H¹, telescoping a hollow sleeve, J, with a ratchet wheel, J¹, said hollow sleeve J telescoping into the thimble E². The bar H has two straight flats, H², for a certain distance fitting accurately into the bottom of the thimble E², and the hollow sleeve J has two oblique or spiral flats, J², fitting accurately into the top of said thimble. When the pressure forces the piston E up the cylinder A the thimble E² fitting the oblique or spiral flats J² causes the piston E to rotate about the one-twentieth of a revolution, because the pawl J³ in the ratchet wheel J¹ prevents the hollow sleeve J from turning backwards. The bar H, with said straight flats H², fitting the bottom of the thimble E², rotates at the same time, but when the piston E is returning from the top of its stroke the pawl H³ prevents said bar H with the straight flats H² from turning backwards, and the oblique or spiral flats J² must turn the hollow sleeve J forward. The bar H with the straight flats H² turns or rotates forward with the piston when it is on the up-stroke or receding from the rock, while the hollow sleeve J with the oblique or spiral flats J² has no rotary motion, but turns the piston forward. On the down-stroke the piston has no rotary motion, and the hollow sleeve J turns forward, thereby producing a constant and compulsory rotating as well as a reciprocating motion.

The hollow sleeve J and bar H are supported in a journal, I, the ratchet wheels being divided into a number of teeth, and placed in a space at the back end of the cylinder A, with their respective pawls J³ and H³. To force the pawls to the ratchet-wheels a small spiral spring is inserted in a hole in the top of each pawl, and rests against the end of a screw bolt in the side of the cylinder head.

A frame with grooves, constructed preferably of phosphor-bronze or malleable cast-iron, is made to receive lugs A², on the cylinder A. A long screw with a handle is secured to the frame, runs through a nut between other lugs on the cylinder, and feeds the machine up and down the frame as required; this frame is secured to a clip or saddle around a spreader in the usual way; but although I have described and shown in the drawings such frame as a most suitable one, and the one which I have found to be preferable, I wish it understood that I do not confine myself to any particular frame or mode of holding my improved cylinder, &c., in position.

The drill-tool used is like the ordinary miner's tool, excepting the cutting point, which cuts and crushes. Part of the point is sharpened in the ordinary way; the other part is checked a distance back. This crushes the lumps and dresses the hole, and prevents the tool from penetrating too far into soft or jointy ground.

Having thus described the nature of my invention, and the method of putting it into operation, I would have it distinctly understood that, save as hereinafter specified, I do not claim to be the inventor of the several mechanical contrivances herein described, and illustrated in my drawings, separate and apart from their connection with the other details which go to make up my machine, but what I believe to be new, and therefore claim as my invention, is—

First—The construction and arrangement of the cylinder A with annular grooves or belts B and C for the entrance and exit of the motive power, and for surrounding the piston E with belts of pressure, substantially as described and explained, and as illustrated in my drawings.

Second—The combination with such cylinder of a piston, E, having one or more holes or port-ways, F and G, therein for supplying said power to either end of the cylinder, for the purpose of giving a reciprocating and percussive motion to a rock-drill, substantially as herein described, and as illustrated in my drawings.

Third—

Improvements in Rock-drills.

Third—The combination and arrangement of piston E, thimble E², rod or bar H, with its straight flats H², and ratchet-wheel H¹, and pawl H³ at its end, and hollow sleeve J with its oblique or spiral flats J², and ratchet J¹, and pawl J³ at its end, for the purpose of giving a compulsory intermittent rotary motion to the piston E, as herein described and explained, and illustrated in my drawings.

Fourth—The peculiar construction of the drill-tool, as herein described, and as shown in figure 9 of my drawings.

Fifth—The combination and arrangements of the several mechanical contrivances, forming a complete rock drill, as herein described and explained, and as illustrated in my drawings.

In witness whereof, I, the said John Mitchell, have hereto set my hand and seal, this fourteenth day of April, one thousand eight hundred and eighty-one.

Witness—

SAMSON HOOVER,
Golden Square, Clerk.

JOHN MITCHELL.

This is the specification referred to in the annexed Letters of Registration granted to John Mitchell, this sixteenth day of August, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Having examined the specification and plans accompanying the Petition, we have the honor to recommend that Letters of Registration should be issued to John Mitchell, for an invention entitled "Improvements in Rock Drills," as shown in the drawing and described in the specification attached to his Petition.

Sydney, 7 July, 1881.
We have, &c.,
JOHN WHITTON.
E. O. MORIARTY.

The Under Secretary of Justice.

[Drawings—one sheet.]

JOHN MITCHELL'S PATENT.

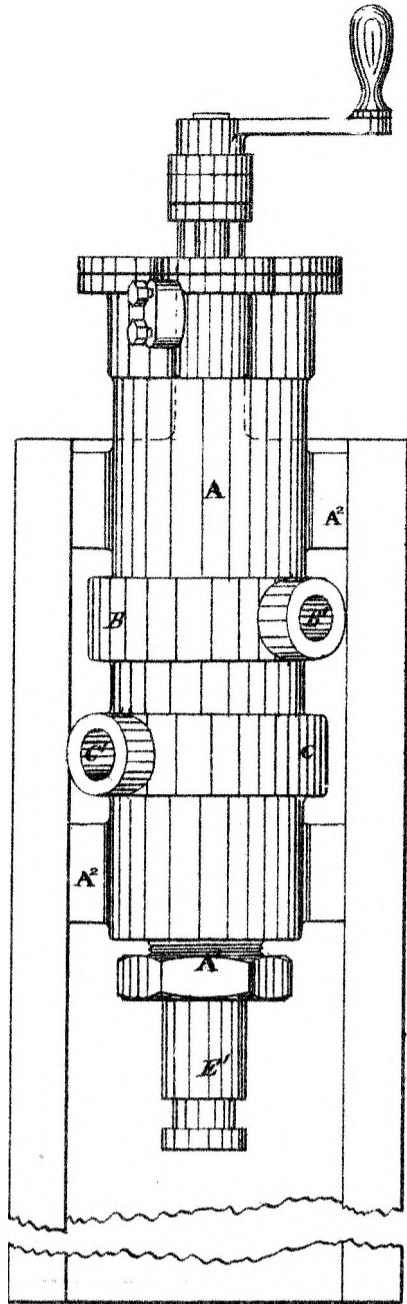


Fig. 1.

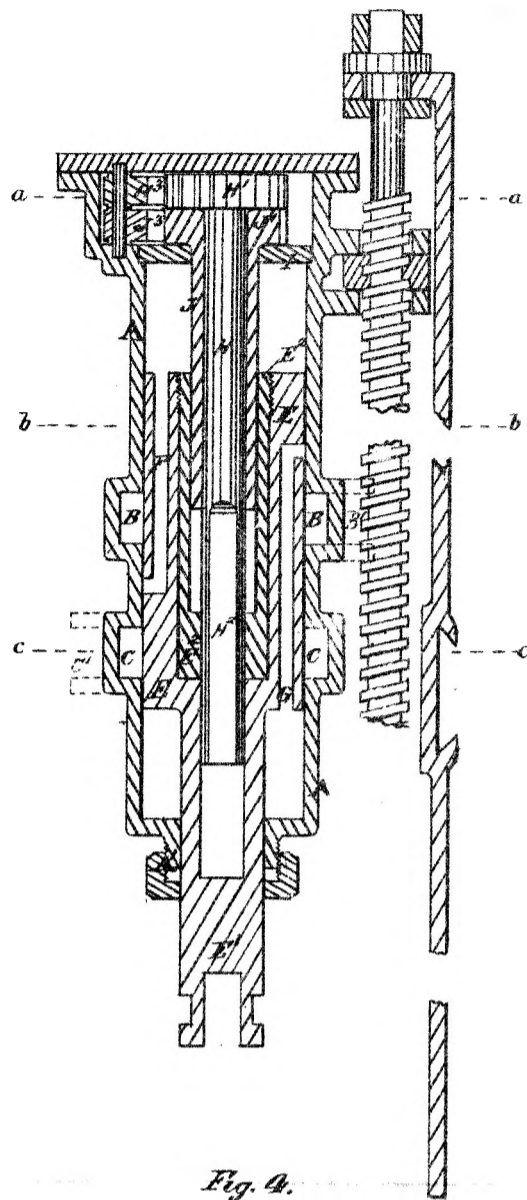


Fig. 4.

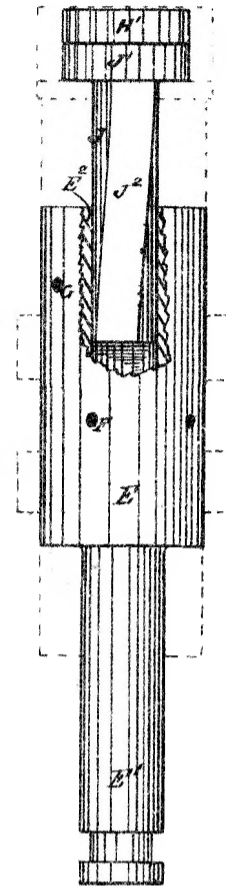


Fig. 5.

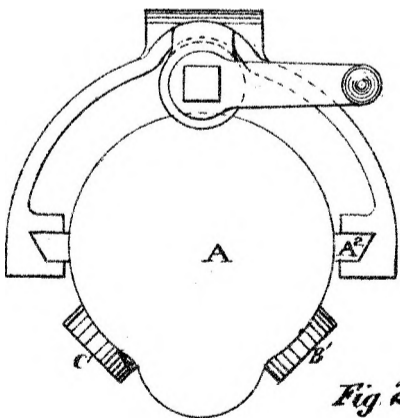


Fig. 2.

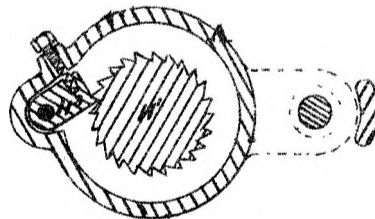


Fig. 6.

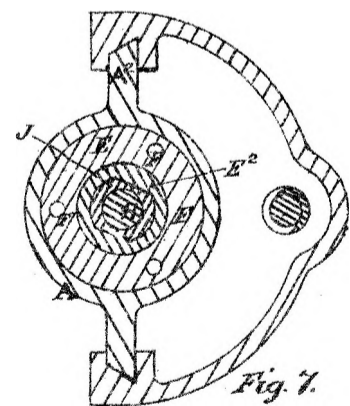


Fig. 7.

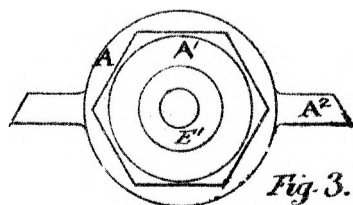


Fig. 3.

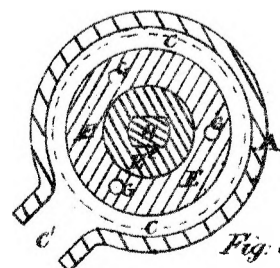


Fig. 8.



Fig. 9.

This is the Sheet of Drawings referred to in the annexed Letters of Registration granted to John Mitchell, this Sixteenth day of August, A.D. 1861.

Augustus Lofthus.



A.D. 1881, 16th August. No. 972.

IMPROVEMENTS IN THE PROCESS OF PRESERVING MEAT, AND IN TINS FOR CONTAINING THE SAME.

LETTERS OF REGISTRATION to Alfred Lee, John Alston Wallace, and Robert Wright Knox, for Improvements in the process of preserving Meat, and in tins for containing the same.

[Registered on the 16th day of August, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS ALFRED LEE, of No. 26, Brunswick-street, Fitzroy, near Melbourne, in the Colony of Victoria, meat preserver, JOHN ALSTON WALLACE, of No. 52, Bourke-street East, in Melbourne aforesaid, Member of the Legislative Council of the said Colony, and ROBERT WRIGHT KNOX, also of the said city of Melbourne, gentleman, have by their Petition humbly represented to me that they are the authors or designers of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in the process of preserving Meat, and in tins for containing the same," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed ; and that they, the said Petitioners, have deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four ; and have humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to them for a period of fourteen years : And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Alfred Lee, John Alston Wallace, and Robert Wright Knox, their executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof ; to have, hold, and exercise unto the said Alfred Lee, John Alston Wallace, and Robert Wright Knox, their executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended : Provided always, that if the said Alfred Lee, John Alston Wallace, and Robert Wright Knox shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this sixteenth day of August, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in the process of preserving Meat, &c.

SPECIFICATION of ALFRED LEE, of No. 26, Brunswick-street, Fitzroy, near Melbourne, in the Colony of Victoria, meat preserver, JOHN ALSTON WALLACE, of No. 52, Bourke-street East, in Melbourne aforesaid, Member of the Legislative Council of the said Colony, and ROBERT WRIGHT KNOX, also of the said city of Melbourne, gentleman, for an invention entitled "Improvements in the process of preserving Meat, and in tins for containing the same."

OUR invention consists of two parts, the first of which relates to the process of preserving meat, and the second to the tins for containing the same; but as the tins have to be first made, we will describe them first.

Our tins are made on a new principle, and are applicable not only to our process of preserving meat, but to every other in which tins are required at all. Hitherto certain parts of the tin have been fastened together by means of solder joints on the inside, but this is found to be injurious to the meat, and we therefore adopt the new principle of soldering all the joints of our tins on the outside, and in such a manner that their contents cannot come in contact with the solder. Referring to our drawings, figures 1 and 2 show respectively plan and section of a tin made according to this principle, and with a grating, B, as already patented by us in this Colony of New South Wales, dated the twenty-fifth day of June, one thousand eight hundred and eighty-one. It will be seen that the edge of the bottom of the body A is turned up to form a flange, which is embraced by another flange extending from the bottom itself and bent round it, the solid black representing the ring of solder. It will also be seen that the edge of the top of the body is also flanged, and that such flange is also embraced by another proceeding from the edge of the top itself, the solid black again denoting the ring of solder. These triple flanges are marked E and D respectively. The grating instead of being soldered on the inside of the top is fastened thereto by rivets, F, which pass through it and are soldered on the outside as shown. The pipe C is also soldered on the outside, as shown at C'. Figure 3 shows an alternative method of making the flange joints.

In observing the ordinary process of preserving meat in tins our grating and the pipe would be dispensed with, a small hole, H, in the top only requiring to be closed. In such cases the top and bottom would be fastened to the body, as already described, and a small cap placed over the orifice and soldered in position, as shown in figure 4.

In observing our process of preserving meat, we first of all place the meat to the best possible advantage in tins made as shown in figures 1, 2, and 5, then solder on the top as before described. We place a number of such tins in a calcium bath, which we heat to from 240° to 260° Fahrenheit, by flues from a fire or by gas jets directly underneath, preferably the latter, and we steady them by means of a weight. This is our first boiling, and should last for a large leg of mutton about three-quarters of an hour, and for smaller joints in proportion. After this the tins should be removed and thoroughly drained of their liquid contents. This is very important, and if not carefully attended to will vitiate the whole process.

After this the second boiling is observed, in which we use a second upper vessel, *f* (see figure 5), from which descends a pipe or tube, *g*, carrying a tap, *h*. The lower end of this tube is inserted in the pipe *d* at the top of the tin. Should the joint not be tight, some cotton wool wound around will make it so. The tap should be opened, the lower pipe *d* firmly grasped (great care being taken not to disturb the upper pipe *g* and vessel *f*), and the tin placed in the tank and weighted with the weight as before. The heat should range from 250° to 270° Fahrenheit, but not lower than 250°. In a short time steam will be observed issuing from the upper vessel, and must be allowed to continue for about ten minutes, by which time it will come with sufficient force to suspend and keep boiling the boiling water, with which the upper vessel should now be half filled. Care must be taken that the water is thoroughly boiling at the time of putting it in. This upper vessel should then be closed, say with an iron weight, for the purpose of keeping the water and heat in. After the lapse of an hour we turn off the tap *h* and quickly remove the cover, grasp the lower pipe *d* with the left hand, remove lead weight with the right, whilst lifting the tin out on to a bench prepared for that purpose, taking extreme care not to disturb the upper pipe *g* or allow any of its contents or the contents of the upper vessel *f* to enter the tin. Then squeeze together the lower pipe *d* about 1 inch from the tin, cut it off where squeezed, and solder the top of the cut. This completes the second boiling.

The third boiling is effected by simply placing the tins without weights in the tank, the heat being not higher than from 240° to 260° Fahrenheit, and allowing them to remain about three-quarters of an hour. After this they are taken out and conveyed to a cool place, where the contents become perfectly set. The process is then completed.

We desire to state that our invention is intended to apply principally to the preserving of joints of meat, such as unboned legs of mutton, &c.

Having thus described the nature of our invention and the manner of performing same, we desire it to be distinctly understood that we do not claim the boiling of meat in tins any number of times as a means of preserving it, but what we do claim as our invention is—

First—The draining of the tins of their liquid contents after the first of three boilings, the second of which takes place whilst the tins are in connection with an upper vessel, but the contents of which are carefully excluded from the tins, and the third boiling after they are finally closed, precisely as herein described and explained.

Second—Constructing tins for preserving meat in such a way that their contents cannot come in contact with the solder used in forming the joints, as illustrated in figures 1 to 5 of our drawings.

In witness whereof, we, the said Alfred Lee, John Alston Wallace, and Robert Wright Knox have hereto set our hands and seals, this twenty-fifth day of June, one thousand eight hundred and eighty-one.

Witness—
EDWD. WATERS.

ALFRED LEE.
JOHN A. WALLACE.
ROBT. W. KNOX.

This

Improvements in the process of preserving Meat, &c.

This is the specification referred to in the annexed Letters of Registration granted to Alfred Lee, John Alston Wallace, and Robert Wright Knox, this sixteenth day of August, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 13 July, 1881.

The application of Messrs. Lee, Wallace, and Knox, for Letters of Registration for "Improvements in the process of preserving Meat, and in tins for containing the same," having been referred to us, we have examined the specification and drawings accompanying the same, and have now the honor to report that we see no objection to the issue of Letters of Registration as prayed for.

We have, &c.,
J. SMITH.
E. C. CRACKNELL.

The Under Secretary of Justice.

[Drawings—one sheet.]

LEE WALLACE & KNOX'S PATENT.

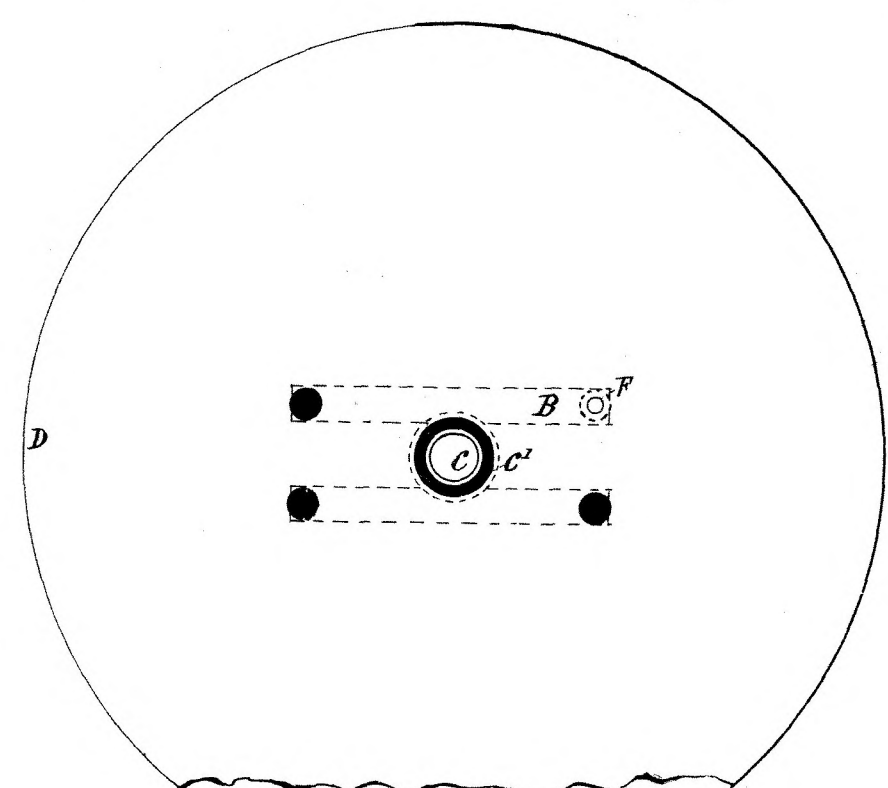


Fig. 1.

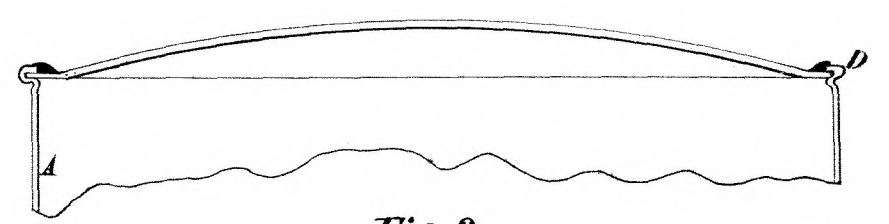


Fig. 3.

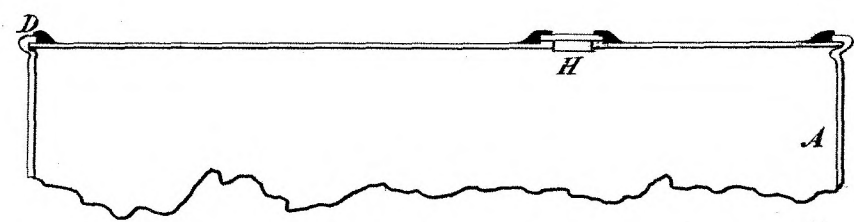


Fig. 4.

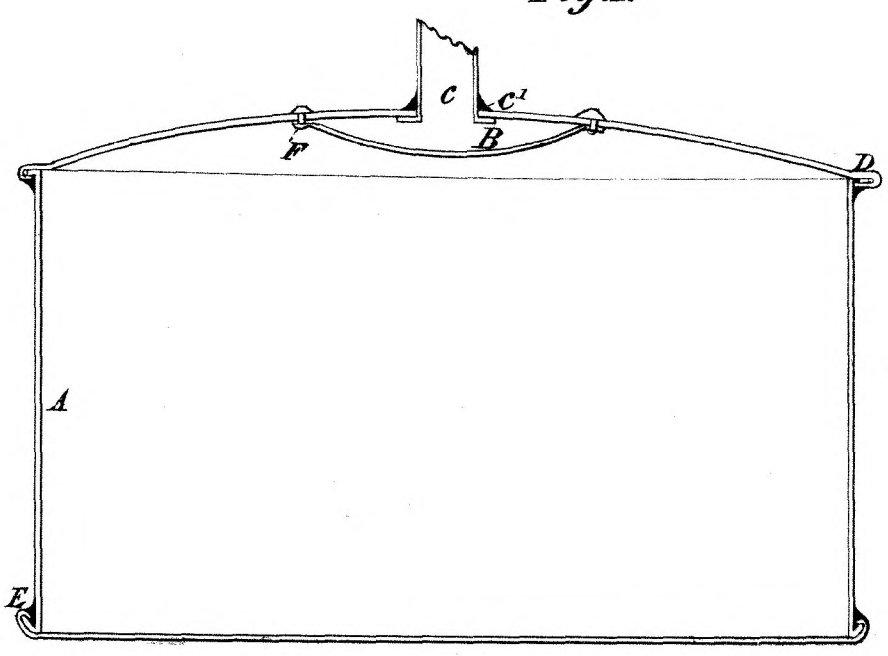


Fig. 2.

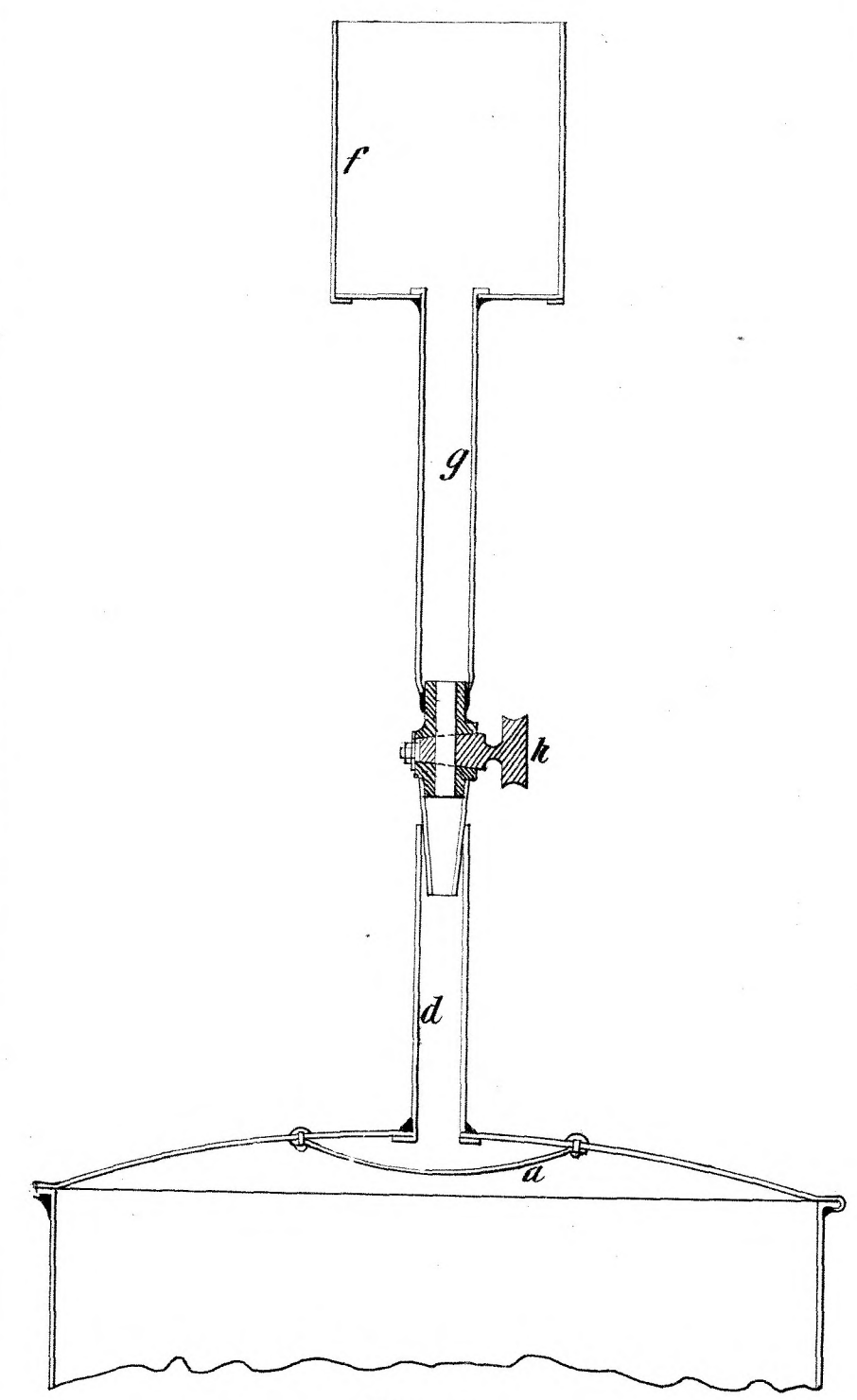
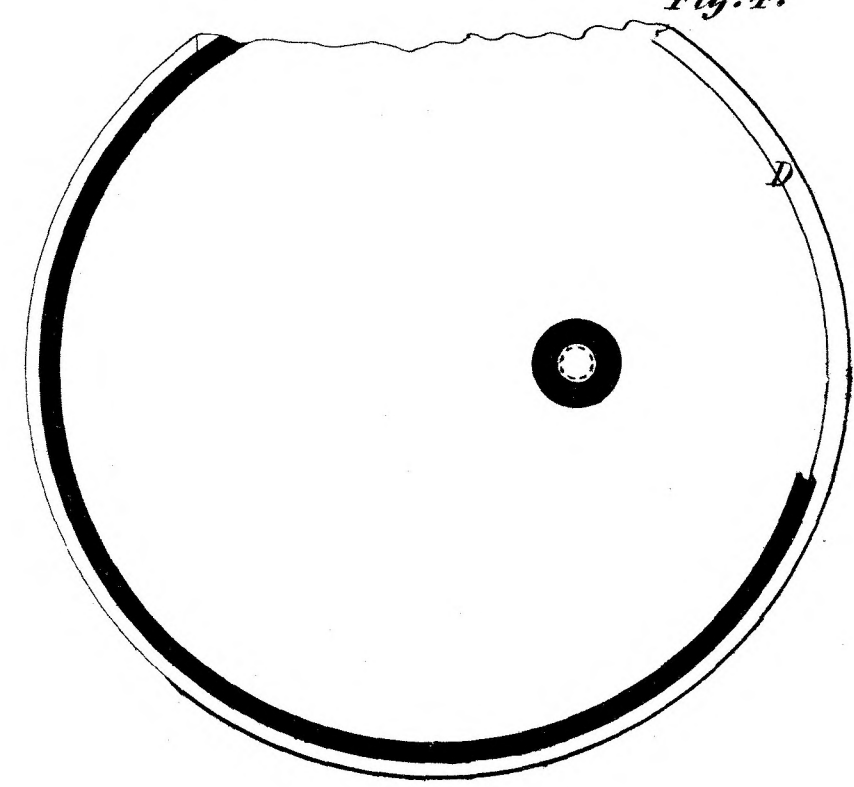


Fig. 5.

*This is the Specification referred to in the annexed
 Letters of Registration granted to Alfred Lee,
 John Alston Wallace and Robert Wright Knox,
 this sixteenth day of August, A.D. 1881
 Augustus L. Otis.*

(Sig. 34.)



A.D. 1881, 16th August. No. 973.

. IMPROVEMENTS IN THE TREATMENT OF QUARTZ, &c.

LETTERS OF REGISTRATION to Louis Thénot, for Improvements in the treatment of Quartz, auriferous sand and soil, argentiferous and other Ores, which may undergo amalgamation, and improved apparatus in connection therewith.

[Registered on the 16th day of August, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting:

WHEREAS LOUIS THENOT, of Paris, in the Department of the Seine and Republic of France, Doctor of Medicine, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in the treatment of Quartz, auriferous sand and soil, argentiferous and other Ores, which may undergo amalgamation, and improved apparatus in connection therewith," which is more particularly described in the specification and sheet of drawings which are hereunto annexed; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Louis Thénot, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said Louis Thénot, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said Louis Thénot shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this sixteenth day of August, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in the treatment of Quartz, &c.

SPECIFICATION of LOUIS THENOT, of Paris, in the Department of the Seine and Republic of France, Doctor of Medicine, for an invention of "Improvements in the treatment of Quartz, auriferous sand and soil, and argentiferous and other Ores, which may undergo amalgamation, and improved apparatus in connection therewith."

My process for the extraction of gold from quartz and auriferous sand and soil is based upon the passage of the ore, carried by a stream of water, once or repeatedly through columns of quicksilver having columns of water above them.

This process may also be applied to the treatment of silver ore, and that of any metal which it may be desirable to heat by amalgamation, or by simple separation.

The drawing hereunto annexed represents, half in section half in elevation, the apparatus which I use.

This apparatus is composed of a variable number of sections, divisions, or separable parts, each division comprising two vertical tubes, A and B, of different diameter, joined at their lower part by a V-shaped tube, C.

These divisions are united at the top by caps, D, with two unions forming an elbow-pipe; they are set upon wheels so as to constitute so many small carriages, easily removed or put into position.

At the end by which the spent material escapes is a cylinder, E, with an emptying cock, which cylinder may be horizontal or slightly inclined towards the apparatus, and to which is connected a discharge pipe, F, having a cock, G. The caps D of the tubes having a movable cover or plate, H, tightening down by a screw, I. At the lower part of each union C is any suitable discharge cock, J; it is preferable that this cock should open only with a key.

A certain quantity of quicksilver is introduced into the apparatus through the openings at H, this quicksilver rising to any desired height in the two tubes A and B. The lid or cover K serves in the same way for the introduction of the quicksilver into the cylinder E; the apparatus is then completely filled with water. The whole apparatus might firstly be filled with water, the lids or covers being open, and the quicksilver be then added.

A real and multiple siphon has thus been formed, working in the ordinary under power.

This done, the treatment of the auriferous sand or soil, or of metalliferous earths generally, may now take place, either by the aid of a column of water under pressure, or operating by exhaust, column of water, or other means.

In the first case, the water mixed with the crushed earth or ore descends from an elevated reservoir and enters the apparatus by the tube L. The mixture descends in the tube A, rises in the tube B, and goes successively into the following pair or series of divisions or sections, in which it travels in the same way; finally it passes through the cylinder E, and escapes by the discharge pipe F.

The cock M regulates the admission of the materials to be heated, and the cock G regulates the issue of the spent matters.

In its continuous passage through the apparatus, the mixture of water and of sand or soil passes alternately through columns of quicksilver and columns of water; the first retain the metallic parts, which, by reason of their relative density, remain at the bottom of the unions C, amalgamate together.

If some particles have escaped the action of the quicksilver they reach the column of water; but there their specific gravity, much greater than that of water, causes them to immediately fall back again. It is the same with the globules of quicksilver which are formed by the agitation of the earth and the water in the apparatus; these globules, carried away by the stream, separate from it in the tubes B, the large section of which (compared with that of the tubes A) very sensibly lessens the rapidity of the current. If the ores are platiniferous the platinum will also remain at the bottom of the unions C, and it may be collected from the discharge pipe.

This speed may be further reduced in the tubes B, while at the same time increasing the agitation by arranging obstructions or divergents, as shown on the drawing. No obstructions will however be placed in the last tube B, the large section of which will have the effect of producing comparative calm or rest, owing to which the separation of the last metallic particles carried thereto will inevitably take place.

By excess of precaution, the matters pass in the cylinder or tube E upon the surface of a bath of quicksilver, which, if necessary, completes the exhaustion of the sand or soil, and retains any globules of quicksilver which may have been carried this far.

The upper reservoir, from whence starts the mixture of water and earth, is placed at a sufficient height to permit the pressure of the liquid column to determine a slow and continuous progression of the mixture through the apparatus. It will be understood that by a proper choice in the height of the reservoir, the number and the dimensions of the divisions or series of pairs of vertical tubes, and by regulating the opening of the cocks M and G, the earths or matters issuing from the apparatus will be completely exhausted. Further, if it is desired to employ only a few divisions or pairs of tubes, A and B, there is no objection to repassing the matters already treated several times through the apparatus.

It is desirable to place at the commencement of the tube L a float-valve closing automatically directly the supply of the mixture of earth and water ceases, so as to keep the apparatus always primed when operating by exhaust.

When operating by exhaust an exhaust apparatus is placed at the end of the discharge-pipe F; this apparatus may be a long column of water, a pump, a fan, a jet of steam or compressed air, or any other means of producing the same result. In this case the column of liquid under pressure is dispensed with, and any direction may be given to the pipe L, to seek the mixture of water and soil; preference is however given to an arrangement substantially the same as that shown in the drawing. Everything then goes on as already above described; the cocks M and G still serving to regulate the flow or passage of material in the apparatus.

It need scarcely be observed that both means, namely, pressure and exhaust, may be used simultaneously, combined in the form of liquid columns, or having recourse to pumps.

When it is desired to prime the apparatus the exhaust column is closed at the lower end, and opened when the apparatus is to be set working.

Instead

Improvements in the treatment of Quartz, &c.

Instead of the ordinary cock G shown on the drawing, it will be advantageous to use a cock the key of which will be of one piece with a screw. On the head of this screw will be set an index, moving in front of a dial, or of a divided and graduated sector. Thus, the apparatus being regulated, the point of the sector to which the index should be brought to obtain a fixed delivery will be exactly known.

To keep the siphon primed when the apparatus is not working, it is arranged so that its end dips into water.

Finally, it is advisable to provide for any disengagement and accumulation of air at the upper part of the apparatus, which would interfere with its working.

Several means may be used to avoid this. A closed vessel containing water may be fitted above the apparatus, and placed in communication with the upper part of the tubes B, by two pipes opening—the one on the upper part, the other on the lower part of the closed vessel.

It will be understood that the air which rises into this vessel will be immediately replaced by the introduction of an equal quantity of water into the siphon.

In conclusion, I would observe that my apparatus is so arranged that the treatment of quartz or metalliferous earths or matters is absolutely methodical. In fact, the first bath of quicksilver in contact with the fresh earths or material saturates itself more than the second, the second more than the third, and so on. When it is considered that the first division, siphon, or pair of vertical tubes, contains only saturated quicksilver, it is detached, removed, the whole remainder of the apparatus is brought nearer to the feed-pipe L, and there is placed at the end, in front of the cylinder E, a siphon charged with virgin quicksilver. The richness of the quicksilver in gold, silver, or other metal, keeps decreasing from the beginning to the end, the virgin quicksilver being in contact with nearly exhausted material. The treatment is therefore, as I have already stated, methodical.

It will be understood that the shape and dimensions of my apparatus may vary, as well as the material of which it is composed; the cylinders A and B may be of glass, of cast-iron, or of other suitable metal. In this latter case I may set in the sides and diametrically opposite two glass lenses, to permit inspection of what is taking place within.

I do not limit myself to any particular details of construction, but I claim as my invention—

First—In the treatment of quartz and metalliferous sand, soil, or matter, the construction and the use of an apparatus forming a kind of siphon, and containing alternate columns of quicksilver and water.

Second—The continuous passage in this apparatus of a mixture of sand or soil and water, driven by a column of water under pressure, or drawn by an exhaust apparatus of any kind, as well as the combination of these two methods of working.

Third—The construction of the apparatus, formed of one or of several separable parts, each part composed of two tubes communicating with each other, and of different sections, and of various globular, serpentine, and other forms.

Fourth—The methodical treatment of the quartz and metalliferous sand or soil, as I have above set forth.

Fifth—The means described for regulating the working of the apparatus, and particularly for regulating its delivery, stopping it, and setting it at work.

In witness whereof, I, the said Louis Thénot, have hereto set my hand and seal, this second day of April, one thousand eight hundred and eighty-one.

Witness—

JOSEPH DELAGE.

DR. LOUIS THÉNOT.

This is the specification referred to in the annexed Letters of Registration granted to Louis Thénot, this sixteenth day of August, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

We do ourselves the honor to state, in reply to your blank cover communication of the 21st instant, No. 5,863, transmitting Mr. Louis Thénot's Petition for Letters of Registration for an invention entitled "Improvements in the treatment of Quartz, auriferous sand and soil, and argentiferous and other Ores," that we are of opinion the prayer of Mr. Thénot's Petition may be granted, in terms of his specification, drawings, and claim.

We have, &c.,

A. LEIBIUS.

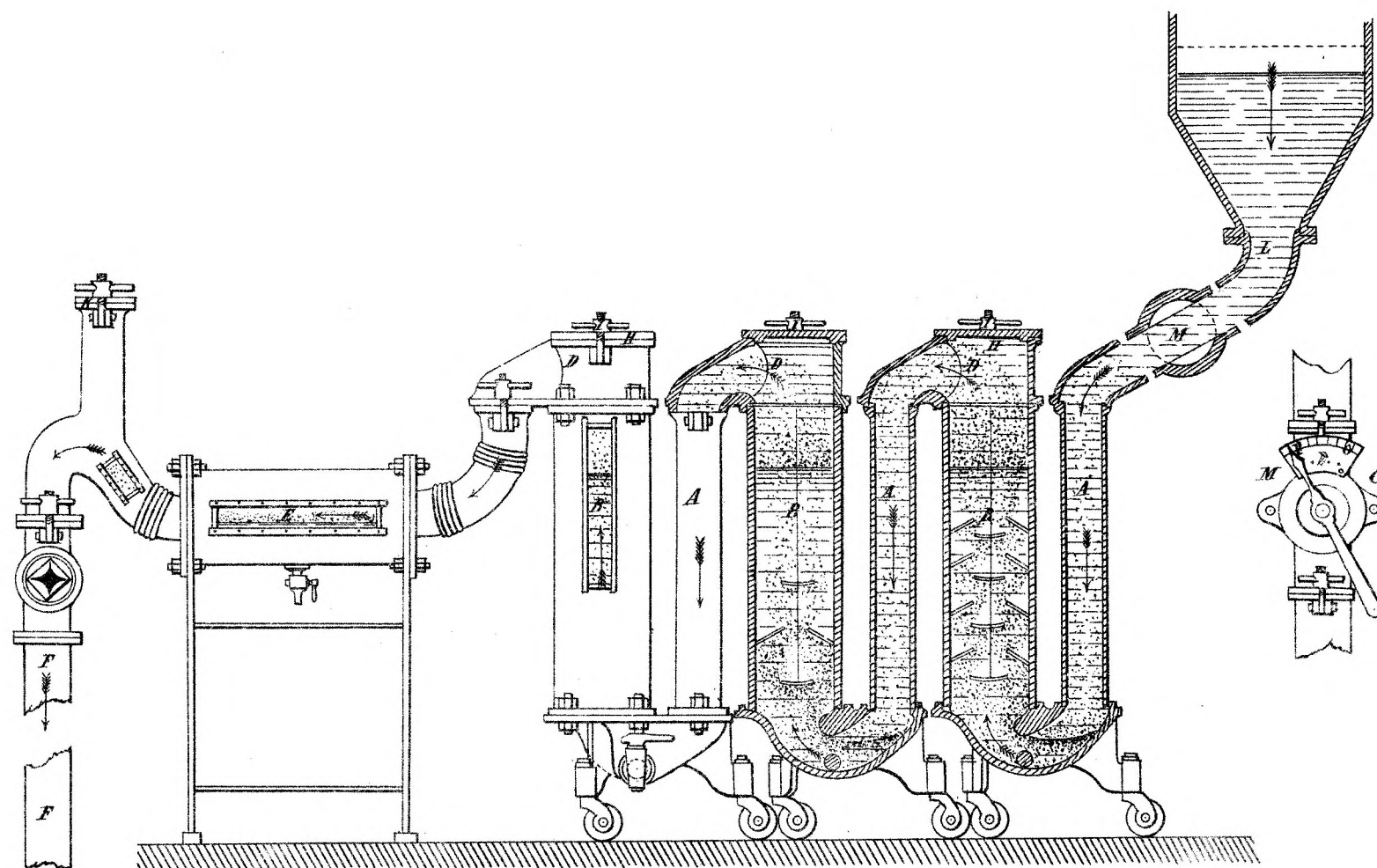
GOTHER K. MANN.

The Under Secretary of Justice.

[Drawings—one sheet.]

No. 974.

[Assignment of No. 881. See Letters of Registration for 1880, page 269.]



*This is the Sheet of Drawings referred to in the annexed
Letters of Registration granted to Louis Thenot this six-
teenth day of August A.D. 1881.*

Augustus Loftus.

Louis Thenot



A.D. 1881, 24th August. No. 975.

IMPROVED LASTS FOR MAKING FULL AND HALF SIZES OF BOOTS AND SHOES.

LETTERS OF REGISTRATION to George Blackeby, for Improved Lasts for making full and half sizes of Boots and Shoes.

[Registered on the 24th day of August, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS GEORGE BLACKEBY, of Rundle-street, Adelaide, in the Province of South Australia, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improved Lasts for making full and half sizes of Boots and Shoes," which is more particularly described in the specification and sheet of drawings which are hereunto annexed; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said George Blackeby, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said George Blackeby, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said George Blackeby shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this twenty-fourth day of August, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improved Lasts for making full and half sizes of Boots and Shoes.

SPECIFICATION.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, GEORGE BLACKEBY, of Rundle-street, Adelaide, in the province of South Australia, send greeting :

WHEREAS His Excellency the Right Honorable Lord Augustus Loftus, G.C.B., Governor and Commander-in-Chief of Her Majesty's Province of New South Wales, by Letters Patent bearing date the day of in the year of our Lord one thousand eight hundred and eighty-one, did, for himself, his heirs and successors, give and grant unto me, the said George Blackeby, my executors, administrators, or assigns, or such others as I, the said George Blackeby, my executors, administrators, or assigns, should at any time agree with, and no other, from time to time, and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend in the Province of New South Wales, certain improvements known as "Improved Lasts for making full and half sizes of Boots and Shoes," upon the condition, among others, that I, the said George Blackeby, by an instrument in writing under my hand and seal, should particularly describe and ascertain the nature of the said improvements, and in what manner the same were to be performed, and cause the same to be filed in the Registry Office within six calendar months next and immediately after the date of the said Letters Patent: Now know ye, that I, the said George Blackeby, do hereby declare the nature of my said improvements, and in what manner the same are to be performed, to be particularly described and ascertained in and by the following statement, that is to say:—My invention consists of an adaption of the iron lasts in general use, by which I am enabled to fix upon them adjustable pieces, according to the size or half size, or particular shape of boots and shoes, which may be required to be made. The drawings deposited herewith show the manner in which I accomplish the above object.

Figures 1 and 1a represent left and right lasts; figure 2, the bolt; figures 3 and 4, brass or other metal shells for fittings, left and right; figure 5, the key for bolt; figures 6 and 7, heel-pieces; figure 8, last with shell and fittings on; figure 9, under side of last.

The lasts, which are similar to the iron lasts ordinarily in use, have at the back of the heel two small holes, A A, in fig. 1, drilled in to a depth of about half an inch, and a hole, B, in fig. 1, from the sole upwards, the object of which is to take in a small bolt, C in fig. 2, the head of which will be flush with the sole, as shown in the drawing. To make the lasts any size which may be required, a piece of brass or other metal, D in fig. 3, is used. This is shaped to fit on to the last, and is about one-eighth of an inch thick, and tapers towards the edges. This covers the last from the top to the toe, and tapers away upon each side to about three-eighths of an inch from the sole. The holes E E E, in fig. 4, round the shell or fitting are for the purpose of attaching a metallic corn or bunion piece anywhere it may be required, by means of a screw from the under side, and the whole shell is held down firmly upon the instep by a bolt through the hole B in the last, which is fastened by the key G in fig. 5. The heel-piece E, in figures 6 and 7, is made of brass or other metal, is the full depth of the last, and tapers round each side for about one and a half inch, and is of any thickness required. This heel-piece is fitted on by means of two small pins, FF in fig. 6, being driven into the holes AA in the heel of the last.

I claim as my invention the making of shells, heel-pieces, and corn and bunion pieces, of brass or other metal, and the facile and secure mode shown by the specifications and drawings of fastening such shell, heel-pieces, and corn and bunion pieces to the last wherever required.

In witness whereof, I have hereunto set my hand and seal, this fourteenth day of June, in the year of our Lord one thousand eight hundred and eighty-one.

Witnesses—

CHARLES N. COLLISON.
E. CLARKE.

GEORGE BLACKEBY,
Boot Manufacturer,
68, Rundle-street, Adelaide.

This is the specification referred to in the annexed Letters of Registration granted to George Blackeby, this twenty-fourth day of August, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

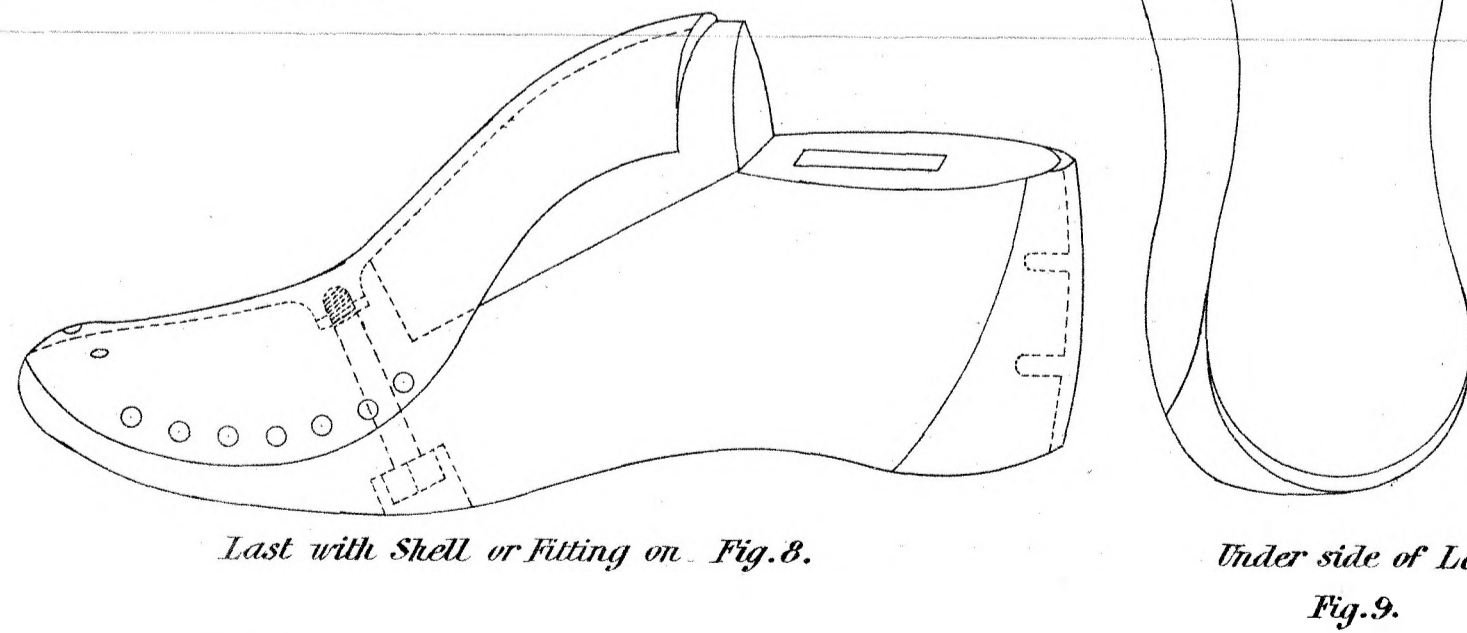
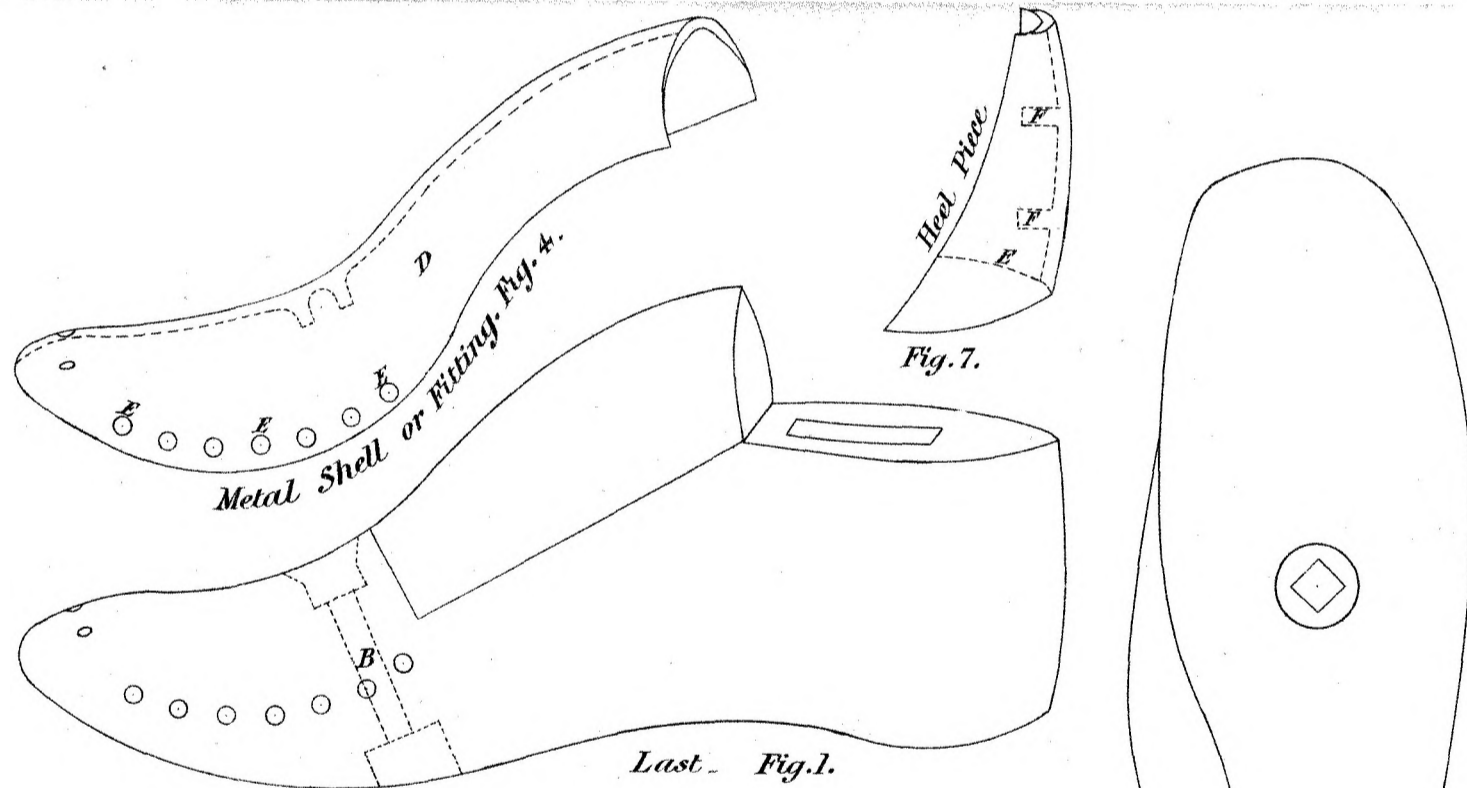
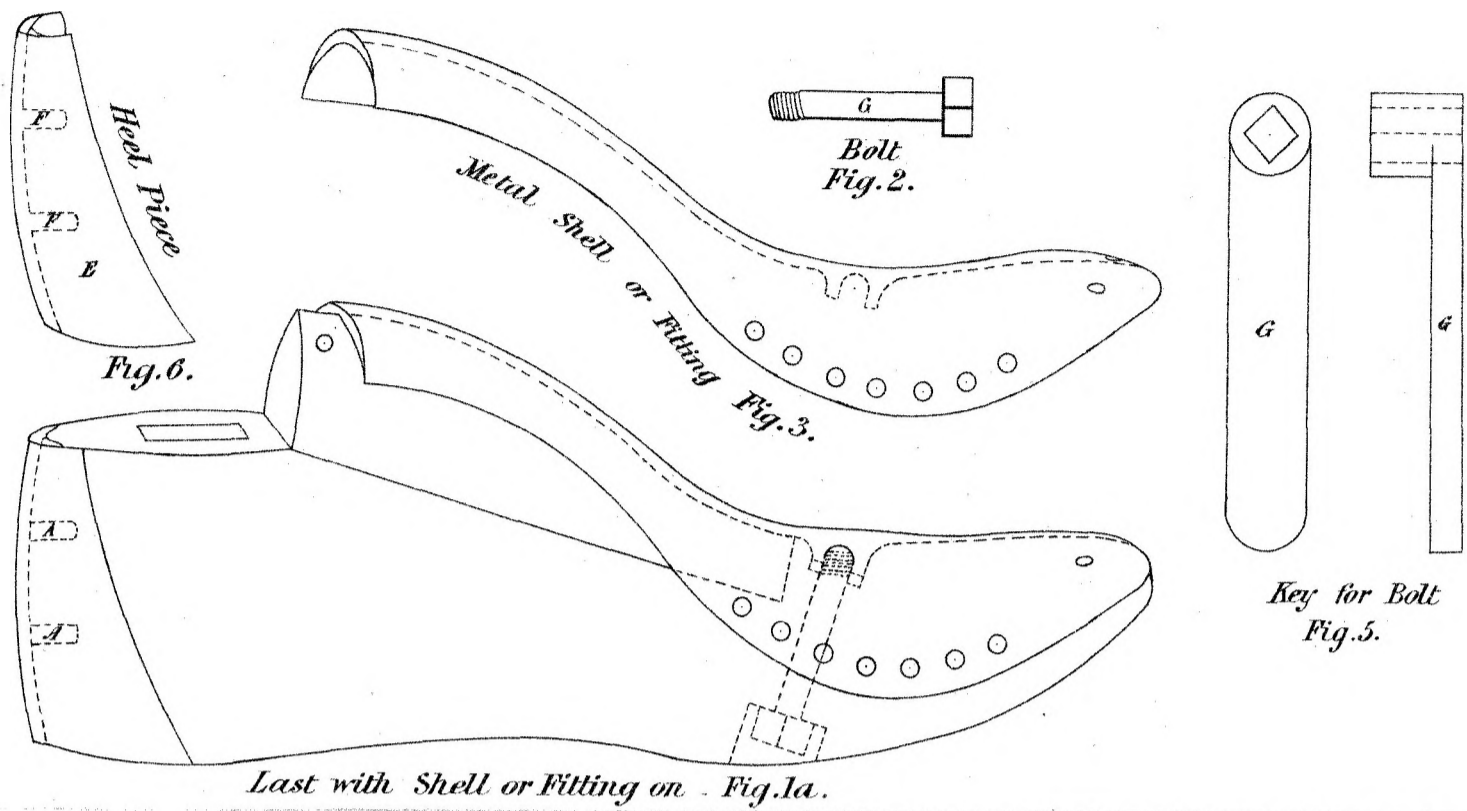
Sir,

The application of Mr. George Blackeby for Letters of Registration for an improved Last for making full and half sizes of Boots and Shoes having been referred to us, we have examined the specification and drawings accompanying the same, and have the honor to report that we see no objection to the issue of Letters of Registration as prayed for.

The Under Secretary of Justice.

Sydney, 12 July, 1881.

We have, &c.,
ARCH. C. FRASER.
THOMAS RICHARDS.



This is the Sheet of Drawings referred to in the annexed Letters of Registration, granted to George Blackeby this twenty-fourth day of August, A.D. 1881. Augustus Loftus.



A.D. 1881, 24th August. No. 976.

IMPROVEMENTS IN TELEGRAPHY.

LETTERS OF REGISTRATION to Orazio Lugo, for Improvements in
Telegraphy.

[Registered on the 24th day of August, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS ORAZIO LUGO, M.D., of the city, county, and State of New York, United States of America, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in Telegraphy," which is more particularly described in the specification and sheet of drawings which are hereunto annexed ; and that he, the said Petitioner, hath deposited with the Honorable, the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four ; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years : And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Orazio Lugo, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof ; to have, hold, and exercise unto the said Orazio Lugo, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended : Provided always, that if the said Orazio Lugo shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this twenty-fourth day of August, in the year of our Lord one thousand eight hundred and eighty-one.

[L.s.]

AUGUSTUS LOFTUS.

Improvements in Telegraphy.

SPECIFICATION of ORAZIO LUGO, M.D., of the city, county, and State of New York, in the United States of America, for an invention entitled "Improvements in Telegraphy."

THE first part of my invention relates to electric circuits for telephonic or telegraphic transmission, and my improvement consists in a novel organization of the conductors composing said circuits, whereby interference arising from action and reaction upon each other of derived or induced currents is prevented.

Telephonic or telegraphic circuits, as is well known, consist in part of a conductor of electricity extending from one station to the other, and insulated from all surrounding conducting bodies, including the earth, the circuit being completed either through the earth or through a return conductor, which may or may not be insulated from the earth, but must be insulated from the first-mentioned conductor, which forms a part of the same circuit. In overland lines the conductors are usually suspended at a considerable height above the ground, and are insulated therefrom, and from the various surrounding objects, by means of the intervening air, which is an almost absolute non-conductor of electricity. The conductors are insulated from their supports by means of glass or other suitable non-conductor.

Subterranean or submarine conductors are insulated by enveloping them in one or more coatings of non-conducting material, usually gutta-percha or paraffine, enclosed in a lead or iron pipe or armour.

When a pulsation of electricity is transmitted through a conductor insulated in the manner above described, a peculiar phenomenon, termed electro-static induction, takes place, which is the inevitable accompaniment of the beginning or ending, the increase or decrease, of the electric current.

Any conductor through which electric currents flow is necessarily partially or wholly surrounded by other conductors, in which induced currents are thus generated. If the whole or a considerable portion of a circuit of conductors of small electrical resistance is very near to a conductor which is traversed by an inducing current, and is so situated with reference thereto that the induction tends to occur throughout in one direction, the induced current will be very considerable, and its reaction upon the inducing current will also be proportionately great. The effect of this reaction is to diminish, for the time-being, the strength of the inducing current. If, on the other hand, the circuit in which the induced current flows is situated at a considerable distance from the conductor traversed by the inducing current, or, if it is only exposed to inductive action for a small portion of its length, or is so situated that the induced current tends to flow in opposite directions in different portions of the circuit, then the induced current will be small, and its reaction upon the inducing current will also be small. These well-known effects of inductive action constitute very serious obstructions to the efficient transmission of telegraphic or telephonic signals, especially in circuits of considerable length. For example, when a conductor is placed within an insulating coating, and is laid under ground or under water, the surrounding earth or water constitutes a conductor, in which an inductive action is set up, which in turn reacts upon the original current and renders the signals indistinct or confused, the general tendency being to prolong all signals and to obliterate the intervals between successive signals. When two or more such insulated conductors are enclosed within a single conduit, or otherwise placed parallel and in close proximity to each other, the inductive action of the current in each conductor tends to induce correlative currents simultaneously in all the other parallel conductors, and thus interfere with the correct transmission of signals through them.

When the electric telephone is used as a medium of communication this effect becomes especially troublesome, for the reason that communications transmitted through any one of the groups of conductors may distinctly be heard in an instrument attached to any one of the other conductors. Various attempts heretofore have been made to obviate this difficulty, one of which attempts consisted in using two insulated conductors parallel to each other, one for the direct and the other for the return conductor of the circuit, this organization being based upon the theory that the inductive action of one conductor would be counteracted by equal and opposite action of like character in the other conductor. Although the effects of inductive action are somewhat diminished under this arrangement, they are by no means effectually eliminated, inasmuch as two parallel conductors cannot be so arranged in practice that each can be situated at precisely the same mean distance from all neighbouring conductors, from which it results that the inductive action in one portion of a conductor cannot accurately be compensated by the opposite effect in another portion of the other conductor.

My invention is based upon the discovery that if one portion of a circuit be surrounded by the other helically, one portion passing through the mathematical axis of the other, and being properly insulated therefrom, thus forming a solenoid, and either portion be used for the direct and the other portion for the return conductor of a telegraphic or telephonic circuit of any length, induced, derived, or magnetizing currents will be entirely prevented.

In the accompanying drawings, figure 1 represents the two portions of a telegraphic or telephonic circuit organized in accordance with the principles of my invention; figure 2 shows a modification of the same which is more suitable for practical use; figure 3 is a theoretical diagram illustrating the application of my invention to a telegraphic circuit; and figure 4, in like manner, represents its application to a telephonic circuit.

Two metallic conductors, A B, are shown in figure 1 as enveloped in the ordinary manner in insulating coatings *a b* of suitable material, the insulated conductor B being wound helically and as closely as possible around the conductor A as shown at O. When the ends of the conductors are united they form a solenoid.

I make use of the double conductor constructed as above described, of any desired length, for a telegraphic or telephonic circuit. It will be evident upon inspection that the mean distance of the conductors A B from each other will be the same throughout the entire circuit, and it will also be observed that the mean distance of the conductors from all surrounding objects, of whatsoever nature, and of whatsoever actual distance therefrom, will be precisely the same. It follows, therefore, that as the current in traversing the circuit necessarily flows helically in a given direction through one conductor, and directly in the opposite direction from the other conductor, the inductive effect of the current in each conductor, while of opposite character, will be precisely equal in amount.

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It is obvious that under the organization hereinbefore described the length of the helical conductor necessarily greatly exceeds that of the other, consequently, where of equal conductivity per unit of length, the total resistance of the helical conductor would necessarily be much greater than that of the direct one. Even under these conditions my invention will be operative, and induction will be prevented, but I prefer to have the two conductors of equal resistance.

The resistance of the two conductors could obviously be modified by making the helical one of much larger wire than the other, but such a mode of construction is obviously objectionable for mechanical reasons.

I obviate this objection by constructing my improved conductor in the manner shown in figure 2, which represents the direct conductor A as enveloped in a compound helix consisting of several parallel conductors, 1, 2, 3, 4, which number I have found to be a convenient one in practice, which conductors are of such thickness and electrical conductivity as to render their joint resistance per unit of conductivity measured on the direct conductor approximately the same as that of that conductor itself.

Figure 3 represents an organization of telegraph apparatus preferred by me, which figure shows a battery, E, a transmitting key, K, a direct axial or central conductor, A, connecting the key with the receiving instrument R, and four helical conductors, 1, 2, 3, 4, connected in multiple arc with the battery and receiver respectively. This organization of apparatus constitutes what would be called by analogy, in other forms of telegraphy, a metallic circuit, either open or closed, according to the normal position of the transmitting key.

It is obvious that in apparatus thus organized electric currents or pulsations transmitted through one conductor will return through the other, and that the inductive influence of the two sets of conductors, both upon each other and upon all surrounding objects, will be equal and opposite. It follows, therefore, that any inductive effects, of whatever nature, produced in or by the direct conductor will be neutralized by similar effects produced in the return conductor.

Figure 4 illustrates a circuit equipped with speaking telephones, C C, arranged upon the same principles as that hereinbefore described. The telephones act both as receivers and transmitters, the circuit necessarily passing through them.

Any required number of independent circuits of conductors organized as above described may lie parallel and close together within a single conduit or pipe, and each conductor will be absolutely protected against the effects of induction, both in itself and in the neighbouring conductors, whatever their number or relative position. I am thus enabled to employ one circuit to convey a portion of the current, generated by a dynamo-electric machine and employed to transmit power, or to supply a series of electric lamps; and to use another circuit for ordinary commercial telegraphy, under either the Morse, the duplex, the quadruplex, or the automatic system of transmission; while still another circuit may be employed for oral transmission by means of speaking telephones, and any number of such circuits may be enclosed in a single casing without in the slightest degree interfering with each other.

The objects of the next part of my invention are so to organize the apparatus that any desired number of intermediate stations may be employed besides the terminal ones, and that where a number or series of helical conductors constitute a part of the circuit, each one of them may be utilized for work independently of the others, so that currents of different character may simultaneously be sent through the same compound conductor, that is to say, one conductor may be employed for the transmission of dynamo-electric currents, another for battery currents, and another for telephonic transmission.

My invention contemplates the employment of the most approved apparatus of the present day, but as the details of such apparatus are well understood they need no description here.

Figures 5 and 6 of the accompanying drawings show these organizations arranged in the best way now known to me, but the arrangement of apparatus may be varied in well-known ways without departing from the principle of my invention, the distinguishing characteristic of which is the transmission of all the currents, impulses, or pulsations, in one direction, through a conductor constituting the longitudinal axis of a solenoid, and in the other through a series of conductors coiled helically around said direct conductor, their circuits, of course, passing through the generator and receiving and transmitting apparatus. The conductors, it will be understood, are properly insulated from each other, and are adapted for submarine or subterranean uses by being armoured or enclosed in conduits or pipes in well-known ways.

Figure 5 represents a theoretical diagram of my improved apparatus organized for the transmission of both voltaic and magneto currents, with a portion of the apparatus at each station constituting a part of the direct conductor, and other portions constituting parts of the helical conductor, the helical conductors in this figure being shown as united in multiple arc at their terminals so as to constitute in effect but one conductor.

Figure 6 represents a similar diagram, showing the apparatus as organized for the transmission of dynamo-electric, galvanic, and magneto currents, with generating, receiving, and transmitting apparatus interposed in the helical circuits, and with each of the helical conductors organized for the transmission of currents or pulsations differing in character from the others.

These drawings each show two terminal stations and one intermediate station, which is sufficient for the purpose of illustration, but obviously the number of intermediate stations may be varied to any desired extent.

Under the organization shown in figure 5, the apparatus employed at each of the terminal stations, U W, is as follows—

The direct conductor A is enveloped by the helical conductor B, both being properly insulated. A battery, E, at each station is connected by a wire, *e*, with a Morse key, K, a wire, *f*, being connected with the helix of an ordinary relay, R, provided with a local battery, L, and with a sounder, S. A switch, *s*, connects the helix of each receiver with the direct conductor A above mentioned.

At the intermediate station V a corresponding switch, *s*, connects the direct conductor with the helix of the receiver R, provided with its local battery L and sounder S. The wire *e* of this helix passes through a transmitting key, K, connected by the direct conductor A with the terminal station W, as already described.

The

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The switch *s* can be turned so as to connect directly with the rheostat H and cut out the relay R and sounder S, as will be readily understood from the drawing, the rheostat affording means of compensating disturbances caused by cutting the relay and sounder into or out of circuit. An ordinary microphone transmitter, T, and its local battery, L', are shown as included at each station in circuit with a receiving telephone, C, at the terminal stations U W; this circuit starts from the switch-point *h* through the wires *i* and through the telephones to the point *j*, where it connects with the helical conductors 1, 2, 3, 4, in multiple arc. The switches afford a means of cutting the relays, keys, and battery out of circuit, leaving the direct conductor A short circuiting the relay in a way which will be obvious from an inspection of the drawings.

The telephone circuit at station V is provided with a rheostat, H', to enable its resistance to be adjusted relatively to that of the direct conductor. The switch *s* in the helical conductor enables the current to be switched from the telephone circuit to the shunt wire *g*, thus enabling the operator to cut out the telephone at the intermediate station when desired. This shunt-wire connects with the helical conductors at a point beyond the intermediate station, which conductors are again connected in multiple arc at their terminal stations in a manner similar to that above described. It will thus be seen that under the organization shown the direct conductor may be utilized for the transmission of galvanic or voltaic currents or pulsations, and that the helical conductor may be used for telephonic transmission, one or the other being thrown out of circuit by the switches, as desired. It is also obvious that this arrangement could be reversed. Of course both sets of apparatus cannot be used at the same time as a telephone and as a telegraph; but the telephone receiver could be made to act as a telegraph receiver, either alone or at the same time that the relay and sounder are operating on the direct conductor.

The following is a description of the apparatus shown in figure 6, that at each terminal station, X Z, being alike.

The direct conductor A extends from station to station without a break, while each of the helical conductors 1, 2, 3, are connected with a different generator, transmitter, and receiver at each station. For instance, the solid black lines show the direct conductor A as connected by a wire, I, with a key, K, battery, M, and sounder, S, at each terminal station, and with a corresponding key and sounder at the intermediate station, this conductor being marked I. The helical conductor 2 is shown, in long dotted lines, as connected through a dynamo-electric machine or generator, G, at the terminal stations, and with a key, K, and sounder, S' at each station. The third helical conductor, 3, is shown in short broken lines as connected in circuit with ordinary magneto-telephones, C, at each station. The terminals of all these helical conductors are connected in multiple arc with the direct conductor, thus forming metallic circuits normally open or closed, according to the position of the keys.

Under the above organization it is not essential that the resistance of the various conductors should be exactly equal or balanced, but the apparatus, on the contrary, will work with quite a wide range of adjustment.

I. claim—

First—In the art of transmitting intelligible signals by electricity, the method herein set forth of preventing induction, which consists in passing the direct current through the axial conductor of a solenoid, the return current traversing the helix, or *vice versa*.

Second—An electric telegraphic or telephonic circuit composed of a solenoid, substantially as set forth.

Third—A solenoid, the helix of which is of equal resistance with the axial conductor per unit of length of the latter, as described.

Fourth—In combination with the transmitting and receiving devices of an electric telegraphic or telephonic circuit the line-wire or cable in the form of a solenoid, substantially as and for the purpose described.

Fifth—A compound electric conductor, consisting of two or more parallel single conductors formed into a helix and united in multiple arc at their extremities with a single electric conductor, placed in the longitudinal axis of said helix, the simple and compound conductors forming respectively the direct and return portions of an electric circuit.

Sixth—The combination, substantially as hereinbefore set forth, of an electric conductor in the form of a helix, a second electric conductor placed in the longitudinal axis of the said helix, an apparatus for transmitting electrical pulsations placed between and connected with the respective terminals of said conductors at one station, and an apparatus for producing physical effects by means of electrical pulsations placed between and connected with the respective terminals of said conductors at another station.

Seventh—The combination, substantially as herein set forth, of the direct and helical conductors with signalling apparatus forming a portion of each conductor.

Eighth—The combination, substantially as herein set forth, of the direct and helical conductors, signalling apparatus forming a portion of each conductor, a short circuiting switch to throw the instrument in or out of circuit, and a rheostat to compensate variations in the resistance of the conductors occasioned by switching the instruments into or out of circuit.

Ninth—The combination, substantially as herein set forth, of the direct and helical conductors, signalling apparatus forming a portion of each conductor, a shunt and a switch to throw a portion of the apparatus into or out of circuit.

Tenth—The combination, substantially as herein set forth, of the direct and helical conductor, signalling apparatus forming a portion of each conductor, a shunt, a switch, and a rheostat.

Eleventh—The combination, substantially as herein set forth, of the direct and return conductor, signalling apparatus forming a portion of each conductor, a rheostat in each conductor, a switch, and a shunt.

Improvements in Telegraphy.

In witness whereof, I, the said Orazio Lugo, have hereunto set my hand and seal, this eleventh day of April, 1881.

Witnesses—

GEO. S. EVANS.
ANT. L. ROSSETTI.

ORAZIO LUGO, M.D.

This is the specification referred to in the annexed Letters of Registration granted to Orazio Lugo, this twenty-fourth day of August, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 19 July, 1881.

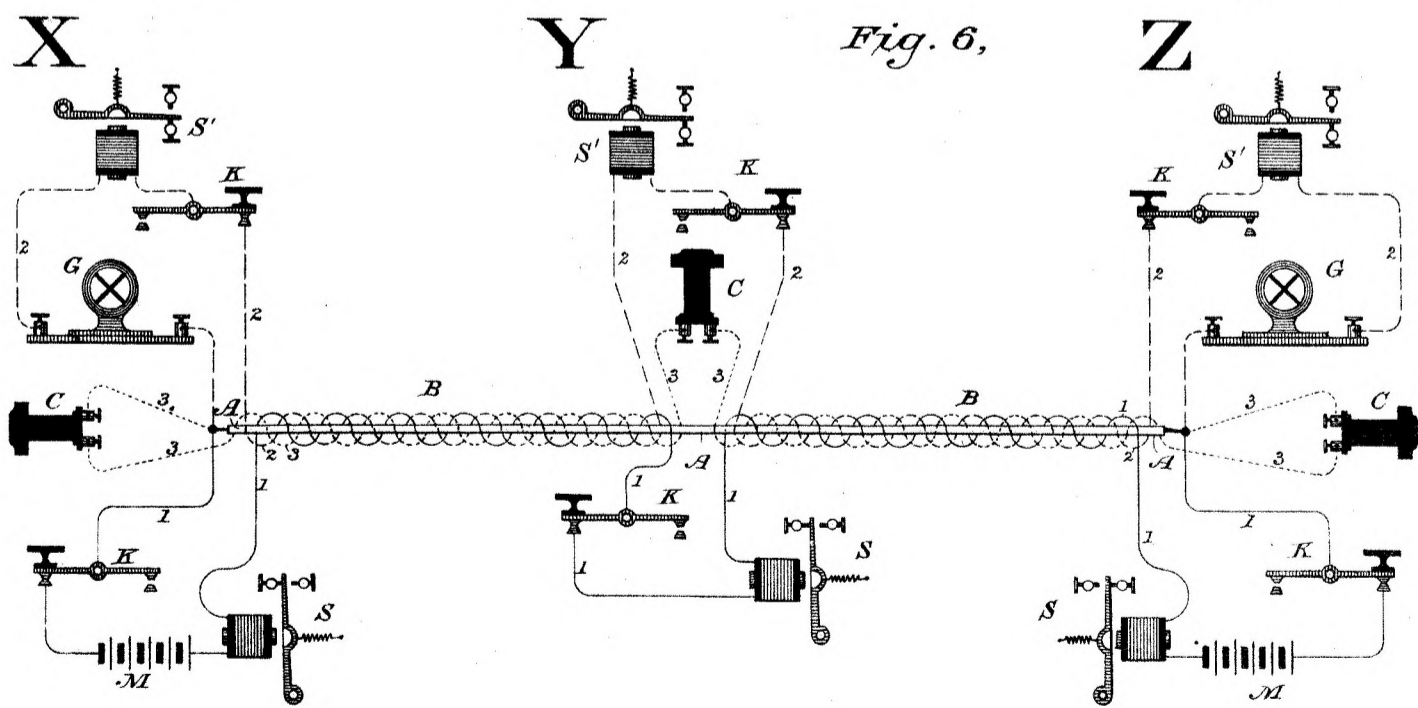
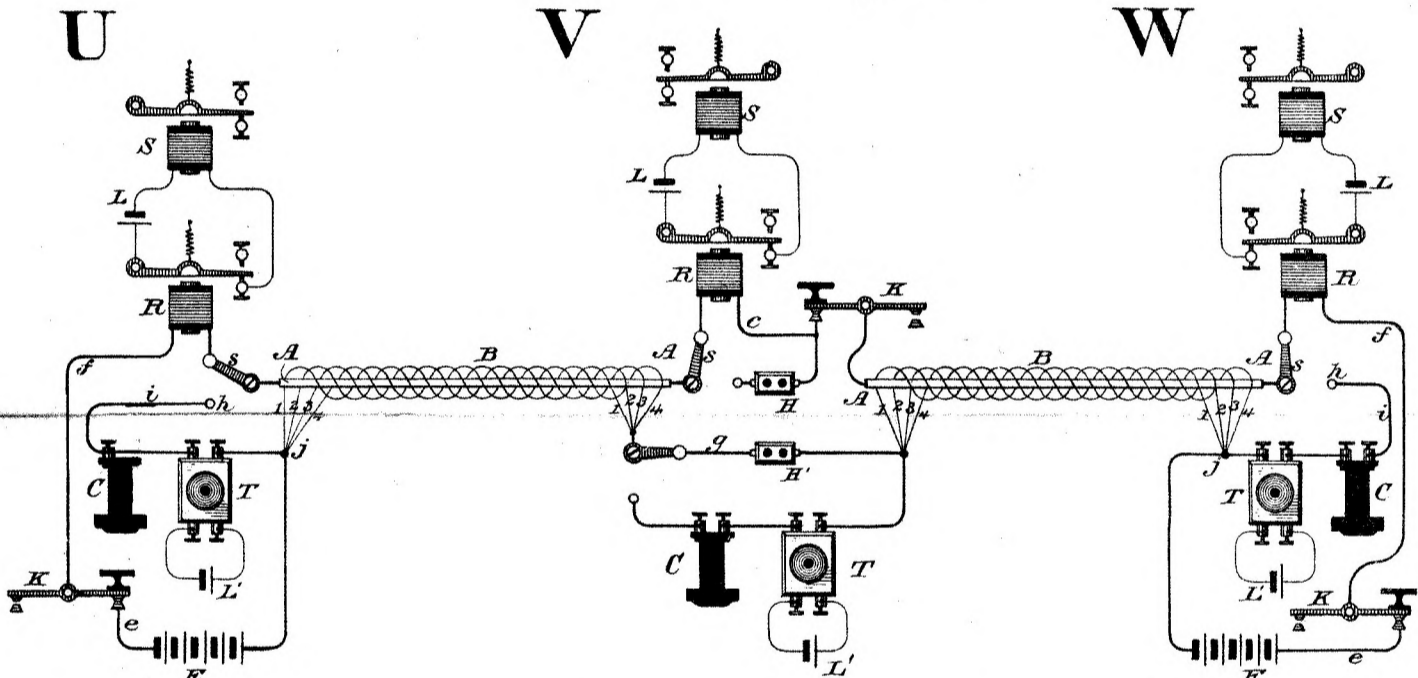
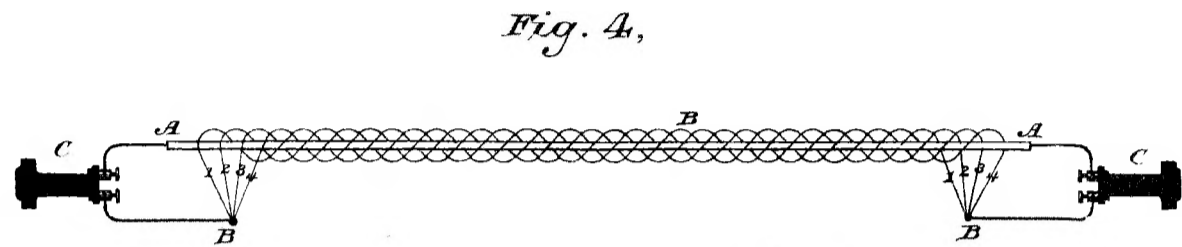
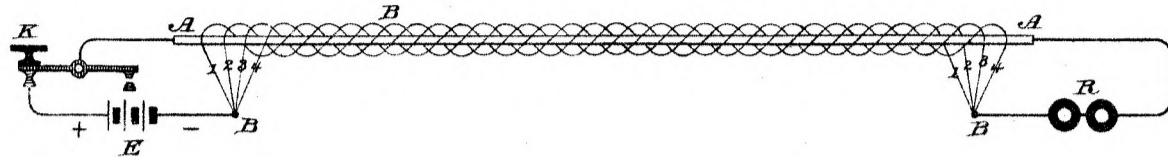
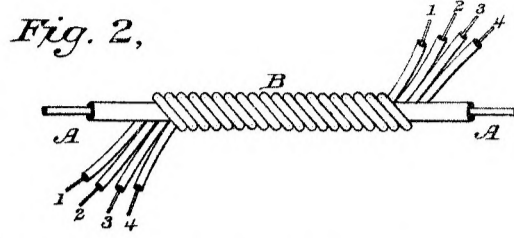
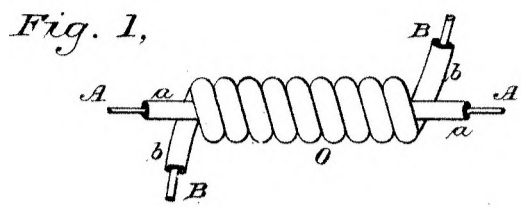
We do ourselves the honor to report, in reply to your blank cover communication of the 7th inst., No. 6,462, transmitting Mr. Orazio Lugo's Petition for the registration of "Improvements in Telegraphy," that we are of opinion that the prayer of the Petitioner may be granted, in terms of his specification, drawings, and claim.

We have, &c.,

E. C. CRACKNELL.
GOTHER K. MANN.

The Under Secretary of Justice.

[Drawings—one sheet.]



This is the Sheet of Drawings referred to in the annexed Letters of Registration granted to Orazio Lugo, this twenty-fourth day of August, A.D. 1861. Augustus Loftus.

Sig. 34.



A.D. 1881, 24th August. No. 977.

IMPROVEMENTS IN MACHINERY FOR PULVERIZING QUARTZ, &c.

LETTERS OF REGISTRATION to George Ashcroft, for Improvements in Machinery for pulverizing Quartz rocks and earths, for sorting the powder so obtained, and for treating it with Mercury.

[Registered on the 24th day of August, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS GEORGE ASHCROFT, of Petone, in the county of Hutt, New Zealand, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in Machinery for pulverizing Quartz Rocks and earths, for sorting the powder so obtained, and for treating it with Mercury," which is more particularly described in the specification and sheet of drawings which are hereunto annexed ; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four ; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years : And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said George Ashcroft, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof ; to have, hold, and exercise unto the said George Ashcroft, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended : Provided always, that if the said George Ashcroft shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this twenty-fourth day of August, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Machinery for pulverizing Quartz, &c.

SPECIFICATION.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, GEORGE ASHCROFT, of Petone, in the county of Hutt, send greeting :

WHEREAS I am desirous of obtaining Royal Letters Patent for securing unto me Her Majesty's special license that I, my executors, administrators, and assigns, and such others as I or they should at any time agree with, and no others, should and lawfully might from time to time, and at all times during the term of fourteen years (to be computed from the day on which this instrument shall be left at the office of the Patent Officer), make, use, exercise, and vend within the Colony of New South Wales and its Dependencies, an invention for machinery for pulverizing quartz rocks and earths, for sorting the powder so obtained, and for treating it with mercury, in order to obtain the greatest yield of gold from the said rocks or earths with the least loss of mercury ; and in order to obtain the said Letters Patent I must, by an instrument in writing under my hand and seal, particularly describe and ascertain the nature of the said invention, and in what manner the same is to be performed, and must also enter into the covenant hereinafter contained :

Now know ye that the nature of the said invention, and the manner in which the same is to be performed, is particularly described and ascertained in and by the following statement (that is to say) :—

In order to carry into effect my invention for the first part, for pulverizing, I provide a strong cast-iron pan, shown on the accompanying drawing, marked A, of which figure 2 is a plan, figure 1 an elevation, and figure 3 a cross-section. A horizontal shaft, E, figure 3, is made to revolve by means of loose and tight pulleys, C and D, which can be driven by steam, water, or other power, giving motion by means of bevelled wheels F and G to the vertical shaft B, or in the case of a small machine the shaft E may be turned by means of a handle. As the vertical shaft B revolves it carries with it a cross-shaft, H, on which are fitted two cones or portions of cones, marked I and J, figures 2 and 3. These two cones carry with them two balls of iron, and as the centrifugal force given to the balls impels them along the face of the cones a spinning motion on their own axes is given to the balls, causing the work of pulverizing to be accomplished with great rapidity. The shaft B with said cross-shaft H and cones can be raised or lowered by means of the wheel and screw marked K and L, figure 3, which lifts or depresses the lever M, on which rests the lower end of the said shaft B. When the centres of the two cones are in the same plane as that of the centres of the two balls driven by them, the crushing and pulverizing force is the weight of the balls. By lowering the shaft B, and thus causing the centres of the cones to revolve below the centres of the balls, the weight of the balls is partially lifted off the material under operation ; on the contrary, when the shaft B is raised the weight of the balls is increased. Round the top of the pan A are fitted spouts, N, furnished with wire gauze of any degree of fineness, through which the material under operation will pass, water being made to flow into the pan during the operation of pulverizing. The spouts N open on a circular trough, P, and the pulverized material flows out finally at P¹, where it is received into a suitable trough or table. A water-tight door, O, is fixed to the bottom of the pan, to allow of the heavier particles being removed after each crushing.

In order to carry into effect my invention for the second part, for sorting, I provide a double trough, Q, consisting of two half-cylinders, R and S, connecting with each other at the ends T T. In the centre of each half-cylinder I cause a shaft, U U, to rotate by means of toothed wheels ; each shaft is furnished with blades or a continuous web, V, so as to form blades in a helical form or a continuous archimedean screw. At the end of each shaft is a blade, W W, so formed as to push any material within the one side of the trough from that to the other side, where the material is taken hold of by the corresponding shaft, and so passed around the double trough as often as may be necessary. The shafts U U can be raised or lowered at pleasure by means of the screws X and X¹. At the bottom of this double trough at Z, and at the side of the same at Y, are water-tight doors ; there is also a slide door at Y—all of which can be opened and closed at pleasure. The manner in which this part of the apparatus works can readily be understood by aid of the drawing and following description :—

The apparatus being fixed in such part of the trough or table previously mentioned as receiving the pulverized matter from the pan A, and the flow of which along the said trough or table can be regulated by means of a small dam, by preference placed diagonally across it, the pulverized matter can be admitted into the double trough Q. The heavy metallic particles contained in this will gradually settle to the bottom of such a thickness as the space that may be left between the revolving shafts U U and the bottom of the trough, which space can be regulated by the screw X. When it is desired to remove the metallic particles, the screw is lowered, and by scraping the bottom of the trough pushes the material forward to the door at Z, where it may be collected.

In order to carry into effect my invention for the third part, for amalgamation, I provide two or more troughs exactly similar to that already described for sorting, except that the shafts do not require the screws X X¹, but remain fixed, with the revolving blades or screw just scraping the bottom of the trough. The material to be operated upon is conveyed by the door Y into one of these amalgamators, and thence, if required, by the door Y¹ into another, and so on to any other number of similar troughs that it may be found desirable to use in order to obtain all the gold possible by amalgamation, mercury being introduced into the troughs and the amalgam drawn off by sliding doors.

I claim with my invention, and to the best of my knowledge and belief as novel, the three features hereinbefore described—

First—The arrangement of vertical shaft, cones, balls, and adjusting screw, as hereinbefore described.

Second—The sorting trough as hereinbefore described.

Third—The arrangement of amalgamators as hereinbefore described.

And

Improvements in Machinery for pulverizing Quartz, &c.

And I do hereby, for myself, my heirs, executors, and administrators, covenant with Her Majesty, Her Heirs and Successors, that I believe the same invention to be a new invention as to the public use and exercise thereof; and that I do not know or believe that any other person than myself is the true and first inventor of the said invention; and that I will not deposit these presents at the office of the Patent Officer with any such knowledge or belief as last aforesaid. And I do hereby declare that no Letters Patent have been applied for elsewhere by me for the invention in respect of which this application is made, excepting in the Colony of New Zealand.

In witness whereof, I have hereunto set my hand, this thirteenth day of June, one thousand eight hundred and eighty-one.

GEORGE ASHCROFT.

Signed by the said GEORGE ASHCROFT, in the presence of J. H. WALLACE, J.P.

This is the specification referred to in the annexed Letters of Registration granted to George Ashcroft, this twenty-fourth day of August, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 14 July, 1881.

In reply to your blank cover communication of the 1st instant, No. 6,338, transmitting Mr. George Ashcroft's Petition, for the registration of "Improvements in Machinery for pulverizing Quartz rocks and earths, for sorting the powder so obtained, and treating it with Mercury," we do ourselves the honor to report that we are of opinion the prayer of the Petitioner may be granted.

We have, &c.,

A. LEIBIUS.

GOTHER K. MANN.

The Under Secretary of Justice.

[Drawings—one sheet.]

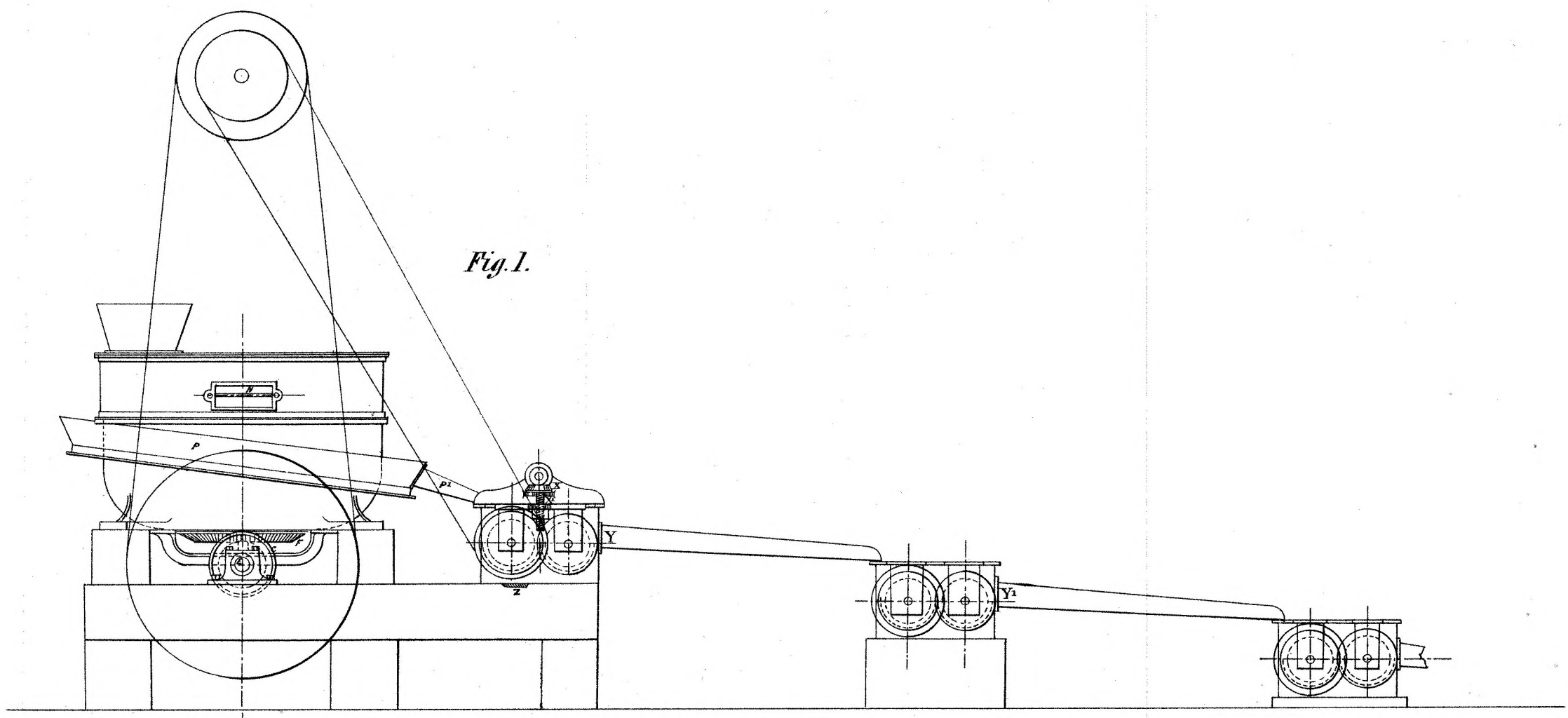


Fig. 1.

Elevation.

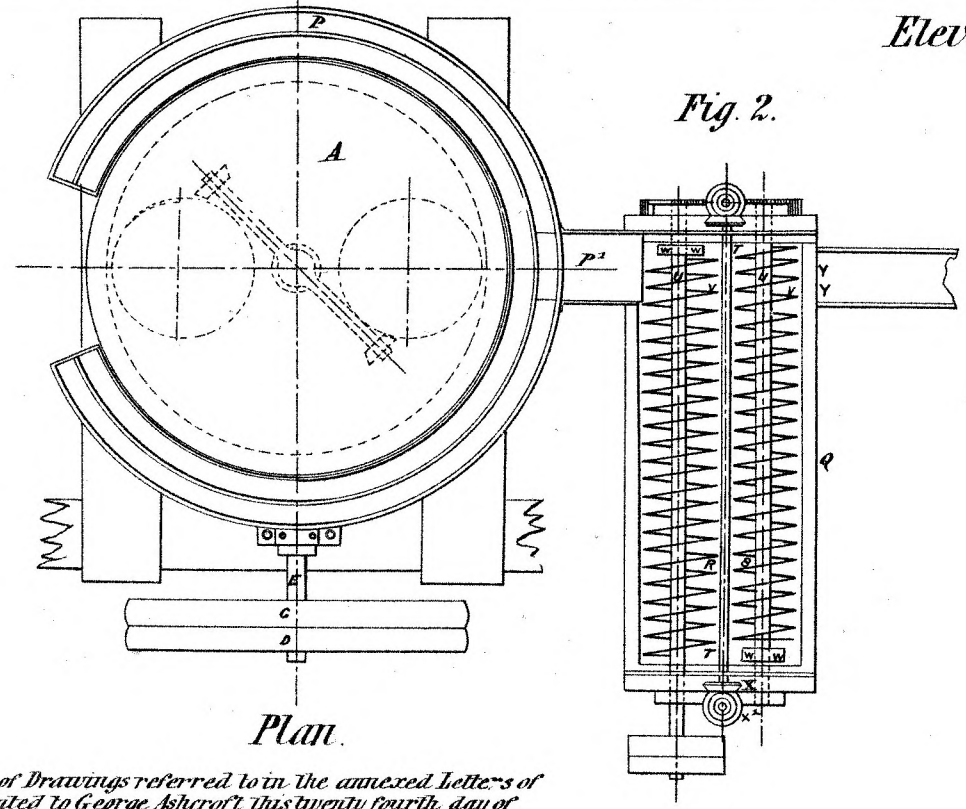
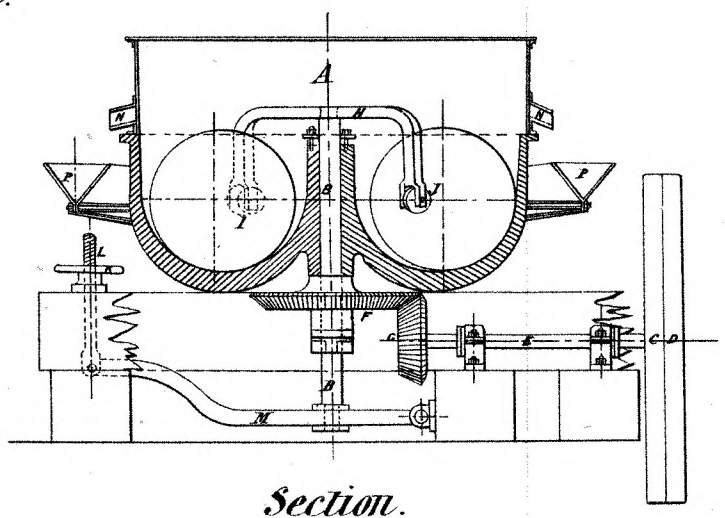


Fig. 2.

Plan.



Section.

Scale of Feet.



This is the Sheet of Drawings referred to in the annexed Letters of Registration granted to George Ashcroft this twenty fourth day of August A. D. 1881.

Augustus Loftus.



A. D. 1881, 24th August. No. 978.

IMPROVEMENTS IN SHEEP-SHEARS.

LETTERS OF REGISTRATION to John Griffith Corey and Nathan Weston Spaulding, for Improvements in Sheep-shears.

[Registered on the 24th day of August, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS JOHN GRIFFITH COREY, farmer, of Paula, County of Ventura, and NATHAN WESTON SPAULDING, manufacturer, of the city and county of San Francisco, all in the State of California, United States of America, have by their Petition humbly represented to me that they are the authors or designers of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in Sheep-shears," which are more particularly described in the specification and sheet of drawings which are hereunto annexed; and that they, the said Petitioners, have deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and have humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to them for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said John Griffith Corey and Nathan Weston Spaulding, their executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said John Griffith Corey and Nathan Weston Spaulding, their executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said John Griffith Corey and Nathan Weston Spaulding shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this twenty-fourth day of August, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Sheep-shears.

SPECIFICATION of JOHN GRIFFITH COREY, farmer, of Paula, County of Ventura, and NATHAN WESTON SPAULDING, manufacturer, of the city and county of San Francisco, all in the State of California, United States of America, for an invention entitled "Improvement in Sheep-shears."

OUR invention relates to certain improvements in Sheep-shears, and it consists in a novel means for adjusting the tension of the spring, so that any pair of shears may be adjusted from the lightest to the heaviest tension to suit the hand of the operator; and to regulate them so as to be used in light, heavy, or dirty wool, as will be more fully described by reference to the accompanying drawings, in which—

Figure 1 is a view of one form of sheep-shears, having our improvement attached; figure 2 is a view of the spring.

Great difficulty is experienced by operators in selecting a pair of shears in which the tension of the spring is such as to exactly suit the hand, and they will often try all the stock of the dealer without finding a pair to suit.

It is also necessary to employ shears having a spring of greater or less tension, as the wool may be heavy, dirty, or light; and finally, the hand of the operator, which is strong in the morning, will become weak after a day's work is nearly finished, and he must use a lighter pair of shears.

Our invention is designed to so adjust the tension of the spring that a single pair of shears will meet all the requirements of the shearer; and it consists in the employment of a movable fulcrum, which may be fixed at any point between the sides of a "U" or other spring having parallel sides, so that by moving this fulcrum from one end to the other of the spring the tension may be changed from the lightest to the heaviest that may be desired.

In the present case, we have shown our invention as applied to the bow spring shears, but it will be seen that it may be equally well employed in connection with other forms, and with the same results.

A A are the blades of a pair of shears, and B is the connecting curved or bow spring which unites the rear ends of the shanks C. The strength of this spring determines the tension or stiffness of the shears, and this is always unalterable, except by grinding the spring down.

In our invention we secure a curved or U-shaped spring, D, between the shanks. The ends of this spring are bent outward, so that they may be riveted or otherwise secured to the inside of the shanks. The right or curve E of the spring, which unites the parallel sides D, is carried back into the bow B, as shown.

Between the parallel sides D of the spring we place a fulcrum, F, which may be moved from the curve E to the opposite end, and fixed at any desired point.

When the blades of the shears are closed the sides of the spring D will be moved towards each other, and when the fulcrum is not between them the rear curve E is the point about which they move.

It will be seen that as the fulcrum is advanced from this curve towards the front its tendency is to prevent the sides of the spring from approaching, except in front of the fulcrum, and the more it is advanced the stiffer the spring becomes.

This fulcrum may be formed in different ways, but the simplest and most efficient is to make a short coil of spring wire of a diameter just sufficient to fill the space between the sides D of the spring.

The ends of this wire are bent, as shown at G, so as to clasp one of the sides D, and the elasticity of the coil will cause the fulcrum to cling to or clasp the spring so that it will remain at any point where it may be set, and it can be easily moved by the thumb and finger to any desired point.

By moving it entirely out of the space between the sides D, and up on the outwardly curving portion of the spring, it will cease to act as a fulcrum, and the tension of the shears will then be just what is due to the curves B and E of the two springs. The tension should be the weakest which will be needed, and it can be increased to any desired stiffness. The grip of the hand and the friction of the fulcrum upon the two parts of the spring will prevent any tendency which the shear blades might have to slip by each other in heavy or dirty wool, technically called "buckling."

Our device may be equally well applied to shears the blades of which are united by a rivet through the ends of the shanks, it being only necessary to introduce the spring D and the movable fulcrum as before described.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is—

- 1st. The improvement in sheep-shears consisting in the employment of a movable fulcrum, F, between the sides of the spring D, whereby the tension of the spring and the stiffness of the shears may be regulated, substantially as and for the purpose herein described.
- 2nd. The blades A with their shanks C united at the rear end as a fulcrum, in combination with the spring D having its ends secured to the shanks C, and having a fulcrum, F, fitted to move between its parallel sides, whereby the tension of the shears is adjusted, substantially as herein described.
- 3rd. The shear blades A with their shanks united at the rear end, and the spring D having its ends secured to the shanks as shown, in combination with the coiled elastic spring F, with its clasping ends G, said spring forming an adjustable fulcrum, substantially as and for the purpose herein described.

In witness whereof, we, the said John Griffith Corey and Nathan Weston Spaulding, have hereunto set our hands and seals, this sixth day of July, one thousand eight hundred and eighty-one.

J. G. COREY.

N. W. SPAULDING.

By their Agent,

EDWD. WATERS.

Witness—

W. S. BAYSTON, Law Clerk, Melbourne.

This is the specification referred to in the annexed Letters of Registration granted to John Griffith Corey and Nathan Weston Spaulding, this twenty-fourth day of August, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Improvements in Sheep-shears.

REPORT.

Sir, In reply to your blank cover communication of the 12th instant, No. 6,723, transmitting Messrs John Griffith Corey and Nathan Weston Spaulding's Petition for registration of "Improvements in Sheep shears," we do ourselves the honor to report that we are of opinion that the prayer of the Petitioners may be granted, in terms of their specification, drawings, and claim.

Sydney, 10 July, 1881.

The Under Secretary of Justice.

We have, &c.,
GOTHER K. MANN.
E. C. CRACKNELL.

[Drawings—one sheet.]

No. 979.

[Assignment of No. 997. See page 339.]

No. 980.

[Assignment of No. 812. See Letters of Registration for 1880, page 69.]

No. 981.

[Assignment of No. 887. See Letters of Registration for 1880, page 301.]

Fig. 1.

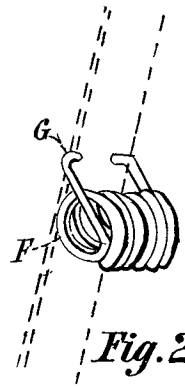
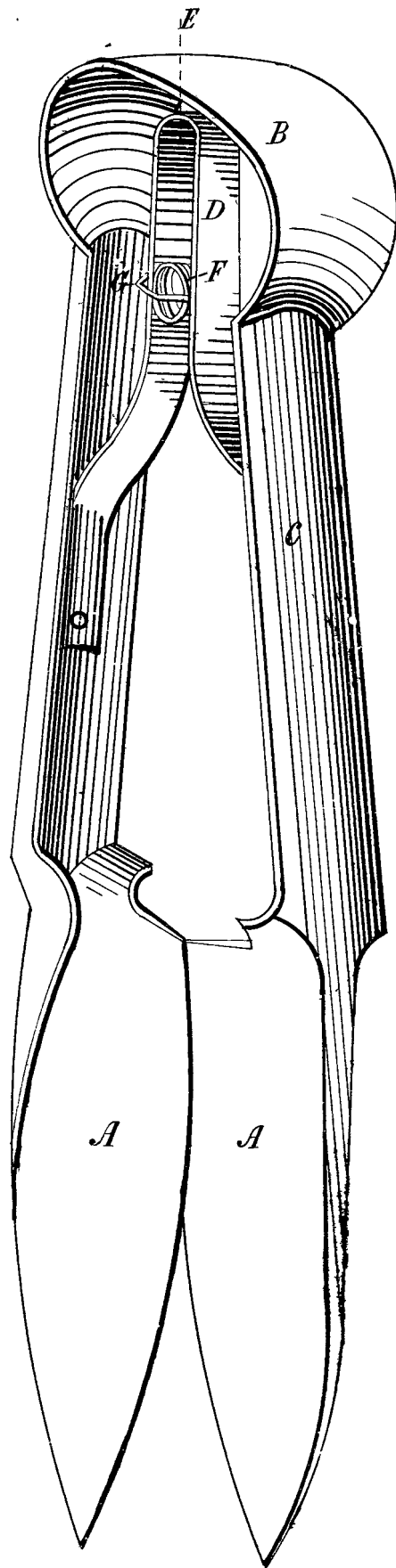


Fig. 2.

*This is the Sheet of Drawings referred to in the annexed
 Letters of Registration granted to John Griffith Corey, and
 Nathan Weston Spaulding, this twenty-fourth day of August,
 A.D. 1887.*

Augustus Loftus.



A.D. 1881, 3rd September. No. 982.

IMPROVEMENTS IN FURNACES FOR BURNING CANE-TRASH AND OTHER FUEL.

LETTERS OF REGISTRATION to Marie Jean Léon Marie, for Improvements in Furnaces for burning Cane-trash and other fuel.

[Registered on the 5th day of September, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting:

WHEREAS MARIE JEAN LÉON MARIE, of Saint Pierre, Martinique, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in Furnaces for burning Cane-trash and other fuel," which is more particularly described in the specification, marked A, and the two sheets of drawings, marked B and C respectively, which are hereunto annexed; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Marie Jean Leon Marie, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said Marie Jean Leon Marie, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said Marie Jean Leon Marie shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this third day of September, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Furnaces for burning Cane-trash and other fuel.

A.

SPECIFICATION of MARIE JEAN LEON MARIE, of St. Pierre, Martinique, for an invention entitled "Improvements in Furnaces for burning Cane-trash and other fuel."

THIS invention relates to an improved furnace for burning bagasse or cane-trash shavings or other fuel, so constructed that the fuel, which is generally very moist, is dried before being burned, whereby perfect combustion is ensured.

The bagasse furnace is placed near and connected to the boiler furnace, which thus merely receives the gases of combustion from the bagasse furnace, which is complete in itself, has a natural draught, and is capable of being readily connected with any boiler by one or more flues on the sides or crown of the furnace, and of standing in any position with regard to the boiler, as circumstances may require.

The bagasse furnace is constructed either of cast-iron, wrought-iron, or other metal, but preferably (on account of its low cost and durability) of cast-iron encased in brickwork.

It possesses considerable advantages over other furnaces, being improved in form and working, and provided with an inclined fire-grate, and a self-acting feeder for spreading the fuel uniformly on the grate.

The working of the furnace is characterized by—

- 1st. The preliminary drying of the moist fuel.
- 2nd. The practical application of the principle "Elevation of temperature is a function of the rapidity of combustion."
- 3rd. Perfect combustion of the gases obtained by the form of the furnace and its high temperature.
- 4th. Perfect natural draught ensured through the grate by the self-acting feeder.
- 5th. Great saving of labour in stoking.

In order that the invention may be more readily understood, I have illustrated two examples in the accompanying drawings—the one a furnace constructed of cast-iron in several parts to facilitate its erection; and the other a furnace built in brickwork with cast-iron grate, doors, and hopper.

Figures 1, 2, 3, 4 represent the type of furnace employed for heating boilers which are not built in brickwork, and have an internal fireplace surrounded with water. The furnace represented in these figures is to be encased with fire-bricks or other fire-resisting material.

Figure 1 is a front elevation of the bagasse furnace, and figure 2 a vertical section of the same. Figure 3 is a part elevation of the side next the boiler to which it is to be connected; and figure 4 is a horizontal section. In these figures the same letters of reference indicate the same parts.

The bagasse furnace consists of a chamber constructed of cast-iron plates, *a b c d*, flanged and bolted together, and stiffened by ribs, *e*. The front plate is furnished with a door, *f*, on a level with the upper end of the fire-bars. The fire-bars *g* are inclined downwards from front to back, as shown, and extend through an opening in the back plate of the furnace, and are supported by an inclined cast-iron bridge or plate, *h*, bolted to cheek plates or extensions of the side walls of the furnace. The back plate *d* has an opening as above mentioned, which, as well as the bridge *h*, is made as wide as possible, the opening being surrounded by a flange, and forming a throat, *k*, which fits in the doorway of the boiler or furnace to which the bagasse furnace is connected, the interval between the two being built up with fire-brick and fire-clay. The form and dimensions of this throat may be varied as circumstances may require, and with the bridge it thus leads the products of combustion directly into the boiler or other furnace, all direct communication of the latter with the exterior air being prevented by closing the lower part of the boiler fire-box with fire-brick, so that the whole of the draught must come through the fire-bars of the bagasse furnace.

The bagasse furnace has a pyramidal crown, *l*, of cast-iron surmounted by a hopper, *m*, through which the fuel is fed into the furnace, the said hopper being furnished with a self-acting balance-door or valve, *n*, kept closed by an adjustable counterweight, *p*, so as only to permit a quantity of bagasse or other fuel corresponding to the balance-weight to fall into the furnace at one time.

Figures 5, 6, and 7 represent the type of furnace intended to be applied to boilers set in brickwork or for sugar-evaporating pans heated by a naked fire (Labat apparatus or copper wall battery).

This furnace is built of brickwork, and has cast-iron doors, grate, and hopper, lined or not with sheet-iron.

Figures 5, 6, and 7, show respectively longitudinal and cross sections and plan of a furnace applied to a sugar-evaporating apparatus. As here shown, the application of this type of furnace presents no difficulties. The bagasse furnace should be arranged as nearly as possible in line with the sugar-evaporating pans or copper wall battery or with the boiler to be heated, the door of the bagasse furnace being placed at the side if necessary. The flues should be contracted as much as possible, in order to utilize all the heat of the flames, especially when bagasse direct from the mill is burnt. A good result is obtained in an apparatus already constructed by erecting small bridges, *r*, in the positions represented.

Having thus explained the construction of the apparatus, the details of which may, however, be varied, I will proceed to describe its working:—

The drying or stoving of the wet cane-trash is the most remarkable feature of this bagasse furnace. It would seem paradoxical at first sight that a furnace placed outside of a boiler could have greater heating power than one inside the boiler, but as cane-trash, in the wet state in which it leaves the mill, will not burn freely, it will be seen that by subjecting it to a preliminary drying it is rendered eminently fit for fuel, and this is effected by my improved bagasse furnace.

A fire having been first lighted in the furnace with some dry fuel, the sides become highly heated; the wet cane-trash is then fed in through the hopper, the self-acting balance-door in which opens, spreads the fuel upon the grate, and immediately closes again, thus re-establishing the natural draught through the grate. The flame of the burning fuel immediately envelopes the fresh fuel, and owing to the high temperature in the furnace the gases at once begin to be distilled. The same results are, I admit, obtained, more or less, with internal furnaces, but as their surfaces never exceed the relatively low temperature of the surrounding water (about 150° C.) the unconsumed gases are carried by the draught away from the furnace, become condensed on the cooler surfaces, and pass away unconsumed in the form of dense smoke.

The

Improvements in Furnaces for burning Cane-trash and other fuel.

The combustion in my improved furnace is much more perfect, as its sides are as hot as the flame itself (1,000° C. at least), and all the caloric which would in the former case go to heat the water is stored up in the furnace casing, which quickly acquires sufficient heat to almost instantly dry the cane-trash and render it fit for burning. As all the gases, whether in ignition or not, are compelled to pass through the contracted throat leading to the fire-place of the boiler to which the bagasse furnace is applied, an intimate mixture of the gases is effected, which ensures the combustion of any as yet unconsumed products. The whole of the fuel is thus utilized, and the furnace, although exterior to the boiler, is yet sufficiently near to transmit a greater amount of heat than that obtained by the imperfect combustion of the same quantity of fuel in an internal furnace. Owing to the perfect combustion thus obtained, there is little or none of the usual deposit in the boiler tubes caused by the condensation of essential oils, tar, and other unconsumed matters, combined with soot.

One man can manage at least three of these furnaces, whereas an ordinary boiler requires two men working alternately, and for not longer than two hours at a time. In case it is required to burn coal in the bagasse furnace when the supply of cane-trash may run short, the parts of the bagasse furnace most exposed to the heat may have a fire-brick lining, to protect the walls of the furnace against the greater heat developed when coal is used. This lining may cover the whole internal surface of the bagasse furnace if necessary, or it may be constructed wholly of fire-bricks. For boilers having very large fire-places, such as those in sugar-houses, my bagasse furnace may be placed inside the boiler fire-place instead of outside, as above described.

The advantages of my improved furnace are :—1st—A saving of about 60 per cent. of fuel. 2nd—Stoking is almost entirely obviated. 3rd—Steam is raised much more quickly. 4th—The production of steam is increased from 30 to 40 or 50 per cent., according to the size of the furnace. 5th—The smoke is entirely consumed. 6th—Little or no deposit in the boiler and tubes. 7th—Complete utilization of a waste material which is often an encumbrance. 8th—Simplicity of construction and working. 9th—It costs nothing for repairs, and is not liable to get out of order like those using an artificial draught. 10th—It may be readily adapted to all kinds of boilers or furnaces, as well as to the whole of the boilers in the works, whereas with furnaces having an artificial draught it is necessary to have at least one ordinary furnace boiler to drive the fan. 11th—Preservation of the boiler-plates, which not being exposed to direct contact of the fire are not corroded by the decomposing action of the sulphides contained in the coal.

Having described the nature of the said invention and the manner of performing the same, I declare that what I claim is—

1. The construction and arrangement of bagasse furnace having a reverbatory chamber constructed of metal, fire-bricks, or other fire-resisting material, surmounted by a feed-hopper, and adapted for connection with a boiler or other furnace, substantially as specified, for effecting the combustion by a natural draught of bagasse shavings or other wet fuel.
2. The combination of the bagasse furnace, constructed as herein shown and described, with a boiler or other furnace, the said bagasse furnace being capable of being placed in any position relatively to and communicating by suitable openings in its walls or crown with the boiler or other furnace to which it is applied.
3. The combination in a bagasse furnace of a hopper with balance-door for supplying fuel to the grate, substantially as shown and described.
4. The combination of a bagasse furnace, constructed as described, with a set of sugar-evaporating pans or copper wall battery, substantially as described and shown.

In witness whereof, I, the said Alexander Melville Clark, as agent of Marie Jean Léon Marie, have hereunto set my hand and seal, this second day of June, 1881.

A. M. CLARK,
Agent of MARIE JEAN LEON MARIE.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to Marie Jean Léon Marie, this third day of September, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

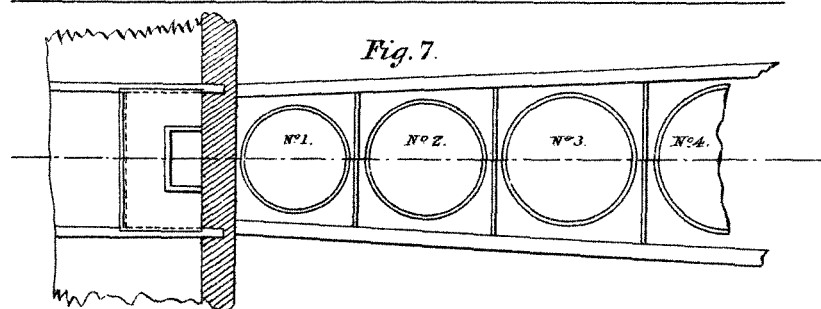
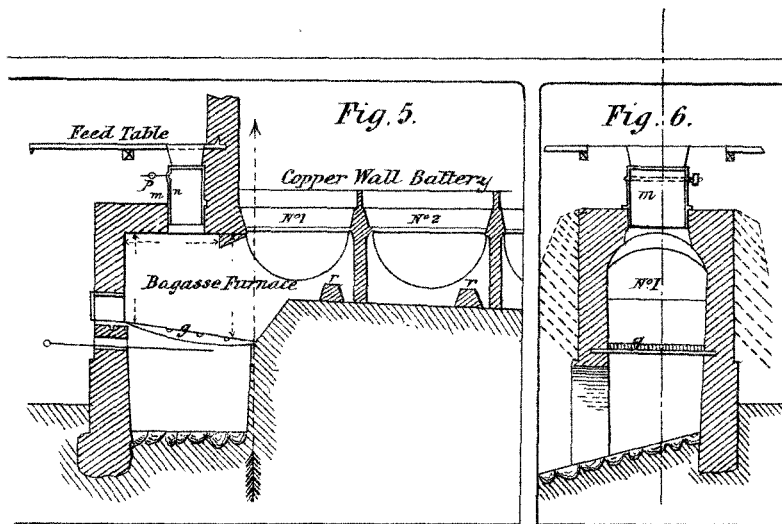
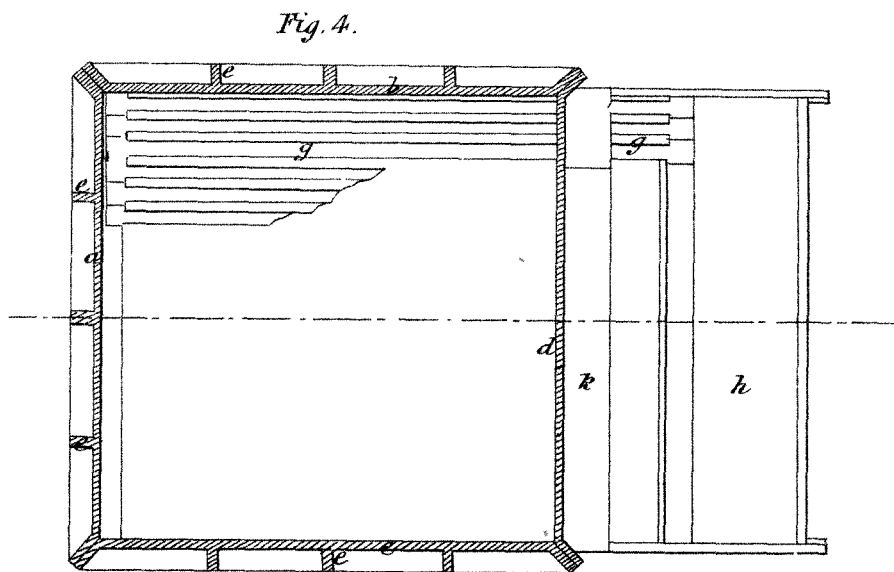
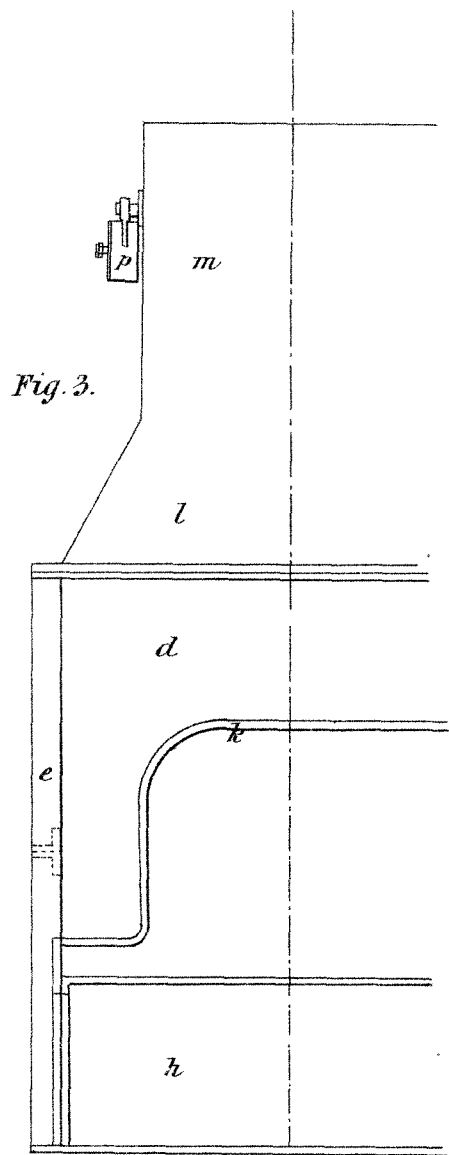
Sir,

We do ourselves the honor to report, in reply to your blank cover communication of the 21st instant, No. 7,164, transmitting Mr. A. M. Clark's Petition, as agent for Marie Jean Léon Marie, for the registration of "Improvements in Furnaces for burning Cane-trash and other fuel," that we are of opinion registration may be granted, in terms of M. J. L. Marie's specification, drawings, and claim.

We have, &c.,
GOTHER K. MANN.
E. C. CRACKNELL.

The Under Secretary of Justice.

[Drawings—two sheets.]



*This is the Sheet of Drawings marked C. referred to in the annexed
Letters of Registration granted to Marie Jean Leon Marie, this third day
of September, A. D. 1881*

Augustus Loftus.

Fig. 1.

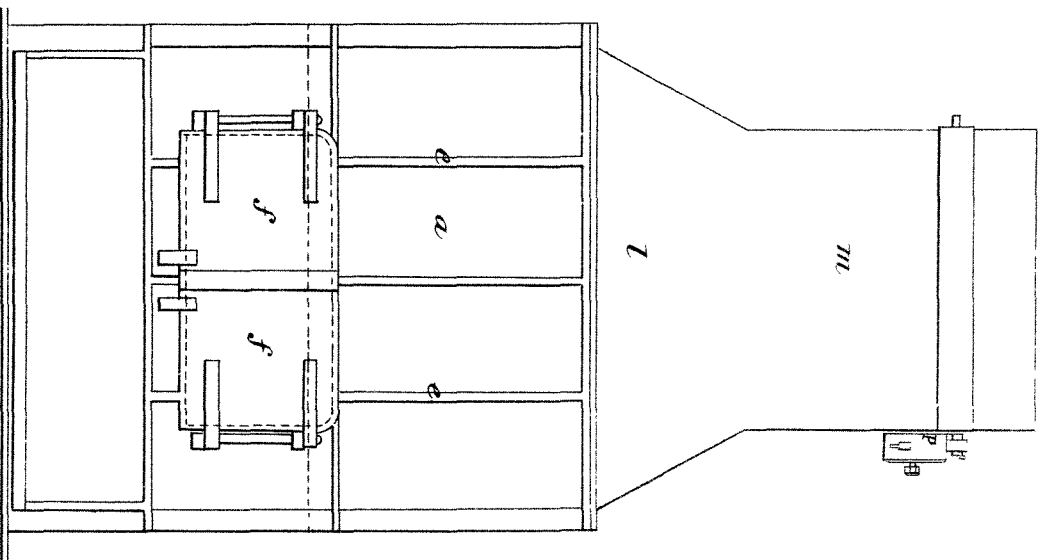
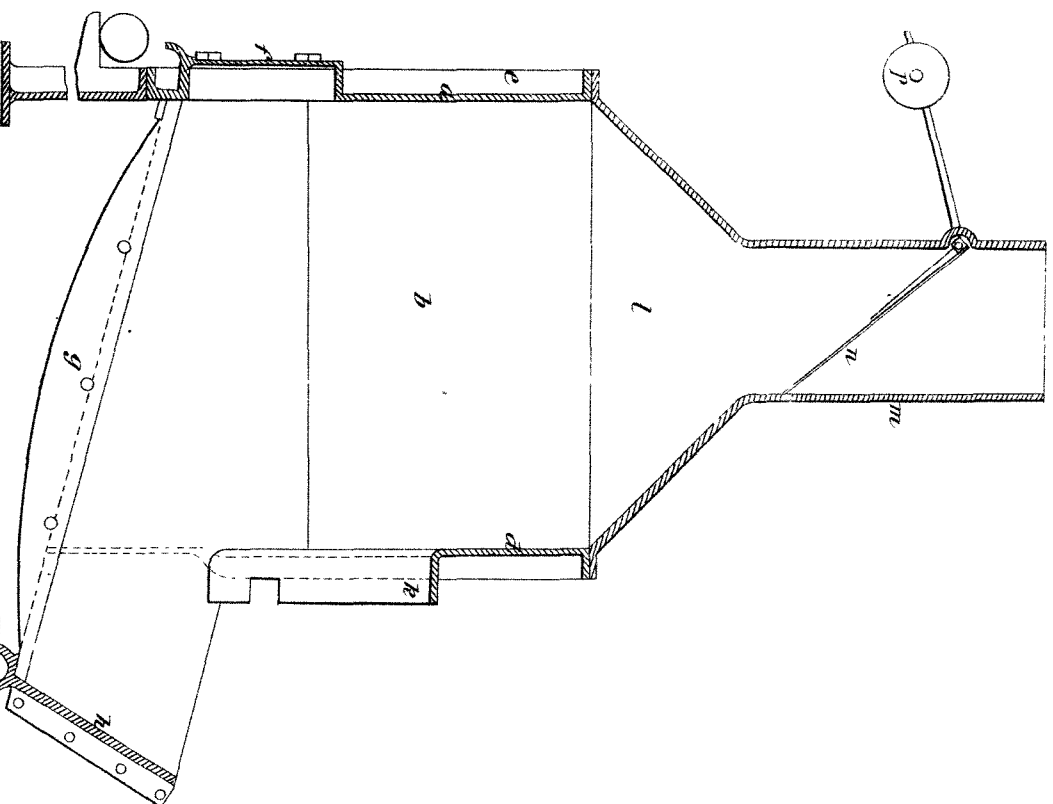


Fig. 2.



*This is the Sheet of Drawings marked B referred to in the annexed
Letters of Registration granted to Marie Jean Leon Marre, this
third day of September, A. D. 1881.*

Augustus Loftus.



A.D. 1881, 3rd September. No. 983.

IMPROVEMENTS IN CLOSETS AND CLOSET-PANS, &c.

LETTERS OF REGISTRATION to Leopold Hesse, for Improvements in Closets and Closet-pans, and in the process of and apparatus for deodorizing and converting offensive matters such as excreta, offal, &c., into a fertilizing material.

[Registered on the 5th day of September, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting:

WHEREAS LEOPOLD HESSE, of Argyle-street East St. Kilda, in the Colony of Victoria, manufacturing chemist, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in Closets and Closet-pans, and in the process of and apparatus for deodorizing and converting offensive matters such as excreta, offal, &c., into a fertilizing material," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Leopold Hesse, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said Leopold Hesse, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said Leopold Hesse shall not within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this third day of September, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Closets and Closet-pans, &c.

SPECIFICATION OF LEOPOLD HESSE, of Argyle-street East St. Kilda, in the Colony of Victoria, manufacturing chemist, for an invention entitled "Improvements in Closets and Closet-pans, and in the process of and apparatus for deodorizing and converting offensive matters, such as excreta, offal, &c., into a fertilizing material."

THIS invention relates, first, to closets and their pans, and, secondly, to the process of and apparatus for deodorizing and converting offensive matters such as excreta, offal, &c., &c., into a fertilizing material.

That part of my invention which relates to closets and their pans consists, first, in a novel contrivance for supplying and scattering the deodorizing material over the deposited excreta, and, second, in a novel construction of pan by which its contents can be readily and effectually sealed up for removal. It is advantageous to make provision for separating the urine from the solid excreta.

That part of my invention which relates to the process of and apparatus for deodorizing and converting offensive matters into a fertilizing material refers to the distillation process, as it is called, and consists in passing the vapours arising from the heating and stirring of such matters through a retort containing heated lime, such retort being so constructed as to admit of its contents being readily removed and replaced. The object of this heated lime retort is to convert the vapours and gases which have a foul smell into ammonia and sulphur compounds easily separated and of commercial value; this foul smell being that which all previous processes have failed to remove.

Referring to my drawings, figure 1 shows side sectional elevation, and figure 2 plan of one of my improved closets, and figure 3, views of my improved closet pan or receptacle. Figure 4 shows an arrangement of plant for carrying on the distilling process of treating excreta, &c., in which my improved heated lime retort is embodied.

In figure 1, A is the usual receptacle at the back for receiving dry earth or other deodorizing material, and A¹ a long trough at the bottom for receiving a charge and discharging it into a shoot, B. This trough is worked by means of rods A² connected to the seat A³, in a manner well understood. C is a bellows, which is also worked by the seat, in the manner shown, so that when the seat descends the trough A¹ turns over and discharges its contents into shoot B, spreading the bellows C. When the seat rises, by means of spring A⁴, assisted by weight A⁵, it returns trough A¹ to its normal position, and the bellows being compressed, blow the charge out of the shoot B over the deposited excreta in the pan or receptacle D; if desired, this part of the apparatus may be substituted by an ordinary spray apparatus, for the distribution of a liquid deodorant, or both parts may be combined, as shown in the drawing, where C¹ is a three-way cock with handle C² above the seat, C³ a bent nozzle, and C⁴ a pipe terminating in the spray apparatus. Instead of the automatic arrangement just described, the bellows and trough may be worked by hand as is well understood.

The pan or receptacle is made in the form shown, and when it has to be removed is closed air-tight by means of a lid, D¹, which has a double rim, D², all round it, packed between with india-rubber, D³, or other elastic material. The edges of the top of the receptacle fit into the space between the double rim, and when pressed down form a tight joint. The lid is then held in this position by swinging links D⁴, which pass over the ends of bands D⁵. The receptacle is then free from any disagreeable smell, and can be removed by the handles D⁶ to a vehicle for carrying it to the depôt, where it is treated in the manner hereinafter set forth and described.

Referring now to the second part of my invention, embodied in figure 4. The material to be treated is first put into a chamber, E, having a perforated false bottom or other means of draining off the liquid part of it. The solids remaining are then conducted by rakes or shovels or other contrivances through pipe E¹ into a closed chamber, F, where they are heated by steam-pipe F¹ for from six to twelve hours determinable upon the degree of moisture they contain. The contents, solid and gaseous, then pass through pipe F² into a retort, G, where it is thoroughly stirred up by rotating rakes G¹ and chains G² like a buddle, and heated by means of flues G³ underneath. These flues are shown more clearly in plan view, figure 5. The vapours arising from this treatment pass over bent pipe H into a chamber, H¹, the principal use of which is to counteract the priming of the retort G. This chamber contains water, as shown, in which is placed from ten to twenty per cent. of alkali, such as lime, so as to make it also serve as a means of preparing the vapours for their subsequent treatment; such vapours pass from hence through another bent pipe, J, into a retort, J¹, containing unslaked lime. This retort is heated from a fire, J², as shown, which also supplies the heat to the retort G. In its passage through this lime retort the noxious vapour loses all or nearly all its offensive smell, and then passes on through bent pipe K, into an acid chamber K¹, which retains all the ammonia and converts it into a salt; the remainder of the vapours then pass over a goose-neck L, into a worm L¹, contained in a vessel, L², full of cold water, which condenses the remaining vapour and conducts it into a final gas-trap, M, the overflow from which is conducted away by pipe M¹, and the gas led to the furnace, where it is burnt.

The urine and other liquid matter separated from the excreta at the outset are distilled in a manner now well known.

In respect to this second part of my invention, I wish it to be distinctly understood that I make no claim for any part of the process or apparatus used in carrying out the deodorization and conversion of excreta, &c., herein described, and illustrated in figures 4 and 5 of my drawings, save and except that item in the process which consists in subjecting the vapours arising from the heating of excreta, &c., to the action of a heated alkali, such as lime, and for that part of the apparatus in which such item of said process is conducted, and which is marked J¹ in the drawings; and I would have it understood that this part of my invention is applicable to any apparatus and process in which offensive material is attempted to be deodorized by heat. Neither do I make any claim for the use of earth-closets, or for the distribution of earth over the deposited excreta therein, as I am aware that this is well known; but what I believe to be new, and therefore claim as the invention for which I am desirous of securing Letters of Registration, is—

First—

Improvements in Closets and Closet-pans, &c.

First—The combination and arrangement of the bellows C, having a bent nozzle, C³, with the long trough A¹, seat A³, and shoot B, in the manner and for the purposes described.

Second—The combination and arrangement of C and C⁴ with the spray apparatus for the liquid deodorant, either with or without the contrivances for supplying the powdered deodorant, substantially as described.

Third—The construction of the closet-pan or receptacle D with a double-flanged lid, packed with india-rubber or other elastic material, and fastened by links D⁴ and bands D⁵, substantially as described.

Fourth—In the process of deodorizing and converting offensive matters such as excreta, &c., by heat, conducting the vapours arising therefrom into and through a heated retort containing a red-hot alkali, specially lime.

Fifth—In apparatus for deodorizing and converting such offensive matters by distillation, combining a heated retort containing a heated alkali, such as unslaked lime, with the other contrivances used in the process, substantially as herein described and explained.

In witness whereof, I, the said Leopold Hesse, have hereto set my hand and seal, this fourteenth day of July, one thousand eight hundred and eighty-one.

Witness—

EDWD. WATERS,
Melbourne, Patent Agent.

LEOPOLD HESSE.

This is the specification referred to in the annexed Letters of Registration granted to Leopold Hesse, this third day of September, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 29 July, 1881.

The application of Mr. Leopold Hesse for Letters of Registration, for "Improvements in Closets and Closet-pans, and in the process of and apparatus for deodorizing and converting offensive matter such as excreta, offal, &c., into a fertilizing material," having been referred to us, we have examined the specification and drawings accompanying the same, and have now the honor to report that we see no objection to the issue of Letters of Registration.

We have, &c.,

J. SMITH.
CHAS. WATT.

The Under Secretary of Justice.

[Drawings—one sheet.]

— LEOPOLD HESSE'S PATENT. —

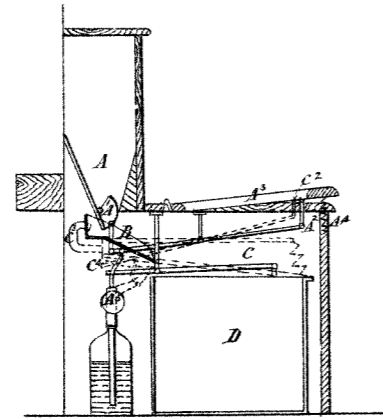


Fig. 1.

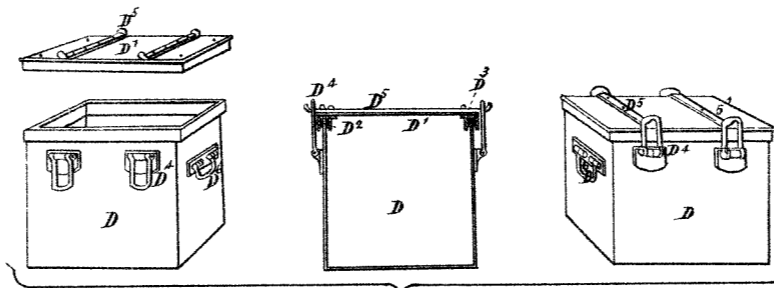


Fig. 3.

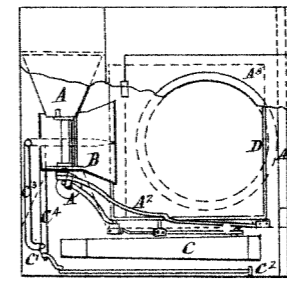


Fig. 2.

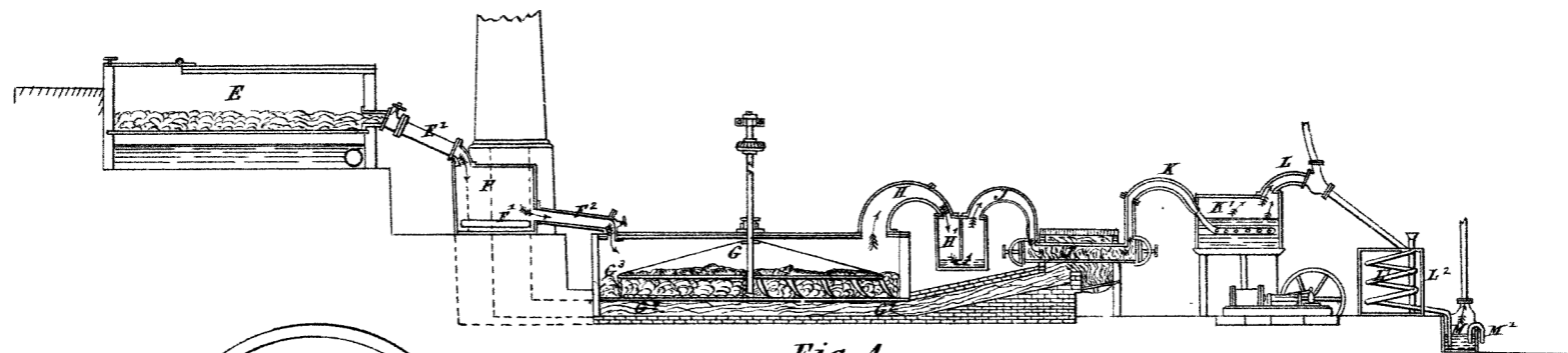


Fig. 4.

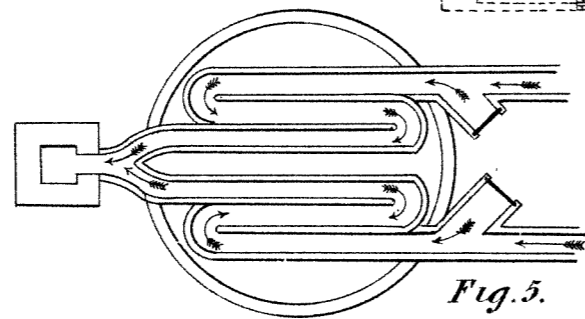


Fig. 5.

This is the Sheet of Drawings referred to in the annexed Letters of Registration granted to Leopold Hesse, this third day of Sept: A. D 1881

Augustus Loftus



A.D. 1881, 3rd September. No. 984.

**IMPROVED PROCESSES FOR THE DISINFECTION OF FECAL AND OTHER LIKE
MATTER.**

LETTERS OF REGISTRATION to Friedrich Petri, for Improved processes for the preparation and utilization of materials for the disinfection of fecal and other like matter, which when disinfected may serve as manure or fuel.

[Registered on the 5th day of September, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS FRIEDRICH PETRI, of Berlin, Germany, Doctor of Philosophy, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improved processes for the preparation and utilization of materials for the disinfection of fecal and other like matter, which when disinfected may serve as manure or fuel," which is more particularly described in the specification hereunto annexed ; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four ; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years : And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Friedrich Petri, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof ; to have, hold, and exercise unto the said Friedrich Petri, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended : Provided always, that if the said Friedrich Petri shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this third day of September, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improved processes for the disinfection of fecal and other like matter.

SPECIFICATION of FRIEDRICH PETRI, of Berlin, Germany, Doctor of Philosophy, for an invention entitled, "Improved Processes for the preparation and utilization of materials for the disinfection of fecal and other like matter, which when disinfected may serve as manure or fuel."

THE best method of disposing of the fecal materials or substances in cities and large towns is a problem which has for a considerable time occupied the attention of persons concerned in such matters. Each of the systems hitherto in use has inherent faults or disadvantages which need not here be enlarged upon, as they are well known.

The present invention relates to improved processes for the preparation and utilization of materials for the disinfection of fecal and like matter, and for destroying the miasma thereof, so that even when considerable quantities of the said material are allowed to remain piled up for some time they will not be liable injuriously to affect the health of the population of the neighbourhood. Such fecal materials treated by my invention may (without artificially supplying heat) be transformed into manure or fuel, the value of which will alter the estimates of towns for sewerage and drainage to considerable advantage, and may, under certain circumstances, even form an important source of income.

This process consists in the disinfection of the fecal materials or substances by means of certain substances the disinfectant properties whereof are partially known, but the combined effects of which have not as yet been applied for the purpose in question; and by the use of the said substances the fecal masses attain such a consistency as will make the same plastic, so that they can be operated upon by machinery in the same manner as clay and the like.

For this purpose I produce from the materials, and in the manner presently to be specified, a disinfectant, which is poured over the fecal materials or mixed therewith. I take thirty (30) litres of finely sifted organic matter, which I term filling material (peat-waste, waste from brown coal, or sawdust will serve best for this purpose). This filling material I moisten with two (2) litres of a liquid consisting of carbolic acid of from twenty to thirty per cent. (20—30 %) and of one per cent. (1 %) of crude chloroform. The chloroform has for its purpose to destroy the minute organisms, such as bacteria, infusoria, fungoid germs, and the like, which either are already present in the fecal masses or are germinated under the action of the atmosphere.

To the filling material thus moistened I add two (2) litres of a powdered mixture of sulphate of iron with coke. Instead of the waste from pure coke, I may use the much cheaper cinders which pass through the grate where coal is used as fuel, and from which cinders the ashes have been previously removed by sifting. To this mixture I further add twenty-five hundredth parts (0.25) of a litre of a solution of nitro-benzol in alcohol—one part of nitro-benzol in a hundred (100) parts of alcohol.

It is hardly possible or altogether impossible to make a fine powder from sulphate of iron alone; I therefore pulverize it in a mill with a vertical runner, together with the waste coke. In this manner I fully utilize the well-known disinfecting qualities of the sulphate of iron, which in the use of this substance as a disinfectant, as heretofore practised, have been to a great extent wasted.

To prevent too rapid oxidation of the sulphate of iron, to which it is all the more liable when pulverized, the alcohol is added, in which 1 per cent. of nitro-benzol has been dissolved; the latter acting as a poison upon the minute organisms which are already developed, and destroying them, and also their germs, prevents fermentation.

The whole of the mass so obtained is now thoroughly mixed or worked up, and pulverized coke or cinders are added till the specific weight of the material is raised to such an extent that one (1) hectolitre weighs fifty (50) kilogrammes.

With reference to the above-given recipe or formula for preparing the disinfectant powder, I have to observe that the proportions therein indicated are not absolute, but are only given as those which I believe to be the best, slight alterations of the proportions set forth may take place without departure from the principle of my invention. Where proportions are stated in numbers, cheapness has been considered, as well as expediency.

The increase of the specific weight of the disinfectant powder has for its object to prevent the same remaining on the surface of the fecal masses which are sprinkled therewith, and to cause the same (it being a body of superior gravity) entirely to penetrate such masses, so as to become fully effective. Thereby the formation of particular beds or spots of fermentation in the treatment of large quantities is obviated, without the necessity for any mechanical treatment beyond that hereinafter set forth.

If the excrement is worked up when fresh, or is disinfected with the powder prepared according to the directions above given immediately when produced, more of the organic filling material may be added, whereby the disinfection is rendered less expensive than it would otherwise be.

The quantity of powder to be added to the excrements depends upon the consistency of the latter; in all cases, however, the addition is to be sufficient to transform the whole into a moist, kneadable mass.

The fecal matters act when the mass is dried as a powerful adhesive substance for the organic filling material, so that the product when ready will form a consistent material not requiring to be packed for transportation.

When, however, excrementitious matter has to be treated which has lain by for some time and has commenced to ferment, it has, after being worked up with the disinfecting powder, to be subjected to sprinkling with a disinfecting fluid compounded from the materials and in the manner hereinafter set forth, that is to say, I take a petroleum barrel of the ordinary size, or a vessel of similar capacity, and pour into the same five (5) litres of water. Into this water I pour ten (10) litres of dry chloride of lime of good quality, and four (4) litres of alcohol, and mix the whole till it becomes a pulp or paste. By these means chloroform (also other chlorides all possessing disinfectant properties) is produced, which is dissolved in the pulp or paste, or mixed therewith. The chloroform acts, as has already been stated with reference to the preparation of the disinfecting powder, very destructively upon the ferments, but if it were to be used pure, as a separate substance, it would be too expensive for the present purpose; moreover, chloroform, as such, could not be recommended for public use, as it might too easily be abused.

To the pulp or paste thus prepared and containing chloroform I add from five to ten (5—10) litres of water and twenty (20) litres of crude chloride of calcium. The liquid, which has a smell like fresh fruit, becomes considerably heated. I then add as much water as is required to fill the cask to about one-third of its

Improved processes for the disinfection of fecal and other like matter.

its capacity, and allow the mixture to stand for half-an-hour. I then stir thoroughly, and completely fill the cask with water. After an hour's time I add yet one (1) litre of alcohol containing 1 % of nitro-benzol, which acts destructively upon the minute organisms, as hereinbefore stated. The addition of chloride of calcium serves to impart a higher specific gravity to the liquid; it moreover possesses disinfectant qualities of its own.

The chloride of calcium acts upon the organic masses very slowly and gradually, destroying them by being transformed into carbonate of calcium; moreover, hydrochloric acid is thereby set free, which forms organic chlorides with the fecal materials, and thus promotes the result sought to be obtained.

The mixture produced as just described I allow to stand all night, and next day decant the clear liquid by means of siphons or otherwise.

The sediment is caustic lime, which might be used for disinfecting, but which is not only useless in the utilization, as manure, or fuel, or fecal matters treated therewith, but would even act injuriously. If the produce is to be used as manure, then the caustic lime having expelled the nitrogen as ammonia has deprived the manure of a valuable component part, whilst, if the product is to be burnt, the lime will increase the proportion of ashes; it is therefore for both objects necessary to eliminate the caustic lime from the disinfecting liquid, and this can be effected without expense by simply allowing it to settle.

The clear liquid obtained as set forth must be kept in closed glass vessels. It may be used not only for the processes herein described, but also for disinfecting sewage waters, putrid urine, and kitchen-wash, or waste waters; likewise, for sprinkling in sick-rooms and lazarettos where epidemic diseases prevail.

For this disinfecting liquid, as for the powder above described, the proportions given are those that are relatively the best, and not absolute, and I may vary the same within certain limits.

The excrementitious matters disinfected by one or the other of the above-described processes, or by both combined, are then taken to the place where they are to be worked up, and are stored in covered pits or sheds till the quantities sufficient for the subsequent mechanical treatment are collected. Materials that have not yet been disinfected may be transported to the place where they are to be worked up, and may there be disinfected.

Fecal matters treated as above described may remain stored for years without undergoing any change; they are perfectly inodorous, and an accumulation thereof will not be dangerous to the inhabitants of the neighbouring localities.

For disinfecting considerable quantities of waste water or sewage with which farm lands have hitherto been irrigated I use the disinfecting powder, prepared as hereinabove set forth, which I mix with from ten to twenty times (and sometimes more) its volume of peat-waste or other filling material. With this mixture ditches and pits can be filled, and the said liquids allowed to pass therethrough. The disinfectant then absorbs all the organic constituents of the liquid, and the water flows off clear and pure.

The disinfecting material charged with the organic matters is from time to time removed and treated by the mechanical process hereinafter set forth, after having also been dried by exposure to the atmosphere.

The fecal masses, after having been subjected to the preparatory drying, are treated by means of the well-known machines commonly used for making mortar, which not being a part of this invention do not require to be here described. I may also use that class of peat or brick pressing machines which mix and propel the materials charged into the same by means of oblique knives mounted on a rotating axle. In the latter class of machines, however, the nozzle has to be taken off, so as to allow the material to be discharged through a wide aperture.

The mass after being thus treated is so deposited, in a lofty place protected against rain, that it offers as large a surface as practicable to the drying air, so as to expel the greater part of the moisture. This drying process is promoted by the property possessed by the disinfectants of which I make use of reducing the bulk of the fecal masses; the astringent effect of the former drives the water to the surface of the mass, where it very rapidly evaporates.

After the mass is deprived of the greater part of its moisture, but when it still has sufficient plasticity, a press of any suitable construction is used to form the same into bricks, which are piled up and thoroughly dried, this taking from two to three weeks, according to the season.

The bricks so produced are a valuable fuel, for which there is ample use, both for domestic and industrial purposes.

In places where coal is cheap manure is more valuable; it will therefore be advantageous not to press the disinfected fecal material into bricks, but to turn the same with the spade, and to put up heaps of loose lumps or pieces thereof till they are perfectly dry, and then to pulverize them by any suitable means, so that the material may be strewn on the farm land like guano, super-phosphate, or other artificial manures.

CLAIMS.

First—The process of disinfecting fecal matters, waste waters, and sewage, by means of the disinfecting powder compounded and manufactured as set forth.

Second—In the manufacture of the disinfecting powder, the pulverization of the sulphate of iron when mixed with coke-waste.

Third—In the manufacture of the disinfecting powder, the prevention of the oxidation of the thus produced pulverized mixture of sulphate of iron and coke-dust, by the treatment thereof with alcohol containing 1 % of nitro-benzol.

Fourth—The second mode of disinfection, by means of a disinfecting liquid, manufactured as set forth.

Fifth—In the manufacture of the disinfecting liquid, the production therein of organic chlorides by the reaction of the chloride of lime upon the alcohol.

Sixth—The process of manufacturing a disinfecting liquid from the substances named, as set forth.

In witness whereof, I, the said Friedrich Petri, have hereto set my hand and seal, this seventeenth day of May, 1881.

FRIEDRICH PETRI.

Witness—

GEORGE LOUBIER.

This

Improved processes for the disinfection of fecal and other like matter.

This is the specification referred to in the annexed Letters of Registration granted to Friedrich Petri, this third day of September, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

The application of Mr. Friedrich Petri for Letters of Registration, for "Improved processes for the preparation and utilization of materials for the disinfection of fecal and other like matter, which when disinfected may serve as manure or fuel," having been referred to us, we have examined the specification accompanying the same, and have now the honor to report that we see no objection to the issue of Letters of Registration as prayed for.

Sydney, 29 July, 1881.

We have, &c.,
J. SMITH.
CHAS. WATT.

The Under Secretary of Justice.



A.D. 1881, 19th September. No. 985.

IMPROVEMENTS IN AMALGAMATORS.

LETTERS OF REGISTRATION to Pierce Butler Wilson, for Improvements in Amalgamators.

[Registered on the 19th day of September, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS PIERCE BUTLER WILSON, of Baltimore, in the State of Maryland, one of the United States of America, consulting chemist, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in Amalgamators," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Pierce Butler Wilson, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said Pierce Butler Wilson, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said Pierce Butler Wilson shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this nineteenth day of September, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Amalgamators.

SPECIFICATION of PIERCE BUTLER WILSON, of Baltimore, in the State of Maryland, one of the United States of America, consulting chemist, for an invention entitled "Improvements in Amalgamators."

THIS invention relates to the adaptation of a centrifugal machine to the separation of gold and other precious metals from water, sand, and crushed ores.

The said invention consists in the interposition between the revoluble basket and the outer casing of the said machine of a mercury-coated plate adapted to receive the contents of the revoluble basket as the same are thrown off by centrifugal force.

In the further description of my said invention which follows, reference is made to the accompanying drawing, in which figure 1 is a sectional elevation of my improved amalgamator, together with some of its attachments. Figure 2 is a section of figure 1, taken on the dotted line $x-y$.

Similar letters of reference indicate similar parts in both the views.

A is the casing of the centrifugal machine, and B the revoluble basket, which is driven in the usual way; C is a mercury-coated plate, preferably made in sections, which is placed in the casing A and around the basket B. The lower end of the casing A terminates in a pipe, D, through which amalgam, water, and ore, after the separating process, are delivered to a vessel, E, provided with suitable stirring devices. The water, or water, sand, and reduced ore, are introduced to the revoluble basket through a trough or pipe, a , and projected from the said basket by centrifugal force against the mercury-coated plate C; and the amalgam thus formed, together with the refuse matter, passes to the pipe D, and thence to the vessel E. If desired a second basket of conical or other shape may be secured in the basket B, as shown by the dotted lines, to effect a better distribution of gold over the surface of the plate C; and a mercury-coated plate can be located in the bottom of the outer or main basket, to increase the amalgamating surface of the machine.

I claim as my invention,—

In combination with a centrifugal machine an amalgamated or mercury-coated plate interposed between the revoluble basket and the outer casing of the machine, substantially as and for the purpose herein specified.

In witness whereof, I, the said Pierce Butler Wilson, have hereto set my hand and seal, this 10th day of May, A.D. 1881.

PIERCE BUTLER WILSON,

Witnesses—

WILLIAM THOMPSON HOWARD,
HARRY V. ALBAUGH.

This is the specification referred to in the annexed Letters of Registration granted to Pierce Butler Wilson, this nineteenth day of September, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

We do ourselves the honor to report, in reply to your blank cover communication of the 21st instant, No. 7,130, transmitting Mr. Pierce Butler Wilson's Petition for the registration of "Improvements in Amalgamators," that we are of opinion the prayer of the petitioner may be granted, in terms of Mr. Wilson's specification, drawings, and claims.

We have, &c.,

E. C. CRACKNELL,
GOTHER K. MANN.

The Under Secretary of Justice.

[Drawings—one sheet.]

Fig. 1.

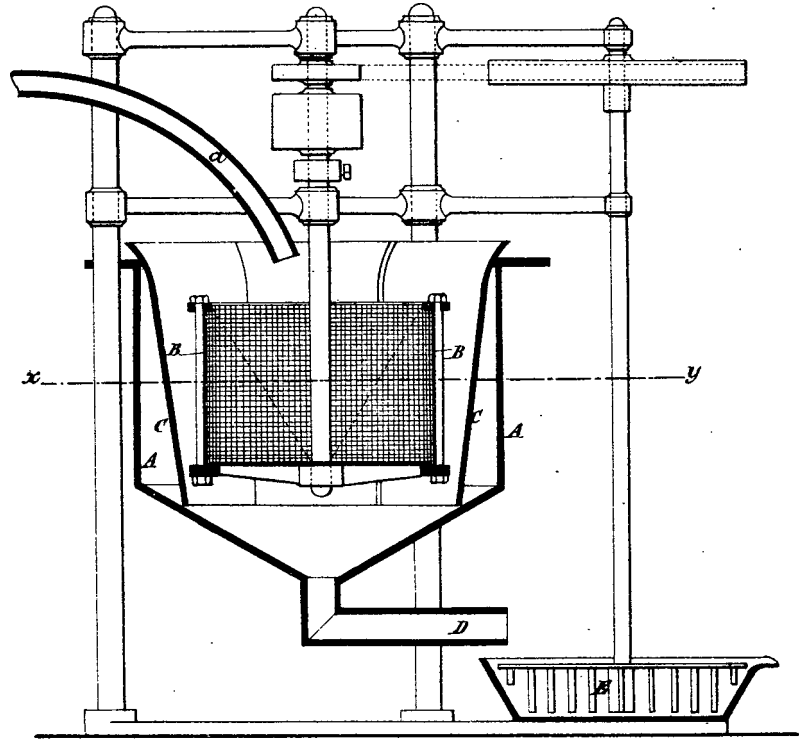
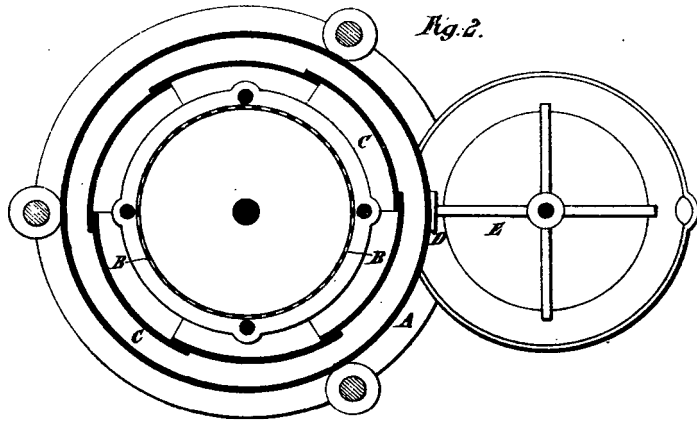


Fig. 2.



*This is the Sheet of Drawings referred to in the annexed
 Letters of Registration granted to Pierce Butler Wilson,
 this nineteenth day of September, A.D. 1881. Augustus Loftus.*

Fig. 34.

PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE,
 SYDNEY, NEW SOUTH WALES.



A.D. 1881, 24th September. No. 986.

IMPROVED APPARATUS FOR CHEMICAL AND METALLURGICAL PROCESSES.

LETTERS OF REGISTRATION to Juan Francisco Nepomuceno Macay, for an Improved Apparatus for dissolving and filtering and for effecting chemical reactions in Chemical and Metallurgical Processes.

[Registered on the 24th day of September, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS JUAN FRANCISCO NEPOMUCENO MACAY, of Charapoto, Ecuador, South America, and temporarily of 53, Chancery-lane, in the county of Middlesex, England, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improved Apparatus for dissolving and filtering and for effecting chemical reactions in Chemical and Metallurgical Processes," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Juan Francisco Nepomuceno Macay, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said Juan Francisco Nepomuceno Macay, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said Juan Francisco Nepomuceno Macay shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this twenty-fourth day of September, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improved Apparatus for Chemical and Metallurgical Processes.

SPECIFICATION of JUAN FRANCISCO NEPOMUCENO MACAY, of Charapoto, Ecuador, South America, and temporarily of 53, Chancery-lane, in the county of Middlesex, England, for an invention of "Improved Apparatus for dissolving and filtering and for effecting chemical reactions in Chemical and Metallurgical Processes."

My invention relates to improved apparatus for use in effecting the operations of dissolving solids in liquids and producing chemical reactions, and of filtering or separating liquids from solids in chemical and metallurgical processes, in which a soluble substance or substances mixed or combined with an insoluble substance or substances is or are to be dissolved separately or together, wholly or partially, in a given solvent or solvents, and the solution separated by filtration from the undissolved residue.

In effecting the separation of liquid from solid matters by filtration it is of importance to keep the filtering surface from being clogged by the particles of solid matter, and to present a clear and unobstructed filtering surface for effecting the rapid separation of the liquid from the solid matters. In the apparatus of my invention this important condition is realized in a very effective manner, the construction and operation of the apparatus being as follows:—

Within a cylinder of wood, or other material not chemically acted on by the materials treated or the reagents employed, is enclosed an inner cylinder of hard-wood or of hard earthenware, or stoneware, or other material not chemically acted on by the materials treated or the reagents employed, this inner cylinder being perforated with holes and lined internally or externally (but preferably internally) with asbestos cloth or other suitable filtering material. Between the inner and outer cylinders there is an annular space, and the inner cylinder is kept in place by longitudinal and circumferential partitions, the former of which divide the annular space into a number of distinct compartments, each provided with a draw-off cock for running off the liquid when separated by filtration. This cylinder is capable of being rotated, and is provided with doors or man-holes in one of the heads, by which the matters to be treated may be introduced and the undissolved residue removed; and the cylinder is also provided with a tubular journal or journals for the introduction of steam, water, air, or other liquids or gases, under pressure or otherwise, which may be blown, forced, or drawn into the annular space for the purpose of keeping the filtering surface clear and of acting chemically or mechanically upon the contents of the cylinder. I place within the inner cylinder the ore or other matter to be treated (previously ground or otherwise reduced to a pulverulent state), together with the reagents or solvents by which it is to be treated. By imparting rotary motion to the cylinder (the draw-off cocks and man-holes being closed) the solid matters are brought into intimate contact with the solvents or reagents, and by forcing steam, water, air, or other liquids or gases into the space between the inner and outer cylinders and thence through the filtering medium into the inner cylinder, any solid matters that may adhere to the filtering surface are disengaged therefrom, whereby the said surface is kept clear, the solid matters are kept in suspension in the liquid, and chemical action which the liquid or gaseous reagents may be capable of exerting on the said matters takes place under the most favourable circumstances as regards the intimate mixture of the reagents with the matters and the large surfaces exposed to their action. The annular space between the inner and outer cylinders being divided into compartments by longitudinal divisions, the liquid which passes through into it is carried round by the rotation of the cylinder, and flows back into the inner cylinder, thus helping to keep the filtering surface clear and unobstructed. When the soluble substances are dissolved or chemically acted on, and it is desired to separate the liquid from the solid matters, the draw-off cocks are opened, and then by giving a slow rotary motion to the apparatus the liquid may be decanted off from the bulk of the solid matter, and at same time filtered from any such matters which it may hold in suspension, by passing through the filtering medium. By this rotary decanting action a practically clear filtering surface, unobstructed by solid matter, is constantly presented for the liquid to pass through.

Having described the general nature of my invention, I will proceed to describe in detail the construction of the apparatus, as illustrated in the accompanying drawings; but I would here observe, that although I at present prefer the construction herein represented, I do not limit myself to the details thereof, nor to the use of any particular material, but would select such as would be best adapted to resist the action of the reagents employed in each particular case.

DESCRIPTION OF DRAWINGS.

Figure 1 is a rear end elevation of the rotary filter, with one-half of the end cover removed, and partly in section on line A B, figure 2. Figure 2 is a longitudinal section of the filter on line C D, figures 1 and 3. Figure 3 is a front end elevation, with one-half in section through the middle on line E F, figure 2.

It is preferred in most cases to construct the filter in the following manner:—A $A^1 A^2$ is the outer barrel or cylinder, and B is the inner barrel or cylinder. When made of wood the outer cylinder is preferably made of the barrel-shape shown, and is built up of a number of staves jointed together and bound by iron hoops, as usual in cask-making. The end hoops a are preferably made of angle iron for another purpose hereafter described. The heads $A^1 A^2$ are bound with iron hoops, and are tied to the body of the cask by tie-rods a^1 passing through an iron ring on the face of the head and through the flange of the angle iron hoops a , and are screw-threaded and furnished with nuts, a^2 , which bear against the face of the heads, and with other nuts, a^3 , which bear against the angle iron hoops a , so as to draw them tight on the body of the cask and permit of either one or both the heads $A^1 A^2$ being removed for access to the interior of the filter. A watertight joint is made between each head and the body of the barrel by an india-rubber ring compressed in a shallow groove in the head, as shown at a^4 .

The inner cylinder B is preferably in the form of a polygonal prism, or it might be a true cylinder, and is placed concentrically within the outer barrel, and is also constructed of staves jointed together and supported by three wooden rings, $C^1 C^2 C^3$, made in segments and fitted within the outer barrel A. On the inside the ends of the staves butt against a strengthening lining, a^5 , fixed to the inside of the heads. Between the inner and outer barrel there is a space, which is divided into segmental compartments D by longitudinal watertight partitions d , which also serve to support the inner cylinder. The compartments at opposite sides of the central ring C^2 communicate by openings c in said ring, and each compartment is furnished with a draw-off cock, E. The staves of the inner cylinder are perforated with holes, b , placed as close

Improved Apparatus for Chemical and Metallurgical Processes.

close as possible together, and are covered over the whole internal surface with asbestos cloth, F, or other suitable filtering medium. The cloth is secured in place by its edges being caulked with asbestos yarn or asbestos cloth cuttings into grooves, *f*, along the joints of the staves; and across the ends thereof, G, are dash-boards arranged around the interior of the inner cylinder, and placed by preference in the inclined or tangential position shown, but they might be radial or otherwise. Half the number of these dash-boards, *i.e.*, the alternate ones, are carried by the arms of end frames, *g*, fitting within the inner cylinder and abutting against the heads. The intermediate dash-boards are carried at one end by the man-hole doors, hereafter referred to, and fit at the other end in recesses *g'* in the opposite head of the cylinder. These dash-boards are preferably set at such inclination and distance apart that when the cylinder is rotated in the direction of the arrow *x* the matters carried round by them will fall from dash-board to dash-board, and so avoid injury to the filtering cloth by hard substances falling upon it. When rotated in the direction of the arrow *y* (which would be the ordinary way of revolving it when the solid matters treated have been finely ground) the dashboards collect the solid and liquid matters, raise and allow the same to drop from a height, thereby ensuring their thorough agitation and intimate mixture. The use of these dash-boards is not obligatory; they may be dispensed with in some cases when a less energetic mixing action and a clearer filtrate are required.

The head A² is provided with man-holes, H, preferably four in number, closed by flanged covers H¹, made watertight by india-rubber washers, and secured by cross-bars, *h*, pivoted at one end to the head and secured at the other end by a nut, the covers having a slightly convex surface so that the cross-bar shall bear on the centre thereof. At the centre of the head A² there is an aperture closed when working under pressure by a similar cover, H³, secured in the same way as the man-hole covers, or left open to permit the escape of air, gases, or liquid blown in, as herein described. The aperture may also be used for charging, and as a sight-hole.

The rear head A¹ has a number of radial passages, I, on the outside, leading one to each compartment, D, of the annular space, with which they communicate by openings, *i*, through the head A¹. These passages, I, radiate from a central distributing valve, consisting of an outer shell, K, screwed to the head, an intermediate conical sleeve, L, ground into the outer shell, and an inner tubular plug, M, attached to a supply pipe, N. The outer shell K is in constant communication with all the passages I by ports *k*; the sleeve L has one or more ports, *l*, and is adjusted and fixed in any desired position by a hand-wheel, O, and tightening screw, *o*. The outer shell K revolves upon this sleeve, L, with the barrel, and thus the radial passages I are brought in succession into communication with the supply pipe N at any desired point or points of the revolution, so that fluid may be forced into or withdrawn from any of the compartments of the annular space at will, and consequently to or from the inner cylinder through the filtering surface, and through the contents of the barrel or not, as may be required.

The inner tubular plug M is ground into the intermediate sleeve L, and is preferably coned to a rather more acute angle than the latter. The inner plug is carried past the port *l* of the intermediate sleeve by feathers or ribs, *m*, so as to give an all-round port, and terminates at the inner end in a ring, *m'*, receiver within the intermediate sleeve L, whose inner end is received in a bearing, R¹, of the outer shell, the whole being tied together by a central bolt, P. These parts, K, L, M, N, would be made of metal, unless it be desired to siphon out or exhaust the liquid through them, in which case they would be preferably made of glass or porcelain, if the liquids are liable to act on metals.

The entire filtering barrel is carried upon grooved rollers, R, mounted in a suitable frame or cradle, S, the angle iron hoops *a* running in the grooves of the rollers. The barrel may be revolved by hand or power through suitable gear. When made of wood I prefer teak or other hard wood for the outer barrel, and pine for the inner barrel and dash-boards.

It will be seen that in the construction of the filter, as above described, care is taken to avoid the use of any metallic parts within the filter, which is important when the reagents to be employed are of such a nature as to act chemically thereon. For certain purposes, however, both the inner and outer barrels might be made of cast-iron or other metal, and other filtering materials than asbestos cloth might be used when no reagents are employed which are capable of exerting any chemical action upon such metals or other substances. When the substances treated or the reagents employed are of such a nature that the use of wood or metals is inadmissible, the inner and outer barrels might be made wholly or partly of earthenware, which, in the case of small filters, might be moulded in one or more pieces, or built up of slabs or staves of earthenware, and bound with hoops as above described.

Having described the nature of my invention and the manner of performing the same, I declare that what I claim as new and desire to secure by Letters Patent is—

- 1st—A rotary decanting filter, constructed of an inner and outer barrel or shell with an intervening annular space, the inner shell being perforated and covered with filtering material, for use as and for the purposes specified.
- 2nd—A rotary decanting filter, constructed of an outer barrel or cylinder and an inner perforated shell covered with filtering material, the intervening space being divided into segmental compartments, for use substantially as and for the purposes specified.
- 3rd—A rotary decanting filter, constructed as herein specified, and provided with means as herein specified for forcing in or drawing off steam or air-gases or liquids through the filtering material and through the contents of the apparatus or not, as may be required.
- 4th—The rotary decanting filter, constructed and operating substantially as shown and described, for the purposes specified.

In witness whereof, I, the said Juan Francisco Nepomuceno Macay, have hereunto set my hand and seal, this first day of July, A.D. 1881. J. FRANCO. N. MACAY.

This is the specification referred to in the annexed Letters of Registration granted to Juan Francisco Nepomuceno Macay, this twenty-fourth day of September, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Improved Apparatus for Chemical and Metallurgical Processes.

REPORT.

Sir,

The application of Mr. J. F. N. Macay for Letters of Registration for "Improved Apparatus for dissolving and filtering and for effecting chemical reactions in chemical and metallurgical processes" having been referred to us, we have examined the specification and drawings accompanying the same, and have now the honor to report that we see no objection to the issue of Letters of Registration as prayed for.

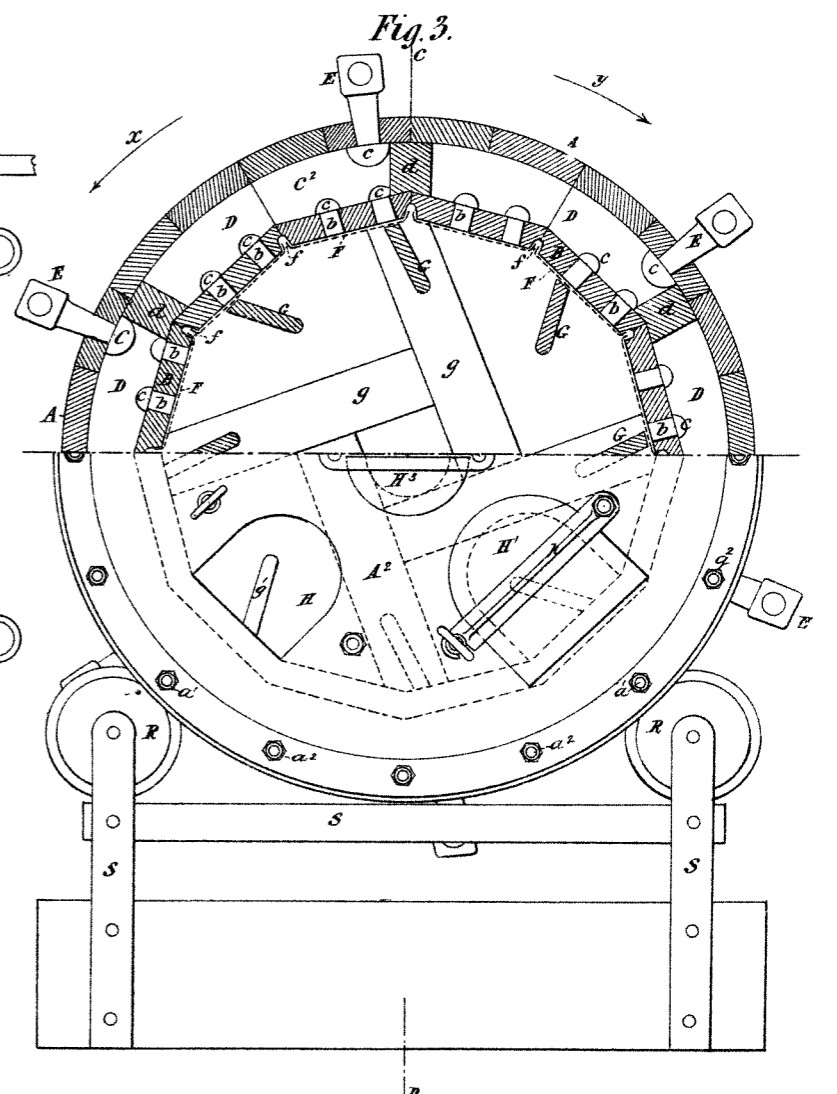
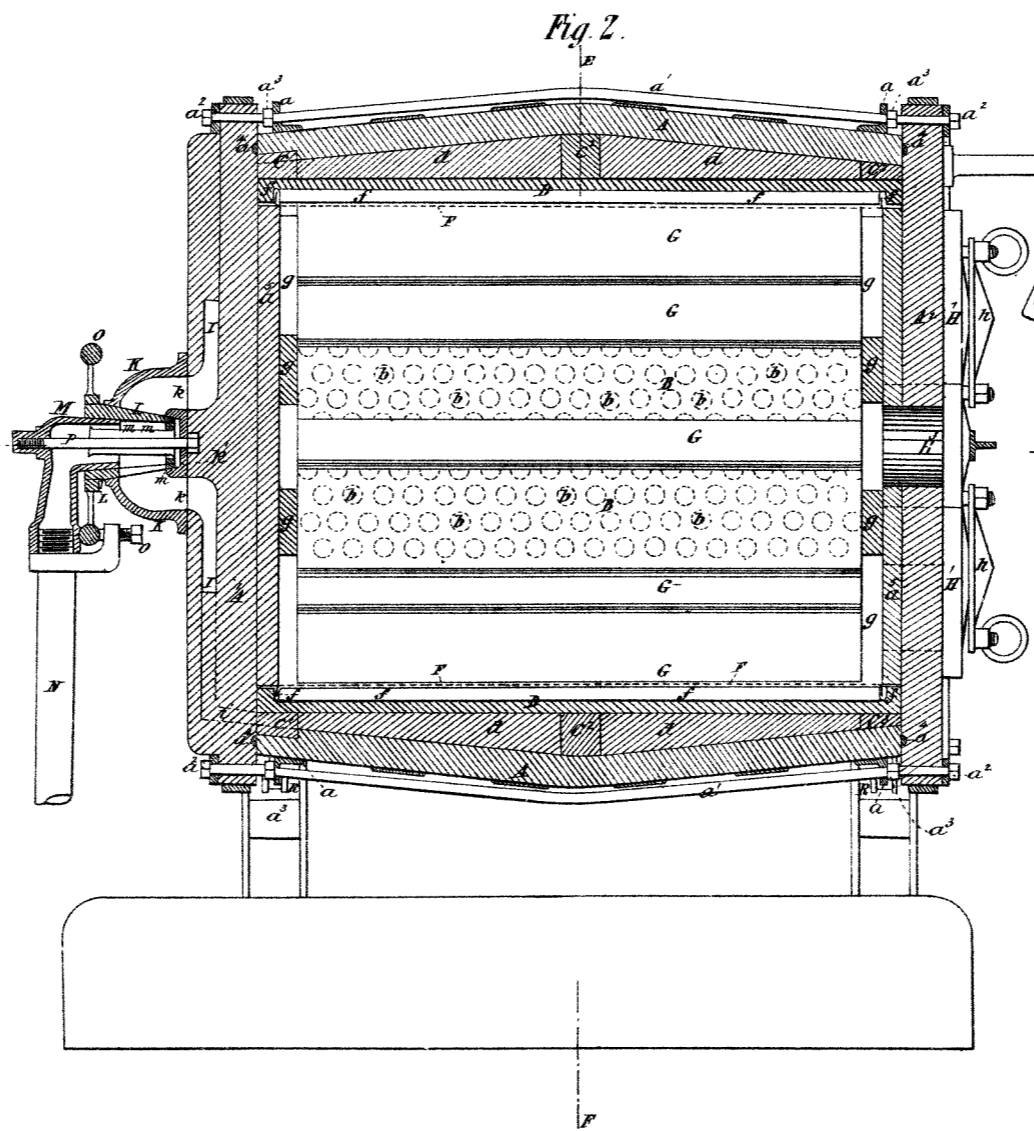
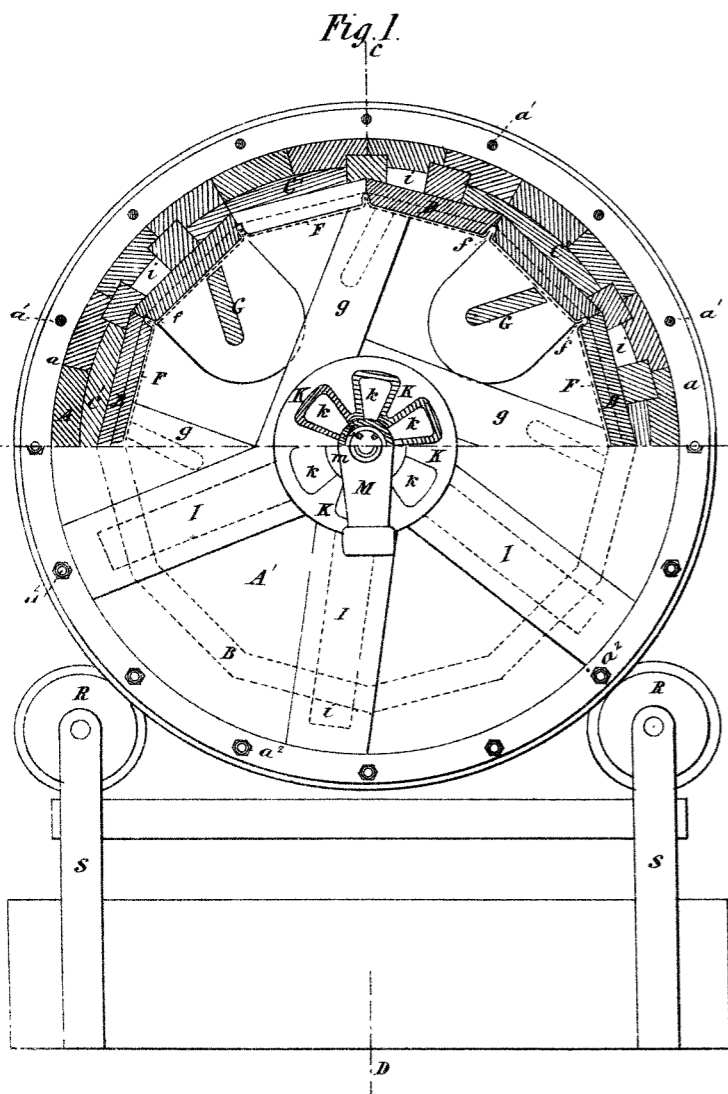
We have, &c.,

J. SMITH.

CHAS. WATT.

The Under Secretary of Justice.

[Drawings—one sheet.]



*This is the Sheet of Drawings referred to in the annexed
Letters of Registration granted to Juan Francisco
Nepomuceno Macay, this twenty fourth day of September
1881.
Augustus Loftus.*

Fig. 3A.



A.D. 1881, 24th September. No. 987.

**IMPROVEMENTS IN DEVICES FOR MEASURING THE ELECTRIC CURRENT
PASSING THROUGH OR USED UPON A CERTAIN CIRCUIT.**

LETTERS OF REGISTRATION to Thomas Alva Edison, for Improvements in devices for measuring the electric current passing through or used upon a certain circuit.

[Registered on the 24th day of September, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS THOMAS ALVA EDISON, of Menlo Park, in the State of New Jersey, United States of America, electrician, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in devices for measuring the electric current passing through or used upon a certain circuit," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed ; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four ; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years : And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Thomas Alva Edison, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof ; to have, hold, and exercise unto the said Thomas Alva Edison, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended : Provided always, that if the said Thomas Alva Edison, shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this twenty-fourth day of September, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in devices for measuring the electric current

SPECIFICATION.

TO ALL WHOM IT MAY CONCERN: Be it known that I, THOMAS ALVA EDISON, of Menlo Park, in the State of New Jersey, United States of America, electrician, have invented an "Improvement in devices for measuring the electric current passing through or used upon a certain circuit," of which the following is a specification.

My invention relates to apparatus for measuring the quantity of electric current passing through a circuit in a given time, and is one of those devices to which I have applied in prior Patents the name "Vebermeter."

It has for its object the ensuring of greater accuracy in recording, when in various conditions as to temperature.

My arrangement, generally, consists of an electro-depositing cell, the anode and cathode of which are plates, the weight of which has been carefully determined. It is placed in a shunt circuit to that of which the current is to be measured, the latter containing a resistance so that a definite proportional part of the current will be shunted through the cell. After the lapse of a proper interval of time, the cathode and anode plates are weighed and the difference in weight noted, this difference showing the amount of current which has passed through the shunt (or only one may be weighed), and this being proportional to the current on the main circuit, the latter is easily determined.

In practical use, however, a rise or fall of temperature would decrease or increase the resistance of the cell, and so allow a larger or a less quantity of current to pass through the shunt circuit.

To obviate this phenomenon, I place at a point in the shunt a metallic resistance, preferably of copper, which increases when the temperature rises, while the resistance of the cell diminishes.

This resistance therefore must be proportioned to that of the cell; for instance, if the latter contains a 20 per cent. solution of copper sulphate, the copper wire resistance must be three times as great as that of the cell, in order that they may continue to balance, and render nugatory the effects of a rise and fall of temperature.

In practice it may be well to use two cells, in one of which the deposition takes place with greater rapidity than in the other, the former being opened, inspected, and weighed at proper intervals, while the latter is kept locked, and used as a "check meter," to ensure absolute correctness in the charges, and to protect the seller of electricity from fraud.

Suitable devices for carrying my invention into effect are shown in the drawings, in which figure 1 is a front elevation of a box or case containing two cells, which constitute a meter; figure 2 is an elevation of the two cells, with diagram of the circuit connections and resistances; figure 3 is a detailed view in section of a portion of a cell; and figure 4 is a section of another form of cell which may be used.

A is a box containing the two electro-depositing cells B C, one of which, B, is arranged to deposit with greater rapidity than the other, this being easily accomplished by varying either the size of the plates, their distance apart, the strength of the solution, or the amount of current shunted through it.

The box has two doors, one of which, D, encloses only the cell C, which is intended to be kept locked, while the outer door E is opened for inspection of the cell B.

In figure 2, 1 2 are the main conductors from which a derived or multiple arc circuit, 3 4, leads into a house in which the meter B C is placed, for measuring the current passing through the house.

Resistances R R' deflect portions of the current into the shunt circuits 5-6 and 7-8, the resistance R' being less than R, so that a greater current enters the cell B than that which passes through C.

$a a$ are the anode and $c c$ the cathode plates, one of which in each cell is arranged so as to be withdrawn from the cell, while the other is permanently fixed therein. $s s'$ are resistances of fine copper wire placed in the shunt circuits.

In figure 3 the arrangement for readily removing one of the electrode plates is shown.

A projection, e , with a rounded top extends above the top F of the cell, and the plate c is made with a curved or hooked portion, G, which hangs over e , and is secured by a thumb-screw, H, which also serves to secure the wire 7. The electrode passes through an aperture, f , in the cover of the cell. The other electrode may be held firmly, connection being made thereto from the wire 8, by means of a set screw, J. The operation of these devices is as follows:—

Current passing through the shunt circuit 7-8 deposits copper on the cathode c of the cell B. If the solution in B becomes heated by the temperature of the room rising, its resistance diminishes, but at the same time the resistance s is increased correspondingly, so that the amount of current passing remains the same.

When measurements are desired, the door E is opened to obtain access to the cell B, the thumb-screw H is loosened, and the plate c raised from the cell, and its increase of weight determined. From this the current passing through the main line is computed.

If it is desired to substantiate or prove the indications of the cell B, the cell C is examined, and one or both of its electrodes weighed, this cell being arranged to allow of a smaller amount of deposition than the cell B.

A convenient arrangement for accomplishing this is illustrated in figure 4. Here the cylinders $a a$ form the anode and $c c$ the cathode, the difference in diameter of a and c producing the difference in deposition. The cells are so arranged in branch circuits, as seen in the figure, that only one shunting resistance, r , and one compensating resistance, t , need be used.

What I claim as my invention is—

First—A vebermeter consisting of two electro-depositing cells, one of which deposits with greater rapidity than the other, substantially as and for the purpose described.

Second—The combination with an electro-depositing cell of a resistance whose increase compensates for the decrease in resistance of the cell, substantially as set forth.

Third—The combination with the cathode plate of an electro-depositing cell, having a curved or hooked extremity, of a projection extending above the cell, and a set-screw for attaching the cathode plate to the projection, substantially as set forth.

Fourth—

passing through or used upon a certain circuit.

Fourth—The combination in a vebermeter of two electro-depositing cells, having circular cathode plates of different diameters, substantially as and for the purposes described.

Fifth—The combination in a vebermeter of two electro-depositing cells, one of which acts as a check to prove the other, substantially as set forth.

Signed by me this sixth day of June, A.D. 1881,—

THOMAS ALVA EDISON.

Witnesses—

CHAS. H. SMITH.

GEO. T. PINCKNEY.

This is the specification referred to in the annexed Letters of Registration granted to Thomas Alva Edison, this twenty-fourth day of September, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 25 August, 1881.

In reply to your blank cover communication of the 16th instant, No. 7,928, transmitting for our report Mr. Thos. Alva Edison's Petition for the registration of an invention entitled "Improvements in devices for measuring the electric current, passing through or used upon a certain circuit," we do ourselves the honor to state that we are of opinion the prayer of the Petition may be granted.

We have, &c.,

E. C. CRACKNELL.

G. K. MANN.

The Under Secretary of Justice.

[Drawings—one sheet.]

Fig. 1.

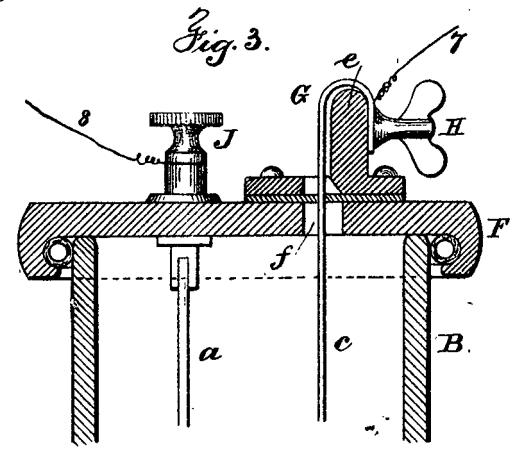
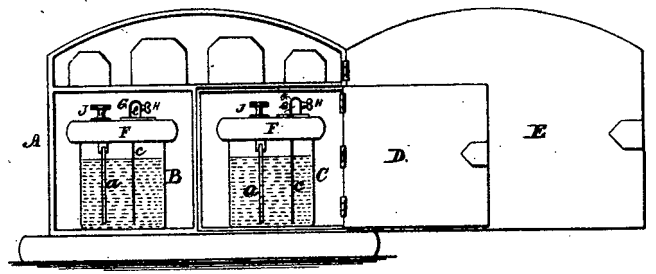


Fig. 2.

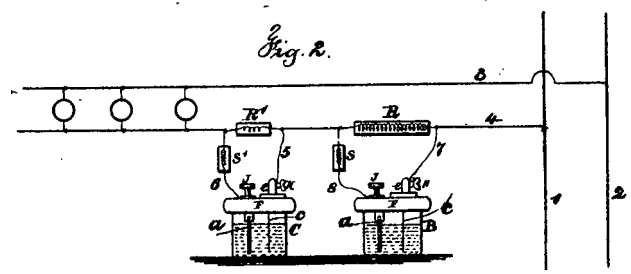
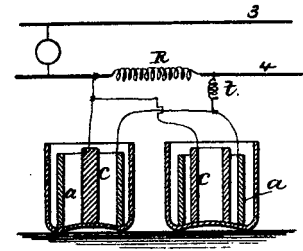


Fig. 4.



Thomas Alva Edison
Inventor

Witnesses
Chas. H. Smith
J. Hall

This is the Sheet of Drawings referred to in the annexed Letters of Registration, granted to Thomas Alva Edison this twenty-fourth day of September, A.D. 1881. Augustus L. Ortus.



A.D. 1881, 24th September. No. 988.

AN IMPROVED METHOD OF WASHING SHEEP.

LETTERS OF REGISTRATION to Francis Seaman, for an improved method of washing Sheep and preventing cruelty to animals.

[Registered on the 24th day of September, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS FRANCIS SEAMAN, of Calabash Station, Marengo, in the Colony of New South Wales, sheep-station manager, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "An improved method of washing Sheep and preventing cruelty to animals," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed ; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four ; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years : And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Francis Seaman, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof ; to have, hold, and exercise unto the said Francis Seaman, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended : Provided always, that if the said Francis Seaman shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this twenty-fourth day of September, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

An improved method of washing Sheep.

SPECIFICATION.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, FRANCIS SEAMAN, of Marengo, in the Province of New South Wales, sheep-station manager, send greeting :

WHEREAS His Excellency the Right Honorable Lord Augustus Loftus, G.C.B., Governor and Commander-in-Chief of Her Majesty's province of New South Wales, by Letters Patent bearing date the day of _____, in the year of our Lord one thousand eight hundred and eighty-one, did, for himself, his heirs and successors, give and grant unto me, the said Francis Seaman, my executors, administrators, and assigns, or such others as I, the said Francis Seaman, my executors, administrators, or assigns, should at any time agree with, and no other, from time to time, and at all times thereafter during the term therein expressed, should, and lawfully might, make use, exercise, and vend, in the province of New South Wales, certain improvements known as "An Improved method of washing Sheep and preventing cruelty to animals," upon the condition, among others, that I, the said Francis Seaman, by an instrument in writing under my hand and seal, should particularly describe and ascertain the nature of the said improvements, and in what manner the same were to be performed, and cause the same to be filed in the Registry Office within six calendar months next and immediately after the date of the said Letters Patent : Now know ye that I, the said Francis Seaman, do hereby declare the nature of my said improvements, and in what manner the same are to be performed, to be particularly described and ascertained in and by the following statement, that is to say,—By the old process of washing sheep they were driven up to the brink of the soak-hole, and then thrown violently into the water, frequently receiving great injury from the careless manner in which they were handled ; by my invention the sheep would be driven into trucks or pens running on a tramway line, and when brought to the edge of the soak-hole the truck or pen would then be so arranged, as described in the drawing, to tilt up and precipitate the sheep into the water. After discharging the cargo, the weight of the truck or pen is so constructed as to fall into its proper place again, and the truck is then run off the line on to a siding, and so back to the yards, so as to allow the other trucks or pens to take its place. The old race in the drawing 1 shows the ground plan of the old method of driving the sheep up to the catching-pen, from whence they were thrown in. The figures 1111 show the ground plan of the tramway with the trucks placed in position ready to receive the sheep, and are kept from moving by the figure gate A. The tramway is the line on which the trucks run on to the edge of the soak-hole, as shown in drawing 2. The soak-hole, washing-pens, and swim-out are shown by the floating panel work in drawing 1. The tilting part in drawing 2 shows the part of the tram-line which is so constructed that when the truck is right out to the end it tilts up and gently throws the sheep into the water. The rod running from the frame with peg-holes to a small upright with peg-holes, on which rod a wheel works at each end of the door of the truck or pen, which door rises as it approaches the end of the tram rails, and so opens.

Having fully described and ascertained the nature of my invention and the manner in which I propose to work it, I claim—

First—Considerable saving of labour and expense.

Second—Prevention of cruelty to animals, and the unnecessary handling of sheep.

Third—Advantage to water-holes or dams, in being able to move the apparatus from one place to another, and also of stowing it away when the sheep-washing has finished ; and as regards the trucks and improved carriage for loading and unloading sheep for any purpose.

In witness whereof, I have, this fifteenth day of August, in the year of our Lord one thousand eight hundred and eighty-one, hereunto set my hand and seal.

FRANCIS SEAMAN,
Sheep-station Manager, Marengo.

Witnesses—

T. B. HALES, 3, Bridge-street, Sydney.
WM. GOODRIDGE.

This is the specification referred to in the annexed Letters of Registration granted to Francis Seaman, this twenty-fourth day of September, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 24 August, 1881.

We do ourselves the honor to report, in reply to your blank cover communication of the 17th instant, No. 8,186, transmitting Mr. Francis Seaman's Petition for the registration of "An improved method of washing Sheep and preventing cruelty to animals," that we are of opinion the prayer of Mr. Seaman's Petition may be granted in terms of his specification.

We have, &c

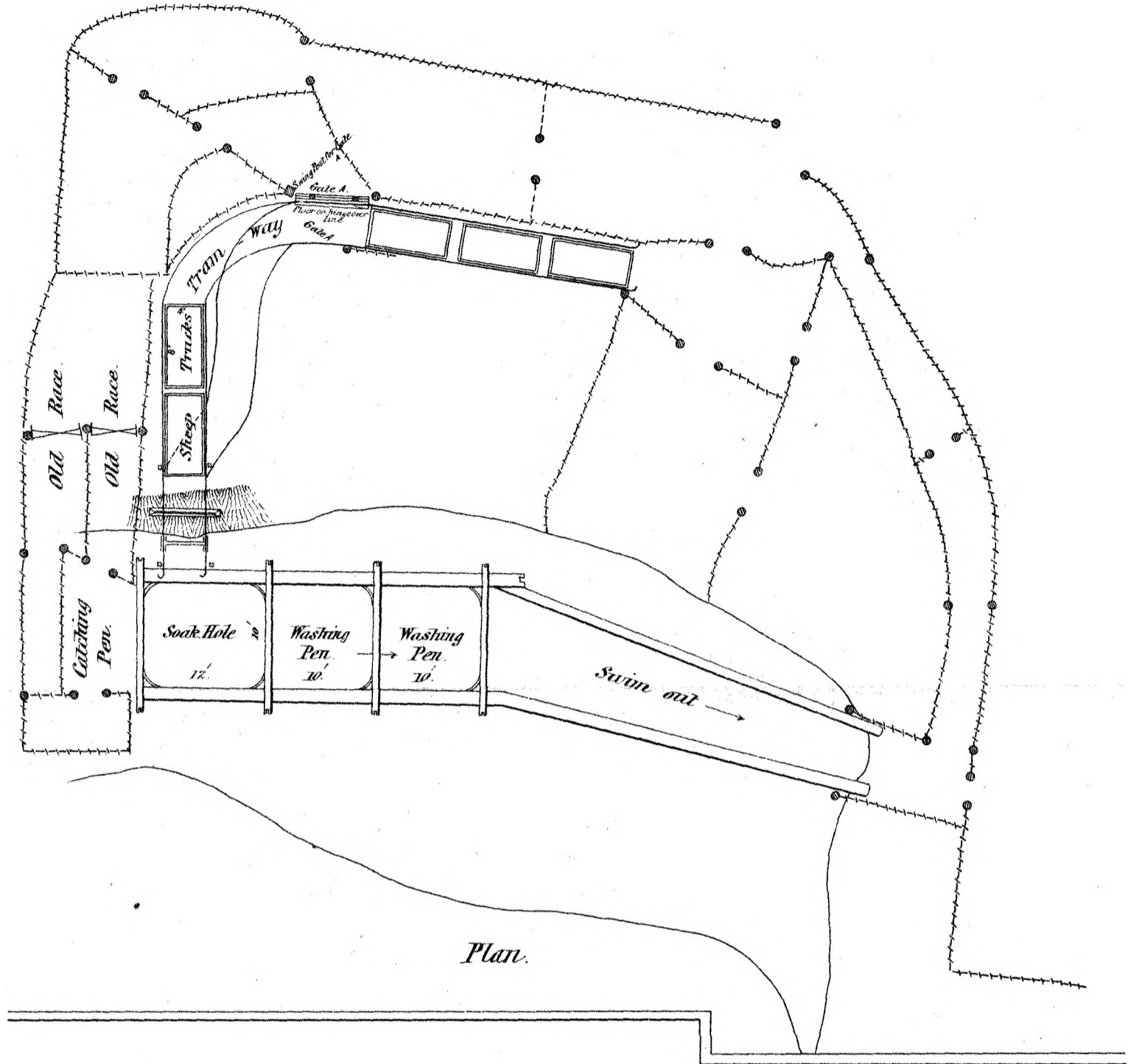
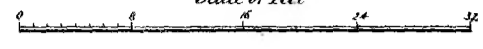
G. K. MANN.
R. G. MASSIE.

The Under Secretary of Justice.

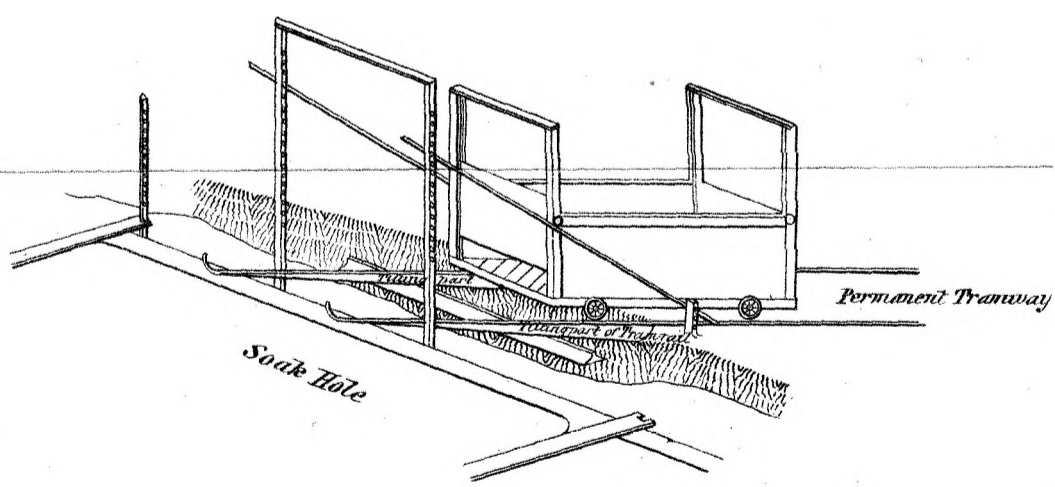
Plan.

Illustrating the application of Tramways and Trucks to Sheep washing operations.

Scale of Feet



Plan.



Truck approaching Soak Hole

Scale of Chains



This is the Sheet of Drawings referred to in the annexed Letters of Registration granted to Francis Seaman, this twenty fourth day of September, A. D. 1881.

Augustus Loftus.



A.D. 1881, 24th September. No. 989.

IMPROVEMENTS IN MACHINES FOR THRASHING GRAIN.

LETTERS OF REGISTRATION to James Martin, John Felix Martin, and Frederick May, for Improvements in Machines for thrashing Grain.

[Registered on the 24th day of September, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting:

WHEREAS JAMES MARTIN, JOHN FELIX MARTIN, and FREDERICK MAY, of South Australia, carrying on business together under the style or firm of "James Martin & Co.," have by their Petition humbly represented to me that they are the authors or designers of a certain invention or improvement in manufactures, that is to say, of an invention for "Improvements in Machines for thrashing Grain," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed; and that they, the said Petitioners, have deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and have humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to them for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said James Martin, John Felix Martin, and Frederick May, their executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said James Martin, John Felix Martin, and Frederick May, their executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said James Martin, John Felix Martin, and Frederick May shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this twenty-fourth day of September, in the year of our Lord one thousand eight hundred and eighty-one.

[I.S.]

AUGUSTUS LOFTUS.

Improvements in Machines for thrashing Grain.

SPECIFICATION of Machine for thrashing Wheat or Barley in damp or cool weather without breaking or damaging the grain.

DIAGRAM marked No. 1 shows the position of the spiked cylinder in the machine, and the grain, after being taken off by the beaters in the front of the machine, is sent up and passed between the spikes in the cylinder and the concave spiked board, and is most effectually thrashed without damaging the grain.

Diagram No. 2 is a representation of the thrashing board and spiked cylinder in a longitudinal section as it is fixed in the machine. The spiked cylinder is driven from the belt-wheel shaft by a belt.

Our claim for Patent for improvements in machinery for thrashing grain is, that by introducing the spiked roller and board into the body of the *ordinary* stripper the work of thrashing in cool or damp weather is greatly improved and made possible.

The *actual position* of the roller and board, or the shape of them, is not so much what we rely upon.

We have made different sorts of rollers, and worked them by other methods (as by cog-wheels, instead of belt), but as the result of long and continued experiment we find that the gear as shown in the sketches is the best adapted for the work it has to do.

So far as we are aware no other maker has made such an improvement to the ordinary stripper and introduced it into New South Wales, and we hold the only Patent in connection with such a thing for the Colonies of South Australia and Victoria, having purchased it from the original proprietor; and although we have already sold several "damp-weather strippers" in New South Wales, we consider ourselves, for reasons given above, justified in applying for a Patent for the improvement.

We have no wish to patent the stripper *as a whole*, but only that portion relating to using a spiked roller and spiked board in the machine to facilitate thrashing in damp or cool weather.

JAMES MARTIN & CO.,
Per PAINE.

This is the specification referred to in the annexed Letters of Registration granted to James Martin, John Felix Martin, and Frederick May, this twenty-fourth day of September, A.D. 1881.

AUGUSTUS LOFTUS.

REPORTS.

Sir,

Sydney, 3 June, 1881.

Having examined the application from Messrs. James Martin & Co. for a Patent for a Thrashing Machine, and also the specification and plans of the same, we are of opinion that the specification is not sufficiently explanatory or definite, nor is the specific invention or improvement set forth for which Letters of Registration are claimed.

We therefore suggest that the application should be referred back to Messrs. James Martin & Co. for further information.

We have, &c.,

EDMUND FOSBERY.
ROBERT G. MASSIE.

The Under Secretary of Justice.

Sir,

Sydney, 21 June, 1881.

In compliance with the instructions conveyed in your B.C. minute, dated the 17th ultimo, and letter of the 17th instant, requesting us to inquire into the Petition of Messrs. Martin & Co. for Letters of Registration for improvements in Machinery for thrashing Wheat or Barley, we have the honor to report that there does not appear to us to be sufficient novelty of invention to entitle Messrs. Martin & Co. to a Patent for the machine *as a whole*.

They have still failed to specify the particular improvement or invention upon which they found their claim, beyond the slight variation in the position of the spikes or teeth set in the roller and the concave shape of the thrashing-board. For these slight improvements in the machine we think Letters of Registration might be granted, but not for the machine as a whole, as described by the drawings and specifications.

We have, &c.,

EDMUND FOSBERY.
ROBERT G. MASSIE.

The Under Secretary of Justice.

Sir,

Sydney, 18 August, 1881.

We have the honor to report that, having further considered Messrs. Martin & Co.'s application for a Patent, we see no objection to it being granted for improvements in the introduction of a spiked roller and board as described, into an ordinary stripper, whereby the thrashing of grain is facilitated.

We have, &c.,

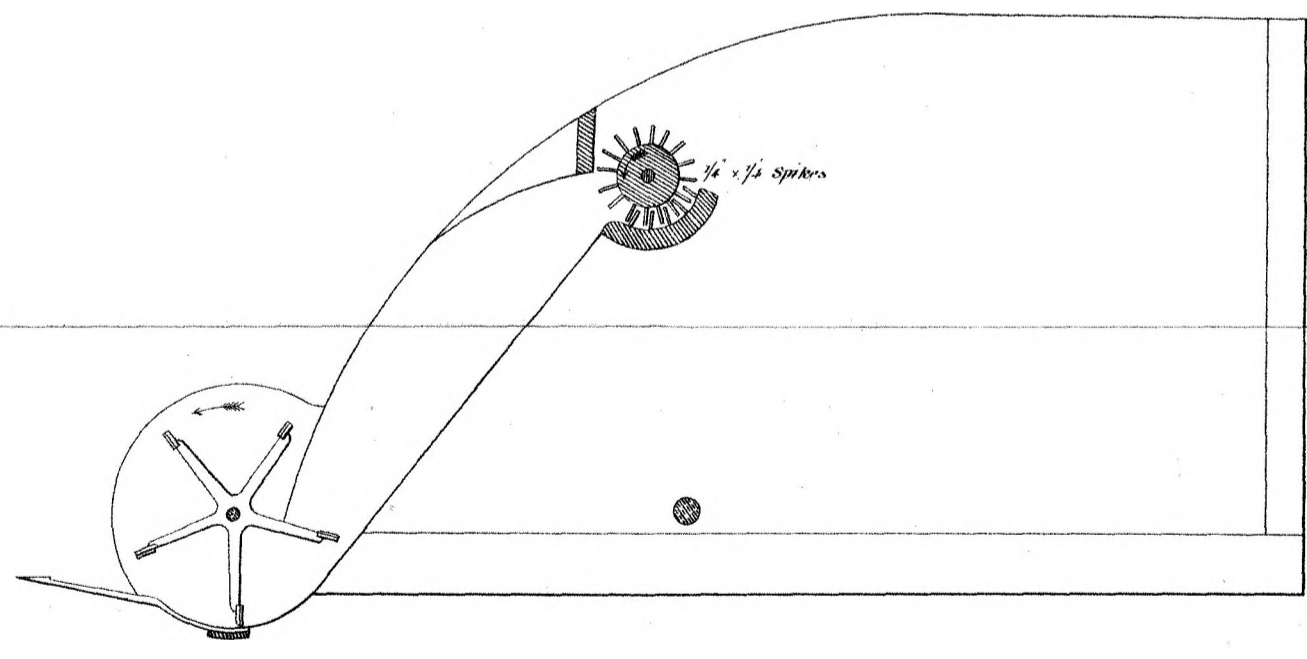
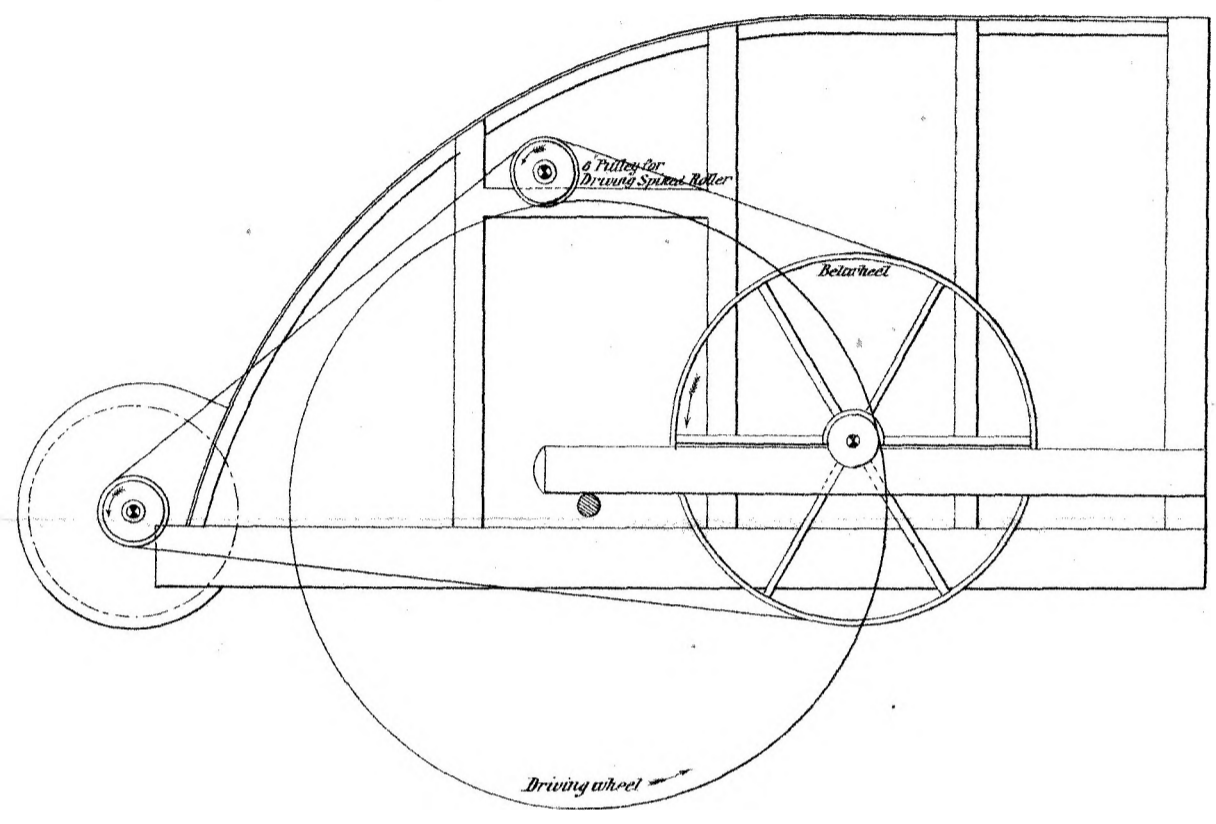
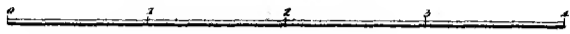
EDMUND FOSBERY.
R. G. MASSIE.

The Under Secretary of Justice.

J A S MARTIN & CO'S

Improved Threshing Gear

Scale.



This is the Sheet of Drawings referred to in the annexed Letters of Registration granted to James Martin, John Felix Martin, and Frederick May, this twenty fourth day of September, A.D. 1881.
Augustus Loftus.



A.D. 1881, 4th October. No. 990.

AN IMPROVED HARROW OR GRUBBER.

LETTERS OF REGISTRATION to Thomas Haxton, for an Improved Harrow or Grubber.

[Registered on the 4th day of October, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting:

WHEREAS THOMAS HAXTON, of Gore, in the Provincial District of Otago and Colony of New Zealand, blacksmith, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled an "Improved Harrow or Grubber," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Thomas Haxton, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said Thomas Haxton, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said Thomas Haxton shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this fourth day of October, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

An improved Harrow or Grubber.

SPECIFICATION of THOMAS HAXTON, of Gore, in the Provincial District of Otago and Colony of New Zealand, blacksmith, for an invention entitled an "Improved Harrow or Grubber."

THE invention of an improved harrow or grubber, for harrowing, grubbing, and breaking up ground, consists of a number of pieces of bar or rod iron formed and twisted in such a manner that they are easily linked or hooked together with the teeth or tines, which are part of the pieces pointing downwards, and which pieces may be as easily unlinked or unhooked again, or rolled up for the purpose of carriage. Any number of them may be linked or hooked together without the use of any chain or split links, so as to form the harrows or grubbers of any size or width, which can be hooked to and pulled by the ordinary whipple tree. They may be used either with the teeth or tines pointing downwards, or by turning them over they may be used as chain harrows. From the shape and manner in which the pieces are made and linked or hooked together it is almost a matter of impossibility to break any of the teeth or tines, as, in the event of any tooth or tine meeting an obstruction, the resistance causes the teeth or tines in front of and behind the one obstructed to sink deeper into the ground, and thus the tooth or tine obstructed is enabled to rise over the obstacle. The tines or teeth being part of the harrows, and not fixed and held by screw-nuts, cannot shake loose, and therefore never require to be screwed tight again. These harrows or grubbers from their flexibility break up all ploughed and rough uneven ground, and make it perfectly level, without any part of them being able to turn over and ride on another part. Referring to the drawings hereto attached, figure 1 shows plan, and figure 2, side view of one of my machines, dotted lines on piece in the left corner of the plan showing the position of the link or piece when the machines are being taken to pieces.

I claim the construction of harrows or grubbers with links or pieces in the shape and make and hooked or linked together in the manner shown.

In witness whereof, I, the said Thomas Haxton, have hereto set my hand and seal, this seventeenth day of August, one thousand eight-hundred and eighty-one.

THOMAS HAXTON,
By his Agent,

EDWD. WATERS.

Witness—

W. S. BAYSTON,

Clerk to Edwd. Waters, Patent Agent, Melbourne.

This is the specification referred to in the annexed Letters of Registration granted to Thomas Haxton, this fourth day of October, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 29 August, 1881.

We do ourselves the honor to report, in reply to your blank cover communication of the 22nd instant, No. 8,250, transmitting the Petition of Mr. Thomas Haxton for the registration of an "Improved Harrow or Grubber," that we are of opinion that the prayer of Mr. Haxton's Petition may be granted, in accordance with his specification, drawings, and claim.

We have, &c.,

E. C. CRACKNELL.
G. K. MANN.

The Under Secretary of Justice.

[Drawings—one sheet.]

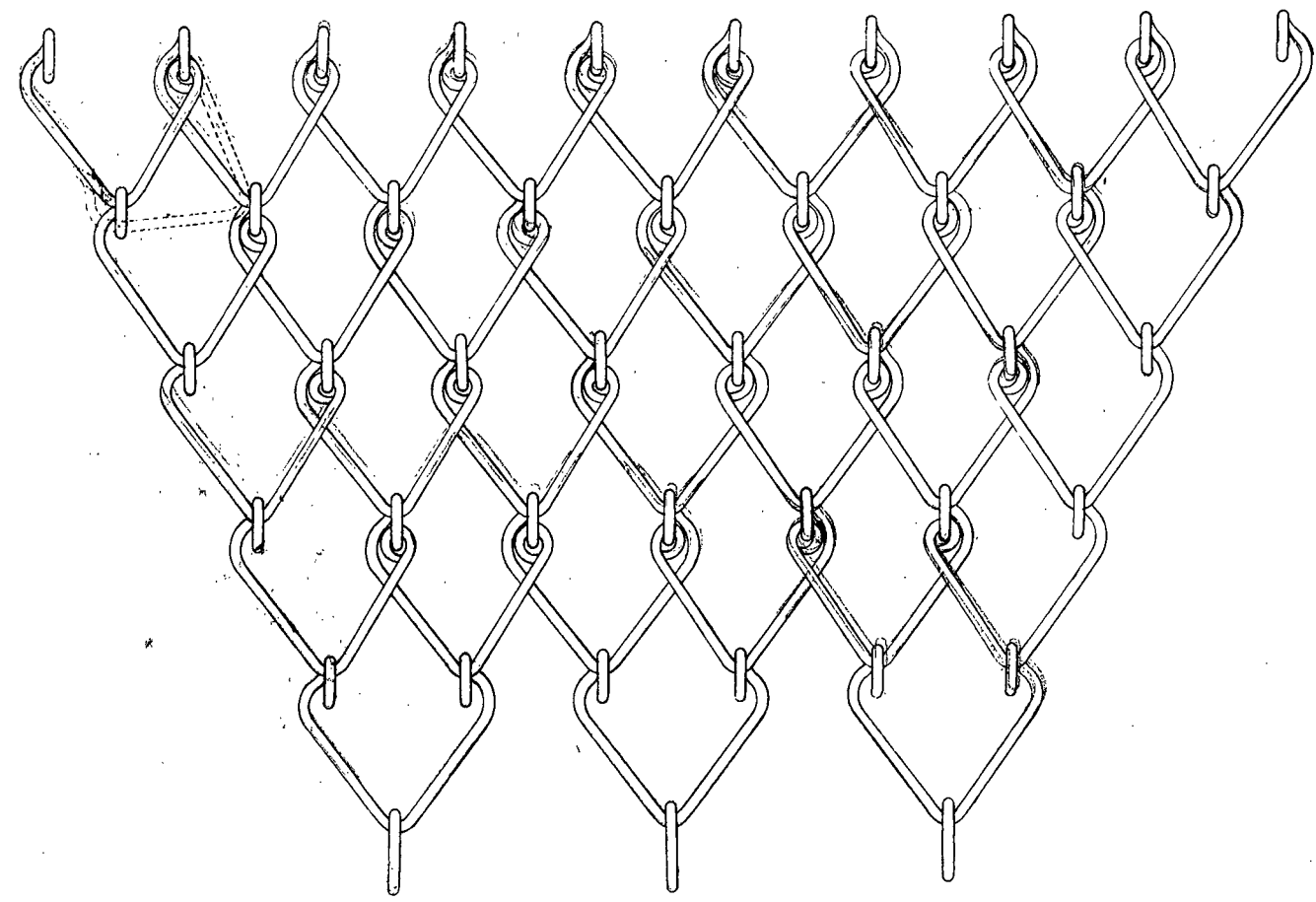


Fig 1.

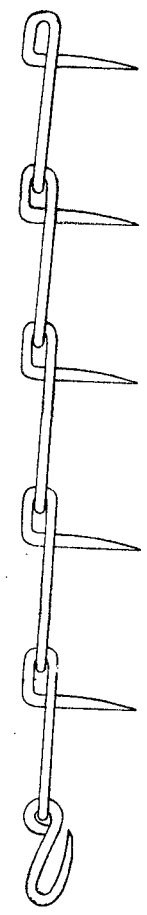


Fig 2.

Thomas Haxton's Patent.

*This is the Sheet of Drawings referred to in the aforesaid
 Letters of Registration granted to Thomas Haxton: this fourth
 day of October, A. D. 1881. Augustus Loftus.*

*Fig 1. Showing view of Section of Harrow lashing down
 Fig 2. Showing side view of section of Harrow.*



A.D. 1881, 4th October. No. 991.

IMPROVEMENTS IN CLOSETS, COMMODES, URINALS, SINKS, TRAPS, &c.

LETTERS OF REGISTRATION to Robert Dale Owen Smith, for Improvements in Closets, Commodes, Urinals, Sinks, Traps, and other depositories for offensive matters.

[Registered on the 4th day of October, 1881, in pursuance of the Act 16 Vic. No. 21.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS ROBERT DALE OWEN SMITH, of Washington, in the United States of America, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in Closets, Commodes, Urinals, Sinks, Traps, and other depositories for offensive matters," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four, and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Robert Dale Owen Smith, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof: to have, hold, and exercise unto the said Robert Dale Owen Smith, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said Robert Dale Owen Smith shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this fourth day of October, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

SPECIFICATION

Improvements in Closets, Commodes, Urinals, Sinks, Traps, &c.

SPECIFICATION of ROBERT DALE OWEN SMITH, of Washington, in the United States of America, for an invention entitled "Improvements in Closets, Commodes, Urinals, Sinks, Traps, and other depositories for offensive matters."

HERETOFORE apartments have been ventilated by means of shafts or flues connected therewith, through which an upward flow of air has been produced by means of heat-fans and other artificial appliances when the required current would not be produced by natural causes, and I am aware that the ventilation of sewers has been attempted in a similar way.

I am also aware that a water-closet has been provided with a lateral outlet connecting with a pipe which extended from the cesspool or sewer to the outer atmosphere, for the alleged purpose of ventilating both the cesspool or sewer and the water-closet.

The escape of sewer-gas and other foul odours from the soil or waste-pipe is generally caused by gaseous pressure within said pipes in excess of the external atmospheric pressure. This excessive pressure is due to chemical and mechanical causes which are well understood.

All fluids move in lines of least resistance, and it is evident that a gas moving through a pipe and under pressure greater than the atmospheric pressure will seek to escape through any lateral opening. Under such circumstances, and a water-closet having a lateral ventilating connection with a pipe also in communication with the cesspool or sewer, sewer-gas will be driven through said ventilating pipe into the hopper, and thence into the apartment, from which no system of ventilation employed prior to my invention has been effectual to remove it. Therefore I do not claim anything as to the principles involved, but only as to the special application of those principles to accomplish the ventilation of closets, commodes, urinals, sinks, traps, and other depositories for offensive matters, in the particular manner herein set forth.

The object of my invention is accomplished by causing a flow of pure air inward and downward through the closet, &c., and thence into a duct or flue which will discharge the same and any gases or odours which it may have encountered on its passage through the closet into the air outside the apartment or building, and so high in the atmosphere as to render them innocuous. The flue or duct and the closet with the intermediate connection constitute an inverted siphon, of which the closet is a part of the shorter leg, subject to the same law of action which controls the flow of fluids through siphons. As in other siphons, the effective action will bear a proportion to the diversity of length of the two legs, modified by any imported force in one leg, such as heat or a fan; and it is evident that, if the longer leg be extended below its connection with the shorter leg to another opening, it will no longer constitute a siphon.

I am also aware that a water-closet having a bowl and an enlargement or chamber, and a water-pan or valve, and a foot, has also been provided with a lateral outlet from said chamber below said pan.

I have now set forth in general terms the principles of action of my invention; but for the purpose of ventilating closets, &c., the simple construction indicated above will be fully effective only under the most favourable circumstances, because dissimilar gases do not mix readily, and when the flow of the ventilating current is feeble it will pass by the shortest way along that side of the hopper nearest the ventilating outlet, while gas from the soil-pipe may pass up the opposite side unobstructed. This is illustrated in figure 4. The plain arrows represent pure air, and the crooked arrows represent the impure or offensive gases, the escape of which into the apartment it is the object of this invention to prevent.

In actual practice natural atmospheric causes must generally be depended on to set up and maintain the required ventilating current. In dwelling-houses these natural causes may be aided by the heat from domestic fires, and under all circumstances these causes will be more or less variable. It is therefore necessary to adapt the apparatus for effective service under the least favourable conditions, and in that part of my invention claimed herein this end is accomplished by a gas-trap inserted in the closet, whereby the most feeble flow of the ventilating current will be enabled to oppose and prevent the escape of offensive odours or gases from the soil-pipe.

When by exhaustion air is drawn with a feeble current from a pipe through a lateral opening in said pipe a current will be set up first along the surface of said pipe nearest to said lateral opening, but when said pipe projects into a chamber from which air is drawn by exhaustion a movement will be set up over the entire cross area of said pipe; and however feeble this movement may be, so long as it is positive, it will constitute an atmospheric plug, which will prevent any gaseous outflow through the same pipe by deflecting the gaseous current aside, and the projection of said pipe into the chamber will constitute a gas-trap, from which the only way of escape will be through the ventilating outlet.

Having now indicated its principles of action, that part of my invention claimed herein consists principally in a closet provided with an enlargement or chamber into which the closet projects, said chamber being provided with a ventilating outlet adapted to be connected with a flue which is independent of the soil-pipe or other connection with the sewer, whereby said chamber constitutes a gas-trap, as set forth.

That others may fully understand the practical means which I propose to employ for this purpose, I will more particularly describe them, having reference to the accompanying drawings, wherein—

Figure 1 is a central vertical section through a closet, and embracing my invention; figure 2 represents an ordinary form of closet with my invention applied to it; figure 3 represents a modified way of applying my invention; figure 4 is an illustrative diagram; figure 5 represents my invention applied to a commode, and figure 6 as applied to a urinal.

This invention is equally applicable in proper form to sinks, traps, and other depositories of offensive matter.

A represents the bowl (say) of a water-closet; B is the soil-pipe to carry away the matters deposited in said bowl; and C is an ordinary stench-trap. The water-closet, comprising the bowl A and chamber G, is a single structure, and is provided with a foot, whereby it may stand upon and be attached to the floor. G is the enlargement or chamber into which the neck *a* or lower part of the bowl A projects, and D is the ventilating outlet in the side of the chamber G, behind the neck *a*. The outlet D is connected with the ventilating flue or duct E.

The flue E and bowl A, with their connections, constitute an inverted siphon, of which the bowl is the shorter leg, and the chamber G constitutes a gas-trap which is impossible for any gas rising from the pipe B
to

Improvements in Closets, Commodes, Urinals, Sinks, Traps, &c.

to pass, so long as there is a movement of air down through the neck *a* into the chamber G, and into the flue E, because, as is shown by the crooked and plain arrows, and as hereinbefore set forth, a movement of air through said neck into said chamber G will form a gaseous plug and obstruction to the passage of a gaseous body in the opposite direction, and said gaseous body will be thereby deflected and turned aside into said chamber G, where it will be trapped. Its further movement will then be assisted and accelerated, instead of opposed, by the flow of the ventilating current, and it will be thereby carried away into the ventilating flue and discharged into the atmosphere above the house-top.

It may sometimes happen that the air currents passing down through the seat may be unpleasantly strong while the closet is being used. In such cases an inlet-valve, V, may be employed, and said valve may be opened by the depression of the seat W, or other portion of the apparatus, so that while a person is sitting upon said seat said valve will be open and air admitted thereto; but at all other times said valve will be closed, and the draught air only admitted through the seat. This I think is the preferable method, but others may prefer to make the valve, or an opening without a valve, the constant inlet for the air current.

In figure 5, A represents the bowl, and B the receptacle. The case of the commode should be made air-tight, and is marked G because it is the equivalent of the chamber G in figures 1, 2, and 3, and the flexible pipe is marked D, because it is the outlet for the foul air into the ventilating flue, which in this case is the chimney of the fire-place. In figure 6, A is the perforated urinal receptacle, and G the enlargement or chamber; D being the outlet, and E the ventilating flue or duct.

Having described my invention, what I claim as new is—

- First—A bowl, A, provided with an enlargement or chamber, G, an outlet, D, and a foot whereon it may stand and be attached to the floor, substantially as shown, and for the purpose set forth.
- Second—In combination with the bowl A and the outlet D, the opening V, substantially for the purpose set forth.
- Third—A bowl, A, connected with, and discharging into, a soil-pipe or depository for foul matters, which is separated from said bowl by a trap, and a ventilating outlet, D, connected with a flue or duct, E, independent of the soil-pipe or other connection with the cesspool or sewer, whereby said bowl and duct constitute an inverted siphon, of which said bowl is part of the shorter leg, combined with a gas-trap chamber, interposed between said bowl and outlet D, as set forth.
- Fourth—A closet provided with an outlet for the escape of foul matters into a soil-pipe or other depository, a chamber, G, or gas-trap as described, into which the neck *a* projects, and an outlet, D, from said chamber G, combined with a stench-trap, in said soil-pipe, and a flue or duct, E, independent of the soil-pipe or other connection with the sewer, whereby a ventilating current of air is caused to flow inward and through said bowl and chamber G, and thereby prevent the escape of gaseous emanations arising from the foul matters in said soil-pipe or depository.
- Fifth—In ventilating closets, sinks, traps, &c., the mode or method of preventing the escape of foul odours or gases, which consists in causing a constant flow of pure air through said closet, sinks, traps, &c., and then into an exhaust outlet, independent of gaseous currents or emanations from the soil-pipe or sewer, whereby said odours or gases are forcibly controlled and carried away, substantially as herein set forth.
- Sixth—A commode constructed and arranged substantially as shown in figure 5.
- Seventh—A urinal constructed and arranged substantially as shown in figure 6.

In witness whereof, I, the said Robert Dale Owen Smith, have hereunto set my hand and seal, this eighth day of August, one thousand eight hundred and eighty-one.

Witness—

EDWD. WATERS, Melbourne, Patent Agent.

R. D. O. SMITH,

By his duly authorized Attorney,
JOSEPH W. OAKMAN.

This is the specification referred to in the annexed Letters of Registration granted to Robert Dale Owen Smith, this fourth day of October, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

The application of Mr. Robert Dale Owen Smith for Letters of Registration entitled "Improvements in Closets, Commodes, Urinals, Sinks, Traps, and other depositories for offensive matters," having been referred to us, we have examined the specification and drawings accompanying the same, and have now the honor to report that we see no objection to the issue of Letters of Registration as prayed for.

We have,
JAMES BARNET.
CHAS. WATT.

The Under Secretary of Justice.

R.D.O. SMITH'S PATENT.

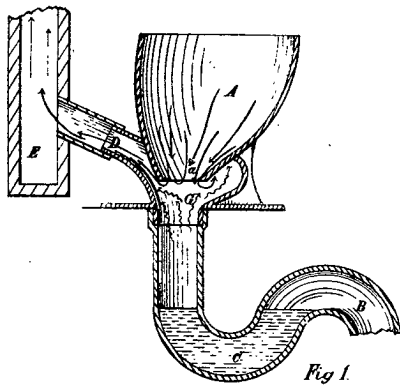


Fig. 1.

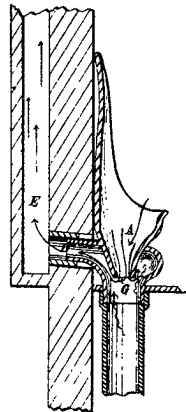


Fig. 6.

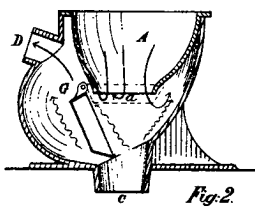


Fig. 2.

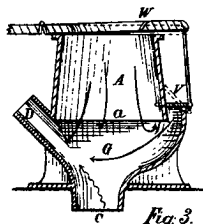


Fig. 3.

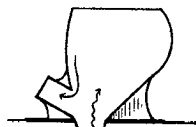


Fig. 4.

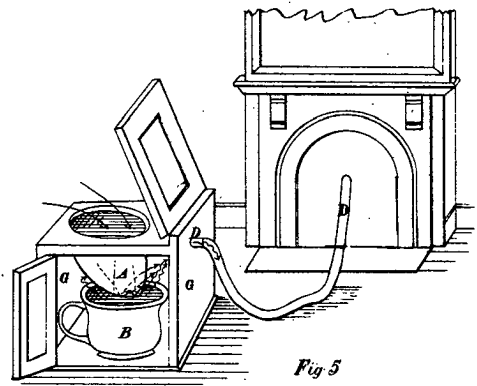


Fig. 5.

*This is the Sheet of Drawings referred to in the annexed
Letters of Registration granted Robert Dale Owen Smith this
fourth day of October, A.D. 1881.*

Augustus L. Offner.



A.D. 1881, 4th October. No. 992.

A PORTABLE PANTASCOPE GASLIGHT.

LETTERS OF REGISTRATION to Francis Edward de Lacye Richards and John Kinloch, for a Pantable Pantascope Gaslight.

[Registered on the 4th day of October, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS FRANCIS EDWARD DE LACYE RICHARDS, of Saint Leonards, North Shore, and JOHN KINLOCH, of Burwood, in the Colony of New South Wales, have by their Petition humbly represented to me that they are the authors or designers of a certain invention or improvement in manufactures, that is to say, of an invention entitled "A portable Pantascope Gaslight," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed ; and that they, the said Petitioners, have deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four ; and have humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to them for a period of fourteen years : And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Francis Edward de Lacye Richards and John Kinloch, their executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof ; to have, hold, and exercise unto the said Francis Edward de Lacye Richards and John Kinloch, their executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended : Provided always, that if the said Francis Edward de Lacye Richards and John Kinloch shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this fourth day of October, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

A portable Pantascope Gaslight.

SPECIFICATION by FCS. ED. DE LACYE RICHARDS, R.N., of St. Leonards, North Shore, in the Colony of New South Wales, of an invention of "A portable Pantascope Gaslight."

I, THE said F. E. de Lacye Richards, do hereby declare to all whom it may concern the nature of the said invention, and the manner in which the same is to be applied, to be particularly described in the drawing or plan attached, and by the following statement, that is to say:—

This invention has for its object the supplying of a brilliant, safe, and portable gaslight, other than the gas extracted from coal, which I propose to effect by a simple, inexpensive, and effective piece of mechanism, which is connected to a reservoir (forming a lamp), and which will effectually withstand the heat and wear, and, owing to its simplicity, will not get out of order of its own accord. (See plan showing section of automaton gasometer and burner.)

The reservoir is filled with the illuminating fluid, which, on turning the tap, is conveyed through a tube, N, through the tap M, into the tube L; the tap is then shut off and a match applied under the tube and burner at A; when the metal is sufficiently hot it will convert the liquid into gas, which then will rush along the channel K into the gas-well G; thence through the little hole at P, being guided by the inner tube B, striking the nipple D, being turned back by the cupola-formed internal shape of the nipple, and escaping at H forms two little jets which, whilst the lamp is burning, are keeping the metal up to the standard heat for the further formation of all liquid supplied from the reservoir into gas; hence, those two little flames are the generators.

The centre of the jet of gas ascending out of the small hole at P, and terminating in the generators (marked in dotted lines) at H, is the flame which gives illumination, and which can be regulated to any size, according to demand; A being holes by which means the flame feeds itself with oxygen.

The dotted black lines in figure 1 (— . — . — . —) show size and position of thin metal cover, which protects the generators from extinguishing, equalizes the draught, and concentrates their heat upon the gas channel K. Thus all fluid passing through N M L into K is converted into gas.

This little machine is an automaton gasometer, for as it makes gas it consumes it, and it cannot make more than what it actually can consume.

The tube L connecting the tap with the burner is filled with packing, which filters and purifies the liquid before entering the burner.

Figure 1 is an enlarged longitudinal section to show simplicity of internal arrangement. Figure 2 is a cross-section enlarged for the same purpose. Figure 3 shows full size of burner when fitted with gallery and globe.

In that instance the outer barrel O is made a little smaller, with a thread running round it at the bottom to enable the gallery to be screwed on.

RICHARDS' OIL.

This illuminating fluid is the refuse of kerosene shale. After kerosene has been extracted the refuse goes through a system of filtration, which cleanses it of all impurities, and leaves it remarkably clear, white, and volatile, and according to the nature of the shale contains more or less illuminating gas.

If the shale should be of an inferior class, then the refuse is not of the standard illuminating power; in that instance a mixture of equal parts of sulphuric acid with bichromate of potassium (at a high temperature) should be added to bring the fluid to the standard illuminating power.

In all kerosene shale at present discovered in New South Wales the refuse is naturally of the illuminating standard power, and requires no addition of any gas-making matter; it requires only to be carefully filtered and purified.

The metal cup Q, held in its place by the screw-plug R, prevents drop of fluid previous to lighting, if by accident too much liquid has been let into the tube L.

ADVANTAGES.

- 1st. Non-explosive.
- 2nd. Easily extinguished in case of accident.
- 3rd. Portability.
- 4th. Brilliancy and mildness of light.
- 5th. Simplicity of construction.
- 6th. Simplicity of manipulation.
- 7th. No wicks or chimneys required.
- 8th. Cleanliness.
- 9th. Equal to benzine in eradicating grease stains.
- 10th. Burner in an automaton gasometer.
- 11th. Staying qualities in windy weather.
- 12th. Can be used in lieu of coal-gas, kerosene or candles.

F. E. DE LACYE RICHARDS, R.N.,

Inventor.

This is the specification referred to in the annexed Letters of Registration granted to Francis Edward de Lacye Richards and John Kinloch, this fourth day of October, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

The application of Messrs. Francis E. de Lacye Richards and John Kinloch for an invention of "A portable Pantascope Gaslight" having been referred to us, we have examined the specification and drawings accompanying the same, and have now the honor to report that we see no objection to the issue of Letters of Registration as prayed for.

The Under Secretary of Justice.

Sydney, 25 August, 1881.

We have, &c.,

JAMES BARNET.

E. C. CRACKNELL.

BURNER FOR PORTABLE
GASLIGHT

Fig. 1.

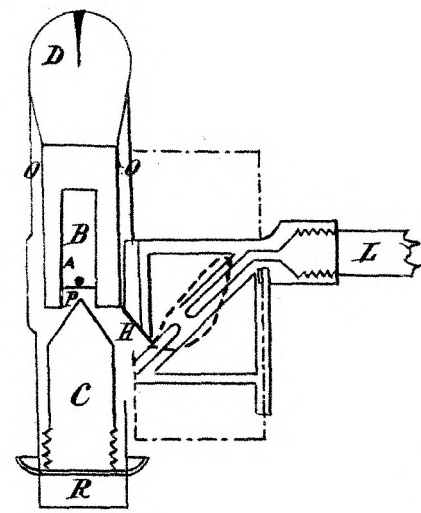
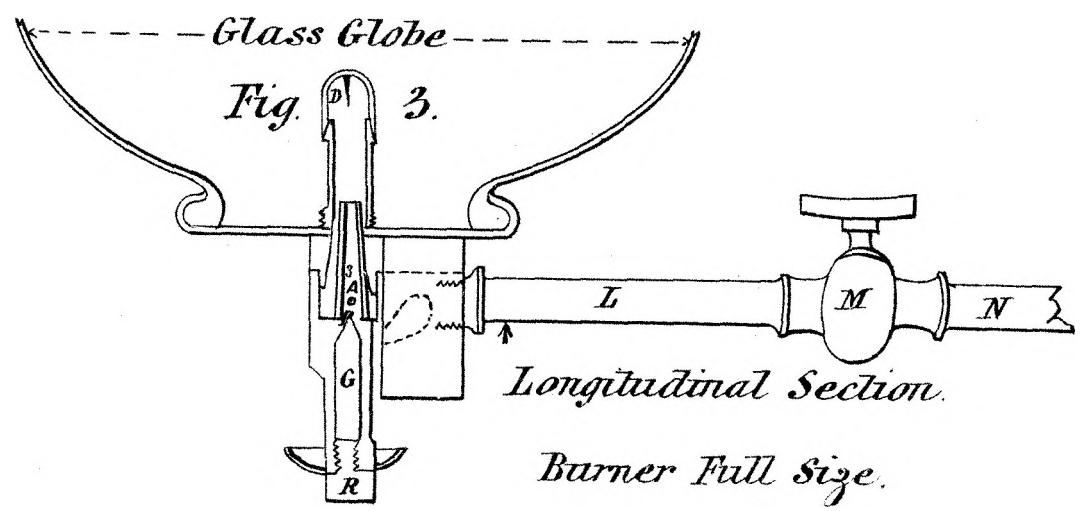
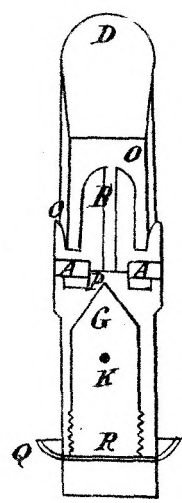


Fig. 2.



F. E. De Lacye Richards R.N.
Inventor.

This is the Sheet of Drawings referred to in the annexed
Letters of Registration granted to Francis Edward de
Lacye Richards, and John Kinloch, this fourth day of October,
A.D. 1881.
Augustus Loftus.



A.D. 1881, 4th October. No. 993.

BRUNTON'S HEADING MACHINE.

LETTERS OF REGISTRATION to John Dickinson Brunton, for an invention entitled "Brunton's Heading Machine."

[Registered on the 4th day of October, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS JOHN DICKINSON BRUNTON, of 19, Great George-street, Westminster, London, in the United Kingdom of Great Britain and Ireland, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Brunton's Heading Machine," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed ; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four ; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years : And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said John Dickinson Brunton, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof ; to have, hold, and exercise unto the said John Dickinson Brunton, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended : Provided always, that if the said John Dickinson Brunton shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this fourth day of October, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Brunton's Heading Machine.

SPECIFICATION.

THE machine shown in drawing marked 2 consists of an iron frame, C D, carried on wheels, O O, arranged to suit the radii of the circle of the tunnel to be operated upon, and kept firm in position by the over-head guiding wheels K K.

The frame carries a large screw, A, a cross-head, B, keyed on to it, two chucks or tool-holders, which carry the cutting discs I I I (as described and illustrated in Letters of Registration 609), also the air-engine I V I, if compressed air be employed as a motive power, or a clip pulley if wire rope be used, together with the cross-shaft, feed shaft, bevel pinions, worm and worm-wheel Q—in fact the whole of the mechanism necessary to drive the cutters and at the same time provide a circular and continuous forward movement to the whole machine, also collect and deliver behind it the whole of the material taken out of the face of the tunnel. The method of working and general arrangements are fully described as follows:—

The cutting portion consists of two chucks or tool-holders, E E, each carrying three cutting discs, I I I, of cast malleable iron or steel, which are carried round by the chucks, and also revolve by contact with the face of the tunnel; the cross-head B also slowly revolves, and carries round with it the chuck arbors. The edges of the cutting discs I I I describe a circular path round the axis of the chucks, and this path is from the circumference of the tunnel to near the centre. The motion is given to the cross-head in the following manner:—The belt from the cross-shaft drives the feed-shaft with its bevel pinion T, the pinion actuates the bevel wheel S, and by it the vertical worm R; this worm working in the worm wheel Q, keyed into the main screw shaft A, turns it round and with it the cross-head B, which is keyed on to it. Thus, the slow circular motion is obtained both of screw and cross-head, but the forward motion is gained by the large screw A, which passes through the nut H. This nut has a collar, W, with legs or short struts, Z, which are placed so as to abut against the sides of the tunnel, and thus constitute the nut and collar, the point of resistance against which the screw acts carrying forward with itself as it revolves the cross-head, chucks, and in fact, the whole machine. The face of the tunnel is not cut to a plane, but to the form of a double spiral, and in this way the chip on the face is maintained. Sketch X X X shows the path of the cutting discs. The slow revolution of the cross-head changing as it does constantly the position of the chuck arbors, causes each disc to make a new cut in advance of that which preceded it, and the cross-head having made one revolution the discs of each chuck will have chipped away from off the entire face of the tunnel a chip of a certain depth, which can be varied according to the nature of the material operated upon. These various and combined motions are derived from the compressed air engine M, seated on the frame of the machine D. Connected with the nut and collar are certain wheels, one in the screw shaft itself, which works into another and gives motion to the wheel H, cast on the nut. This is the differential gear fitted for the purpose of varying as may be required the depth of the chip, a groove is run along the thread of the screw, into the groove a tongue in the wheel that is on the screw is fitted, and consequently is carried round by the screw; this and the wheel in which it works can be changed for wheels of other proportions, so as to carry round the nut in the same direction as the screw, but at no time so fast.

The debris as quickly as it can be cut from the face of the drift, is carried away through the action of the delivery drum and scoops X. The scoops are fixed at an angle on the conical face of the drum, and become at one part of their revolution inclined shoots, down which the stuff they have collected from the bottom of the tunnel slides as they pass upward, and at the moment of their rising over the over-fall plate Y, the scoops touching the interior portion of the tunnel all round, nothing escapes them, and their ends revolve in close contact with the inner face of the over-fall plate, so that they cannot lose what they have gathered till they surmount the edge of the over-fall plate, when it immediately slides off the ledge and down a shoot, V, which delivers it to an endless travelling band of strong canvas or other material running between the wooden frame P, which conveys it under the machine to the rear, and finally tips it into the waggons or other receptacles placed to receive it. The delivery drum is driven by the shaft, which passes above the screw, near the top of the tunnel.

The power for driving this machine can be obtained either from steam, compressed air, gas, electricity, or by the use of wire rope, in connection with the above.

And I specially claim as novelties in this invention—

First—The adaptation and combination of the screw and cross-head in connection with the chucks and discs, and the circular and continuous motion imparted to the same.

Second—The adaptation and general construction of the differential gear, also of the collar and struts, as effecting a point of resistance for the screw to work from.

Third—The action of the delivery drums and scoops, in connection with the over-fall plate in collecting the debris and discharging and forwarding same.

Fourth—The general combination and adaptation of parts as described and illustrated as connected with tunnelling machines.

Dated this nineteenth day of August, one thousand eight hundred and eight-one.

Witness—

DUNCAN MCRÆ, J.P.

JOHN DICKINSON BRUNTON,
per JOHN MACINTOSH.

This is the specification referred to in the annexed Letters of Registration granted to John Dickinson Brunton, this fourth day of October, A D. 1881.

AUGUSTUS LOFTUS.

REPORT

Brunton's Heading Machine.

REPORT.

Sir,

Sydney, 31 August, 1881.

We do ourselves the honor to report, in reply to your blank cover communication of the 22nd instant, No. 8,280, transmitting Mr. John Dickinson Brunton's Petition for the registration of improvements in machinery for tunnelling operations, designated "Brunton's Heading Machine," that we are of opinion the prayer of Mr. Brunton's Petition may be granted, in terms of his specification, drawings, and claim.

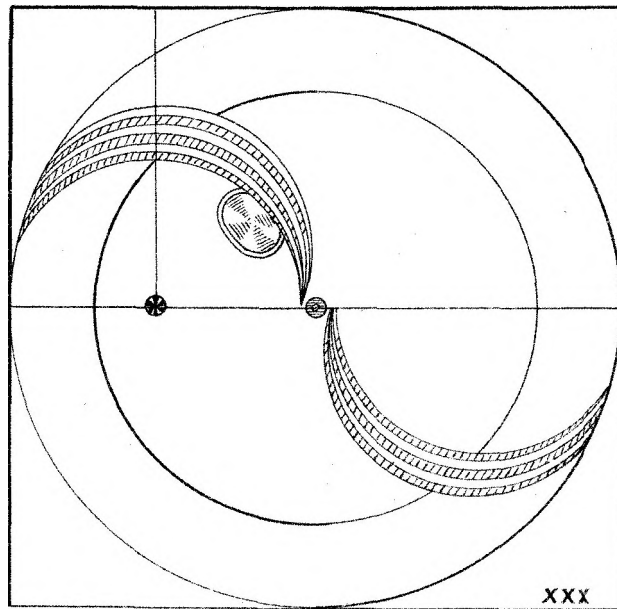
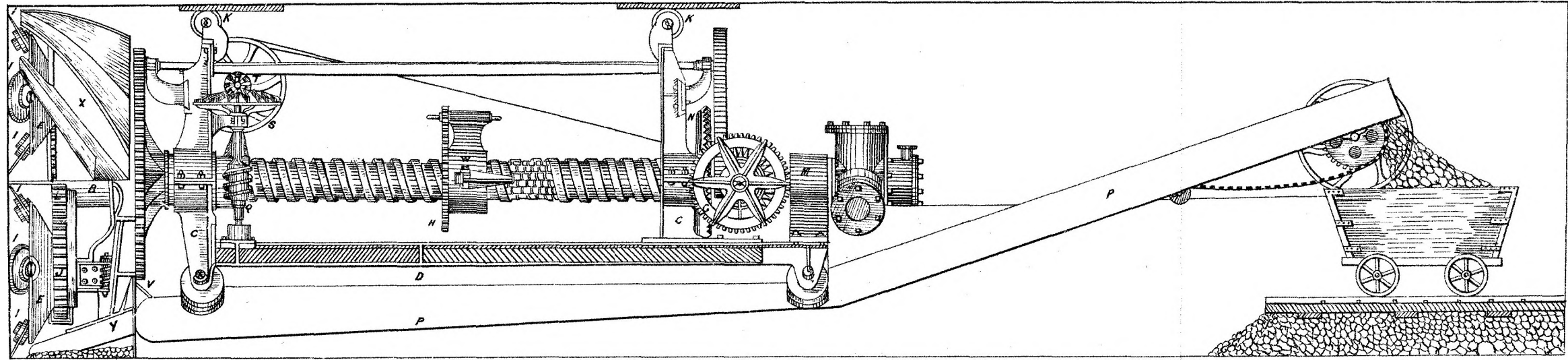
We have, &c.,

JAMES BARNET.

G. K. MANN.

The Under Secretary of Justice.

[Drawings—one sheet.]



BRUNTONS HEADING MACHINE 1881

*Witness
Simeon McKee J.P.*

*John Dickenson Brunton
per John Macintosh*

*This is the Sheet of Drawings referred to in the annexed
Letters of Registration granted to John Dickenson Brunton,
this fourth day of October A. D. 1881.*

Augustus Loftus.



A.D. 1881, 4th October. No. 994.

THE INDUSTRIAL TREATMENT OF BAGAUZE.

LETTERS OF REGISTRATION to Jules Gerard and Eugène Serullas, for the industrial Treatment of Bagauze, so as to extract therefrom sugar, and at the same time to obtain a ligneous paste especially suitable for the manufacture of paper.

[Registered on the 4th day of October, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS JULES GERARD, of Saint Denis, in the Island of Réunion, Esquire, Director of "La Compagnie Générale des engrais de la Réunion," and Eugène Serullas, of Saint Denis aforesaid, Esquire, Chevalier of the Order of the Légion d'Honneur, Doctor of Fine Arts, have by their Petition humbly represented to me that they are the authors or designers of a certain invention or improvement in manufactures, that is to say, of an invention for "The industrial Treatment of Bagauze, so as to extract therefrom sugar, and at the same time to obtain a ligneous paste especially suitable for the manufacture of paper," which is more particularly described in the specification which is hereunto annexed ; and that they, the said Petitioners, have deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four ; and have humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to them for a period of fourteen years : And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Jules Gerard and Eugène Serullas, their executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof ; to have, hold, and exercise unto the said Jules Gerard and Eugène Serullas, their executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended : Provided always, that if the said Jules Gerard and Eugène Serullas, shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this fourth day of October, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

The industrial Treatment of Bagauze.

DESCRIPTIVE SPECIFICATION drawn up in support of the demand for Letters Patent during fifteen years, for the industrial treatment of Bagauze, so as to extract therefrom sugar, and at the same time to obtain a ligneous paste especially suitable for the manufacture of paper, by MM. JULES GERARD and EUGENE SERULLAS.

BAGAUZE has very often been experimented on for the purpose of obtaining paper from it, but hitherto the desired result has only been achieved by sacrificing the saccharine matter contained in the bagauze.

The process for which we now beg for a Patent bears, on the contrary, on the extraction of that saccharine matter previous to the utilization of the ligneous element.

The industrial extraction of sugar from bagauze has never been put into practice anywhere; the second pressure when even made on bagauze humected with hot water or by steam when they come from the mill has produced, as ought to have been foreseen, only insignificant results. A methodical and rational exhaustion can alone permit one to hope to attain the desired object, and, which we do not fear to affirm, it has been completely realized by the process of which we subjoin a description.

Our process in its essential features, and under the reservation of such improvements or modifications of detail which we shall endeavour to introduce into our system, as well as our machinery, comprises—

- 1st.—The shredding and the chopping of the bagauze when it comes from the mill after the crushing of the canes.
- 2nd.—The exhaustion of this bagauze by water in an apparatus “à effet continu,” and acted upon by an anti-fermenting element.
- 3rd.—The expression of the bagauze exhausted by the methodical process above said.
- 4th.—The sufficient purification before the concentration, and by the means of special filtrations, of the juice obtained by diffusion and expression.
- 5th.—The utilization of the ligneous residue when in a state which renders it adaptable, especially for the rapid and economical preparation of paper paste, in consequence of the desagregations and the levigation to which this ligneous matter has been submitted during the course of operations, for the extraction of the saccharine matter.

APPARATUS.

1st.—A chopping and shredding bagauze machine, provided with a hopper, and which acts on the bagauze, firstly, by wringing, afterwards by chopping. The wringing is obtained by means of an endless screw which turns round in a tube. In front of this tube, towards the opposite extremity of that where the hopper opens, the chopping is effected perpendicularly to the shaft of the shredding screw by means of a series of twelve knives, in the form of half-crescents, presenting a projection of about seven centimètres on the circumference, and adapted to a fly-wheel, with which they are connected by rivets.

This machine is constructed so as to be able to manipulate a quantity of 1,250 kilogrammes of bagauze per hour; when it is in its normal working order the screw yields from 35 to 40 cubic decimètres a minute; the fly-wheel turns with a velocity of from 110 to 115 revolutions in the same space of time, and the bagauze emerges, not only sufficiently shredded, but cut up into pieces not exceeding one centimètre in length.

2nd.—A diffusing levigator, mainly composed of a metallic cylinder (it would be preferable to employ copper), in which revolves an Archimedes screw, and whose shaft is inclined.

This fixed cylinder is only closed at its lower end; its upper generating point has on its highest part a conducting pipe for the exhausting liquid, and at its lowest point an orifice surmounted by a hopper for the introduction of the bagauze; it is surrounded at its lower extremity, and for a third of its length, by a double lining, for the purpose of procuring heat by the injection of steam.

The Archimedes screw is of perforated copper, or of strong metallic cloth, and is adapted to an iron shaft, set in motion by the engine of the mill.

The cylinder and the double lining are besides provided with cocks for draining and for steam, sufficiently indicated by the respective destinations of these matters.

The cylinder is 7 mètres 50 centimètres long, on a diameter of 115 centimètres. The perforated copper screw (the diameters of the holes being 8 millimètres) has a furrow of 75 centimètres. The shaft of the screw must have a rotatory velocity powerful enough to deliver 1,000 and 200 kilogrammes of bagauze per hour.

3rd.—Two filters of different systems. The first is used for the defecation of the juice; it consists of a cylindrical filter, made of metallic cloth, which is not absolutely horizontal, so as to allow the flowing off of the produce of the filtration. This cylinder is mounted on a hollow shaft, and turns in a cylindrical trough. During the rotatory motion the filtered juice is taken from the interior of this cylinder by spiral tubes, which conduct it to the interior of a hollow shaft, from which it flows, whilst the heavier matters collect themselves on the exterior of the cylindrical filter, in a double lining of cylindrical shape, whence they escape by an orifice furnished with a lever valve connected with another valve, which closes the upper orifice of this double lining, so that one of its orifices is shut when the other is opened.

The second filter, which serves for the clarification of the sugar-juice after its defecation, forces this juice through alternate layers of sand and charcoal.

The whole of these layers are held together between two thick plates or washers of perforated copper, in a casing having nearly the shape of the trunk of a straight cone. We effect this filtration in an upward direction by means of a simple pressure on the juice, or else by suction. This filter is easily taken to pieces, so as to allow of its being cleared.

MODUS OPERANDI.

On its leaving the mill the bagauze is conducted into the hopper of the shredding apparatus, and after having undergone the process of chopping it is sent by means of an endless cloth into the hopper of the diffusing levigator.

From

The industrial Treatment of Bagauze.

From the outset of the operation the latter is supplied with a mixture of 4,000 litres of pure water, and of an anti-fermenting element, such as the salicylate of soda, for instance (about 5 cubic centimètres of a concentrated solution of the salicylate of soda to one litre of the exhausting liquid).

The water is then heated till it attains a temperature of about 60 degrees Centigrade by an injection of steam into the double lining, and the water produced by the condensation of this steam is utilized. The shaft of the screw is then set in motion, and the loads of bagauze are brought to the spot. The latter is drawn into the Archimedes screw in the cylinder, which it ascends through all its length, being watered on its passage by fresh quantities of water, which act on it by displacement and by osmose. On leaving the levigator the bagauze is exhausted for industrial purposes.

At the end of the first hour 1,200 kilogrammes of bagauze have already penetrated into the diffusing levigator and begin to emerge from it, but this bagauze has absorbed during its passage about twice its own weight of water. For the 60 kilogrammes of humected bagauze which will now every minute emerge from the apparatus, there will therefore be about 40 kilogrammes of water during the same interval withdrawn from the original mass of 4,000 kilogrammes, with which the apparatus has been supplied at the beginning of the operation. It will therefore be necessary from that moment to pour into the cylinder through the tube fixed to its upper part 40 kilogrammes of pure water, to which has been added, as it is said above, a concentrated solution of salicylate of soda. This water and the bagauze consequently circulate in the cylinder in inverted directions, but as soon as the bagauze has been ejected from the cylinder it has been carried back to the mill, whence the juice which is extracted from it is conducted to the upper tube of the levigator. The latter therefore ceases to be fed by pure water, to be supplied henceforth with a saccharine liquid.

Thanks to this methodical and continual exhaustion of new quantities of bagauze which are supplied without intermission to the diffusing levigator, the saccharine juice goes on concentrating itself till at the end of four hours it has already reached a degree sufficient to equal 6 or 7 degrees Baumé. If it be not proposed to produce a greater degree of concentration, it will only be necessary to divert a portion of this juice, and to replace it by pure water and its solution of salicylate of soda.

After having made the juice pass through the first of our filters we send it to the defecator. This artificial juice afterwards passes through our second filter, and henceforth it is ready to be concentrated.

The ligneous matter of the second crushing to which the bagauze coming from the levigator has been subjected only requires an immersion in a mild bath of a chemical mixture to be freed from its colouring and incrustative substances. The shredding, which has been already effected to about $\frac{3}{4}$ per cent., only requires now to be passed through a refining rather than a shredding machine. An apparatus L'Affineur Labrousse of centrifugal power will be found sufficient, and after a simple washing the paste will be in a fit state for the market, and ready to be supplied to paper manufacturers. The chemical bath which we employ, and of which we have just spoken, is composed of 20 kilogrammes of lime, and of the following substances:—Chlorine de sodium, carbonate of soda and lime, for 100 kilogrammes of paste to be obtained. This economical bath is effective at boiling heat.

The treating of the bagauze in the manner we have adopted necessitates, it is true, the use of coals, but we are compensated by the production of an excellent paper paste, after having extracted nearly the whole of the sugar contained in the bagauze.

Therefore, if when analyzed this bagauze yields a mean of 30 per cent. of ligneous matter and 13 per cent. of sugar, it is quite as rich in saccharine matter as the beetroot.

To resume, our intention is to take out a new Patent for the commercial utilization of cane bagauze, according to a principle and a method, and with the aid of apparatus which have never been applied to bagauze, that is to say:—

- 1st.—The rational and methodical exhaustion of the bagauze in an apparatus "à effet continu."
- 2nd.—The whole of the operations it comprises, and which consist in extracting the juice from the bagauze by our process, and in obtaining in the residue a disaggregated and purified ligneous substance which possesses advantageous qualities for commercial enterprise, and which will especially prove serviceable and economical to paper manufacturers.
- 3rd.—The apparatus which we use for the above exhaustion, either as regards the innovations we have adopted or taken in their intrinsic disposition, or yet again, as regards their adoption in sugar mills.

JULES GERARD.
EUGENE SERULLAS.

By their Agent,
C. CECIL GRIFFITHS.

This is the specification referred to in the annexed Letters of Registration granted to Jules Gerard and Eugène Serullas, this fourth day of October, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Having examined the specifications accompanying the application of Messrs. Gerard and Serullas for Letters of Registration for an invention entitled "The industrial Treatment of Bagauze, so as to extract therefrom sugar, and at the same time to obtain a ligneous paste especially suitable for the manufacture of paper," we have now the honor to state that we see no objection to the prayer of the Petition being granted.

We have, &c.,

THOS. RICHARDS.
A. C. FRASER.

The Under Secretary of Justice.

Sydney, 1 September, 1881.



A.D. 1881, 10th October. No. 995.

AN IMPROVED PROCESS OF ENGRAVING ON GLASS OR GLASSY SURFACES.

LETTERS OF REGISTRATION to Samuel Henry Crocker, for an improved process of Engraving on Glass or glassy surfaces, either direct or by transfer.

[Registered on the 10th day of October, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS SAMUEL HENRY CROCKER, of Railton, in the Colony of Tasmania, mechanical engineer, but at present residing in Melbourne, in the Colony of Victoria, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "An improved process of Engraving on Glass or glassy surfaces, either direct or by transfer," which is more particularly described in the specification which is hereunto annexed; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Samuel Henry Crocker, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said Samuel Henry Crocker, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to complete and ended: Provided always, that if the said Samuel Henry Crocker shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this tenth day of October, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

An improved process of Engraving on Glass or glassy surfaces.

SPECIFICATION of SAMUEL HENRY CROCKER, of Railton, in the Colony of Tasmania, mechanical engineer, but at present residing in Melbourne, in the Colony of Victoria, for an invention entitled, "An improved process of Engraving on Glass or glassy surfaces, either direct or by transfer."

MY improved process of engraving on glass or glassy surfaces, either direct or by transfer, may be applied either to the ornamentation of articles or to the production of blocks for typographical purposes. It consists essentially in drawing on said surfaces, or on paper for transfer to such surfaces with an ink that will resist the subsequent action of fluoric acid, and that is sufficiently fluid for the purpose, when used with a hot pen, or with any other heated drawing instrument.

The ink that I prefer to use is made of six parts of resin, four parts of wax, and one part of lamp-black or other pigment. I wish, however, to state that there is nothing novel in the composition of this ink, as it is perfectly well known that the ingredients I have mentioned will constitute a material which will resist the action of fluoric acid. The novelty consists in the application of such inky composition to a glass or glassy surface, either direct or through the intervention of transfer paper, by means of a pen or other drawing instrument, kept sufficiently hot to preserve the fluidity of such composition while the drawing is being made.

The pen that I use is a common steel writing pen, and I believe any make will answer as well as another. I keep it hot preferably by passing a current of electricity from galvanic batteries through insulated wires connected with them, and arranged in the pen handle and holder to the point of the pen, where the conducting circuit is impaired and made sufficiently imperfect to cause the electricity to generate heat enough to melt the composition, or by connecting a very small gas pipe or tube to the pen to convey gas to a little gas-burner fixed in such a position under the pen as will allow its flame to impart to the pen the necessary amount of heat, or by fixing to the pen a small spirit or other lamp, but the lamp and its appurtenances must be so very minute that the pen to which they are fixed may be used without hindrance or inconvenience.

A brush or any other drawing instrument that will carry the ink and that can be kept hot may be used as a substitute for the pen.

When the drawing has been completed on the glass or glassy surface, either by drawing directly upon it, or by means of transfer from suitable paper, and no matter whether it has been made as an ornament to an article or to be used as an engraving for typographical purposes, I cover such surface with fluoric acid, or with its equivalent, sulphuric acid and finely divided fluor spar, until those parts not protected by the ink have been etched or engraved deep enough for the purpose required. I then wash the whole with cold water to remove the acid, and then with turpentine to remove the drawing. If the object has simply been ornamentation, the process is now complete; but if the object has been to prepare an engraving for typographical purposes, I take the engraved surface, which, in this case, should be on the face of a plate of glass, cut it to the required size, and, to prevent fracture, mount and firmly secure it to a metal backing of any required thickness by means of shellac, glue, or other sufficiently adhesive substance. The block is then complete, and may be printed from direct or from electro or stereo types which can be taken from it as freely as from a wood block.

When the drawing is first made on paper, and then transferred to the glass in the same way as in transferring drawings to stones for lithographic printing, I use the same ink and pen as in drawing on the glass direct, and the paper used may be that which is commonly used by lithographers and called transfer paper.

The transfer paper must of course be submitted to the necessary temperature and pressure to ensure the adhesion of the ink to the glass or glassy surface, as is well understood, and the paper must then be removed by wetting it with warm water, and the glass heated to ensure perfect adhesion of the ink.

Having thus described the nature of my invention, and the manner of performing same, I would have it understood that what I claim as new and of my invention is—

- 1st. The improved process of engraving on glass or glassy surfaces, by drawing thereon with a hot pen or with any other heated drawing instrument which melts and maintains fluid an ink capable of resisting the subsequent action of fluoric acid, substantially in the manner herein described and explained.
- 2nd. The modification of such process, by drawing on transfer paper with the same ink and pen and then transferring it to glass or glassy surfaces, substantially as herein described and explained.

In witness whereof, I, the said Samuel Henry Crocker, have hereto set my hand and seal, this twenty-third day of August, one thousand eight hundred and eighty-one.

SAML. HY. CROCKER.

Witness—EDWD. WATERS.

This is the specification referred to in the annexed Letters of Registration granted to Samuel Henry Crocker, this tenth day of October, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 9 September, 1881.

We do ourselves the honor to report, in reply to your blank cover communication of the 27th ultimo, No. 8,390, transmitting Mr. Samuel Henry Crocker's Petition for the registration of an "Improved process of Engraving on Glass or glassy surfaces, either direct or by transfer," that we are of opinion the prayer of the petitioner may be granted, in terms of specification and claim.

We have, &c.,

JAMES BARNET.
G. K. MANN.

The Under Secretary of Justice.



A.D. 1881, 10th October. No. 996.

IMPROVEMENTS IN AERIAL BALLOONS.

LETTERS OF REGISTRATION to Count Antoine Apraxine, for Improvements in aerial Balloons.

[Registered on the 10th day of October, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting:

WHEREAS COUNT ANTOINE APRAXINE, of the city of St. Petersburg, in the Empire of Russia, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in aerial Balloons," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Count Antoine Apraxine, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said Count Antoine Apraxine, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said Count Antoine Apraxine shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this tenth day of October, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in aerial Balloons.

SPECIFICATION of COUNT ANTOINE APRAXINE, of the city of St. Petersburg, in the Empire of Russia, for an invention entitled "Improvements in aerial Balloons."

THIS invention relates to improvements introduced into the construction and arrangement of aerial balloons, with a view to facilitate the working and control of the same, and to permit of dispensing either wholly or partially with the discharge of ballast or gas during the ascensions and descents. These improvements constitute an extension of a system of captive and semi-captive aerostation invented by me in 1878, and in which the expenditure of ballast or gas for controlling the vertical movement is replaced by the mechanical power at the disposal of the aeronaut, the dimensions of the different parts of the apparatus being in proportion to this power.

Figure 1 of the accompanying drawing represents one of the forms of my improved aerostat. In this figure, *a* is the main balloon, with its car *b*, and encircled at its greatest diameter by a wooden belt, *b'*, fitted with two eyelets, *e e*; *d d'* are two cords passing freely through these eyelets, their upper ends secured to the auxiliary balloons *c c'*, which are provided with reversed parachutes, *f f'*; the remainder of each of these cords *d d'* is coiled in the car *b* within reach of the aeronaut, who can check its run at any point of its length. On the ascent of the aerostat arranged as above, the auxiliary balloons *c c'* are on or about the same horizontal plane, and at the shortest possible vertical distance from the main balloon *a*, with which they are connected, and the whole rises in the air with a velocity proportioned to its ascensional power and to the resistance of the parachutes plus that of the surface of the main balloon. When on attaining the desired elevation, it becomes necessary to arrest the upward movement, the aeronaut allows the cord *d* to run through the eyelets *e e*. The balloon *c* being thus freed commences to rise alone, and the remaining two being rendered heavier than the air begin to descend along the cord which is being run out. The balloons *a c'* having descended by a distance equal to half the length of the cord *d*, and the balloon *c* having on the other hand ascended by an equal distance, the aeronaut begins to haul in this cord *d*, to bring back the balloon *c* towards the main balloon *a*, and at the same time lets the cord *d'* run out to set free the second auxiliary balloon *c'*. In its downward movement the parachute *f* closes as shown for *f'* by the dotted lines, and notwithstanding the speed at which it has to move, the pressure of the air on this parachute does not exercise any retarding influence on the descent of the main balloon *a*. By thus alternately working or immobilising the auxiliary balloons *c c'*, the aeronaut is enabled to control the vertical movement, that is to say, to ascend or descend at will, or to remain more or less stationary at any required elevation. The following formula may be used in the calculation of the principal parts of the apparatus:—(1) $R = D^2 \cdot 0,029,451 \cdot V^2$; in which *R* is the resistance (expressed in kilogrammes) which the air opposes to the movement of a spherical body of the diameter *D* (in mètres), moving at a uniform speed *V* (in mètres) per second. Therefore, if the ascensional force of the balloon be *R* and its diameter *D*, it will rise at a uniform velocity *V*, that is to say, the balloon will rise per second to a height $e = v$ mètres. For the dimensions of the parachutes the following formula may be used:—(2) $R = D^2 (0,054,976 + 0,12,801 \cdot V^2)$, in which as in formula 1, *R* is the resistance, *D* the diameter, and *V* the velocity. In the arrangement shown in figure 1, the mechanical force developed by the aeronaut is employed to bring back the auxiliary balloon to its starting-point. If we call the force thus developed per second (*p e*) kilogrammètres, the ascensional power of this balloon *r*, the resistance opposed to the movement r_1 , and the distance travelled (*i.e.*, the length of the cord), *v*, we will have:—(3) $(r + r_1)v = p \cdot e$. The diameters of the auxiliary balloons will be deduced from (4) $r + \frac{n + m}{1,04} = \frac{1}{2} \pi D^2$, in which *r* is its ascensional

power; *n*, the weight of the parachute, whose diameter must be equal to the seven-tenths of that of the principal balloon; *m*, the weight of its envelope, and *D* its diameter. The value r_1 will be deduced from the following formula: (5) $r_1 = D \cdot (0,029,451 \cdot 4 V^2)$. The main balloon must be heavier than air by the weight (r_{11}) kilogrammes:—(6) $\frac{r_{11}}{2} = 3r + r_1$. The ascensional force of the entire system *R*, will be:— $\frac{r + r_1}{2}$.

From these formulæ it will be seen that it is advantageous to reduce to a minimum the horizontal diameters of the balloons, that is to say, instead of making them spherical, to give them the most elongated shape possible, and to increase the diameter of the parachutes by reducing their weight as far as practicable.

Figure 2 represents a modification of the invention in which the upper auxiliary balloons in connection with parachutes are replaced by two reversed parachutes, *c c'*, suspended beneath the main balloon *a*, from a cross bar, *b' b'*, secured to the car *b*, and provided with terminal pulleys *e e*, through which run the cords *d' d'*, to be operated by the aeronaut. In this modification the ascensional force *R* of the aerostat should be $R = \frac{p \cdot e}{2v}$. The diameter of the balloon should be calculated by the formula 1. The diameters of

the parachutes are equal to that of the balloon, and the length of the cord paid out per second will be equal to $2V$. In this arrangement as in the preceding, the power of the aeronaut is only applied during the descent, the system being lighter than air by *R* kilogrammes.

Figure 3 represents a second modification in which two non-reversed suspended parachutes are provided with counterpoises *x x*. In this modification, the ascensional force of the balloon being *R*, and the velocity of ascension *v*, we will have:— $Rv = \frac{p \cdot e}{2}$. The weight *r* of each counterpoise will be deduced from

the formula $r = 2R - n$, in which *n* is the weight of the parachute. The diameter of the balloon should be calculated by the formula 1. The diameter of the parachutes should be at least equal to the diameter of the balloon; the length of the cord drawn in per second equal to *v*. In this modification, the power of the aeronaut is applied to the ascension of the apparatus, the entire arrangement being heavier than air by *R* kilogrammes.

Figure 4 represents a third modification of the invention composed of one main and two auxiliary balloons, as in figure 1, the latter surmounting two non-reversed parachutes, and the whole being operated as in the first arrangement, with the exception that the ascension is determined by the power of the aeronaut, the apparatus being heavier than air. The

Improvements in aerial Balloons.

The ascensional force r of each auxiliary balloon should be as small as possible, but sufficient to carry the weight n of its parachute with the velocity $2V$, the diameter of the parachute being equal to that of the main balloon. The apparatus being heavier than air by R kilogrammes, the power applied to the ascension will be $Rv = \frac{p \cdot c}{2}$. The length of the cord drawn in per second, $2V$, and the overplus charge of the entire arrangement $R - r$.

Figures 5 and 6 represent in side view and plan an arrangement heavier than air, in which a is the balloon, b , the car, provided with two beams, $c c$, oscillating freely on a horizontal shaft, d . At each end of these beams are set the frames $f f$, in light wood, provided with valves $g g$, opening downwards. The beams are operated by means of the connecting rods $i i$ and cranks, $k k$, which latter are so set on the horizontal shaft l as to work the beams in opposite directions, that is to say, that when the end of one beam with its frame descends, the corresponding end of the other beam rises. The shaft l is rotated by the aeronaut by means of the crank m . When the frames $f f$ are brought down, their valves $g g$ close, and the entire surface is exposed to the resistance of the air, which produces a pressure sufficient to determine the ascension of the apparatus at a speed equal to half the distance travelled by the frames in their descent.

In supposing the apparatus to be made heavier than air by R kilogrammes, and the surface of each frame to be equal to half the horizontal section of the balloon through its largest diameter, the quantity R will be $R = \frac{p \cdot c}{2v}$.

Figures 7 and 8 represent in elevation and plan a final modification of this invention. In these figures, a is the balloon; b , the car provided with two stationary parallel bars, $c c$, which sustain two Archimedian screws, $f f$, set on vertical shafts, $g g$. These shafts are provided with pulleys or drums, $h h$, and by means of endless cords, $i i$, also coiled on the pulley, k ; the screws revolve in the air, when the latter pulley k is rotated by the aeronaut by means of the winch handle l . The horizontal projection of the surface of each screw should be equal to half the surface of the horizontal section of the balloon through its greatest diameter. With these dimensions of the screws in supposing the aerostat to be weighted by R kilogrammes, and the power of the aeronaut to be $p \cdot c$, it will ascend with a velocity v per second, $v = \frac{p \cdot c}{2R}$. The two last-named arrangements may, if required, be applied to apparatus lighter than

air. In this case the valves of the system shown in figures 5 and 6 should be made to open upwards instead of downwards, and the screws of the system shown in figures 7 and 8 should be made to rotate in the reverse direction.

Having now described the nature of the said invention, what I claim is—

- Firstly—An aerostat composed of a main balloon and two auxiliary balloons, in combination with two reversed parachutes, constructed, arranged, and operated substantially as herein set forth, and shown in figure 1 of the accompanying drawing.
- Secondly—An aerostat composed of a balloon in combination with two suspended reversed parachutes, constructed, arranged, and operated substantially as herein set forth, and shown in figure 2 of the accompanying drawing.
- Thirdly—An aerostat composed of a balloon in combination with two suspended non-reversed parachutes, and two counterpoises, constructed, arranged, and operated substantially as herein set forth, and shown in figure 3 of the accompanying drawing.
- Fourthly—An aerostat composed of a main balloon and of two auxiliary balloons surmounting and in combination with two non-reversed parachutes, constructed, arranged, and operated substantially as herein set forth, and shown in figure 4 of the accompanying drawing.
- Fifthly—An aerostat composed of a balloon in combination with horizontal frames provided with valves, constructed, arranged, and operated substantially as herein set forth, and shown in figures 5 and 6 of the accompanying drawing.
- Sixthly—An aerostat composed of a balloon in combination with two Archimedian screws, constructed, arranged, and operated substantially as herein set forth, and shown in figures 7 and 8 of the accompanying drawing.

In witness whereof, I, the said Count Antoine Apraxine, have hereto set my hand and seal, this thirty-first day of May, 1881.

Witness—

M. F. MENNONS.

A. APRAXINE.

This is the specification referred to in the annexed Letters of Registration granted to Count Antoine Apraxine, this tenth day of October, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

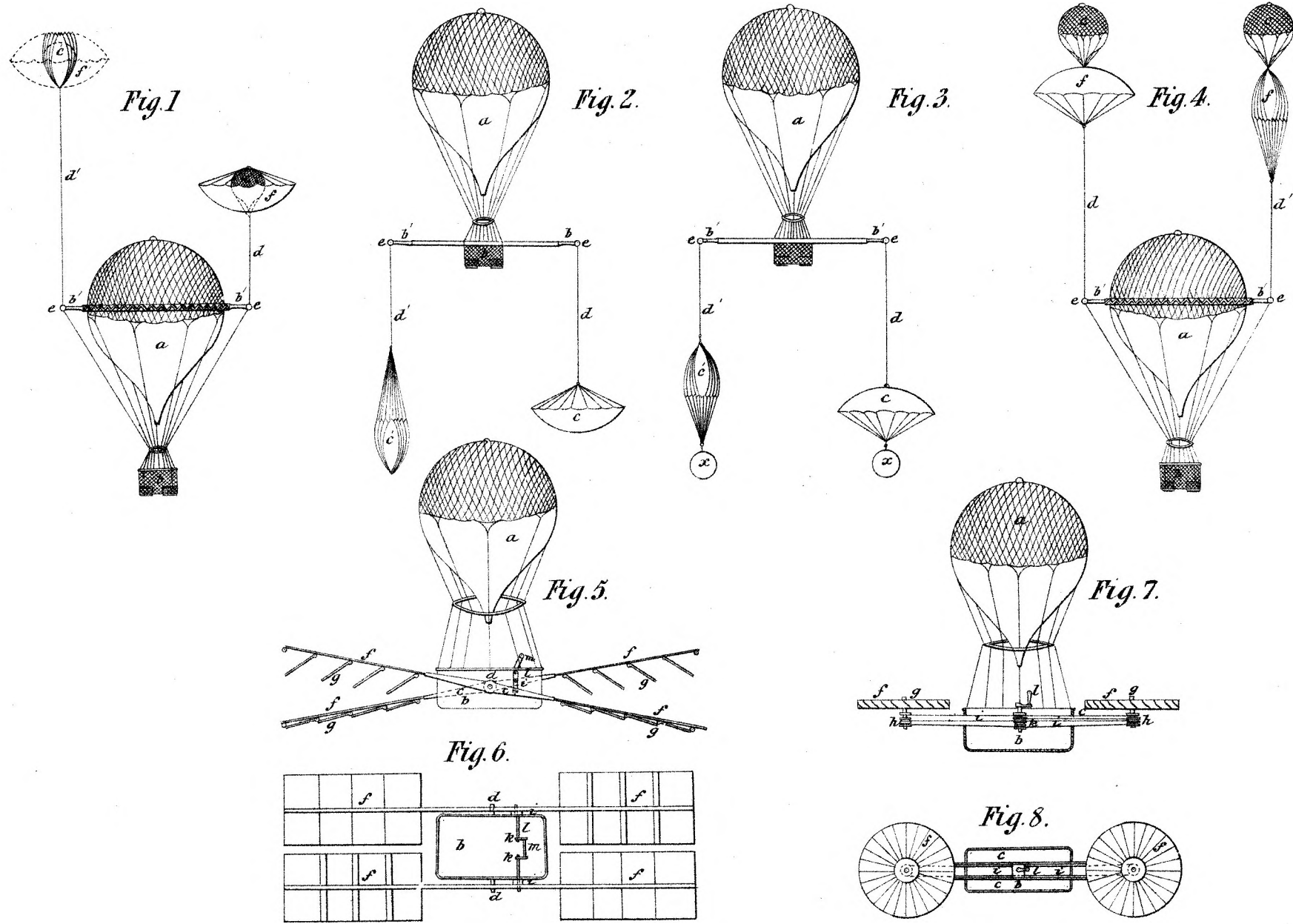
The application of Count Antoine Apraxine for Letters of Registration for "Improvements in Aerial Balloons" having been referred to us, we have examined the specification and drawings accompanying the same, and have now the honor to report that we see no objection to the issue of Letters of Registration as prayed for.

The Under Secretary of Justice.

Sydney, 9 September, 1881.

We have, &c.,

J. SMITH.
C. WATT.



*This is the Sheet of Drawings referred to in the annexed
Letters of Registration granted to Count Antoine Appare,ne,
this ninth day of October, A.D. 1881.*

Augustus Loftus.



A.D. 1881, 10th October. No. 997.

**A PROCESS OF SMELTING ANTIMONY ORE WITHOUT THE AID OF METALS
OR CHEMICALS.**

**LETTERS OF REGISTRATION to Henri Herrenschmidt, for a process of smelting
antimony ore without the aid of any metals or chemicals.**

[Registered on the 10th day of October, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS HENRI HERRENSCHMIDT, of West Kempsey, Macleay River, in the Colony of New South Wales, metallurgist, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention of "A process of smelting antimony ore without the aid of any metals or chemicals," which is more particularly described in the specification which is hereunto annexed; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Henri Herrenschmidt, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said Henri Herrenschmidt, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said Henri Herrenschmidt shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this tenth day of October, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

A process of smelting antimony ore without the aid of metals or chemicals.

SPECIFICATION.

My invention consists in smelting antimony ore to produce antimony regulus without the aid of iron or chemicals.

Antimony regulus is produced as follows:—1st, to produce an artificial oxide of antimony; 2nd, the production of antimony regulus by smelting the artificial oxide of antimony with crude antimony and charcoal, the result being regulus of antimony.

The artificial oxide of antimony is produced by introducing in an ordinary blast or cupola furnace natural oxide or natural sulphide of antimony, with 10 per cent. of charcoal if the ore is a natural sulphide, and 25 per cent. if the ore is a natural oxide.

The blast or cupola furnace has a flux or flume, which flux or flume is connected with chambers or large flux, or any other appliance in which antimony oxide can be collected. On the end of this flux chamber or appliance in which the antimony oxide is collected, there is a tank or any other vessel containing water. This water is used for the purpose of forcing through the escaping gases which come from the furnace, after having passed through the flux chamber or other appliance.

The process is conducted as follows:—Say, two hundredweight of charcoal is set on fire in the blast or cupola furnace; on the top of the charcoal there is thrown one ton of sulphide of antimony, or eight hundredweight of natural oxide of antimony. The charging door is then made air-tight, and an air-blast from a fan or any other appliance giving blast is set in motion.

The oxygen from the air is blown into the furnace, there combines partly with the antimony and partly with the sulphur which is in the antimony ore, producing oxide of antimony, which collects in the flux chambers or other appliance, while the sulphurous acid escapes after passing through the water. The gases and fumes are compelled to pass through the water, so that the water will retain a part of the oxide of antimony which would otherwise escape. The time required to blow a charge of ore depends entirely on the strength of the blast which is applied. A charge of one ton of ore generally takes six hours with the blast produced by a fan worked by a four-horse power.

When all the antimony which the ore contained is oxidized, the furnace door is opened, the refuse from the ore is taken out, and the furnace re-charged.

To make antimony regulus, my invention consists in smelting artificial oxide of antimony with crude antimony and charcoal (the crude antimony is produced in the ordinary way). This process is conducted in an ordinary reverberatory furnace; this furnace is first heated to a red heat, then charged with the following proportions:—ten of artificial oxide, six of crude antimony, and one of charcoal. After six hours' continuous firing the charge is well rabbled; the reaction between the oxygen of the oxide and the sulphur from the sulphide takes place, and antimony metal is produced.

I claim as my invention the production and collection of oxide of antimony, through a blast or cupola furnace. I also claim as my invention the smelting of antimony oxide with crude antimony and charcoal, to produce regulus of antimony.

H. HERRENSCHMIDT.

This is the specification referred to in the annexed Letters of Registration granted to Henri Herrenschmidt, this tenth day of October, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 7 September, 1881.

In reply to your blank cover communication of 27th of August last, No. 8,436, enclosing Mr. Henri Herrenschmidt's Petition for the registration of "A process of smelting antimony ore without the aid of any metals or chemicals," we have now the honor to report that we have examined the specification accompanying the same, and see no objection to the issue of Letters of Registration as prayed for.

We have, &c.,

J. SMITH.
A. LEIBIUS.

The Under Secretary of Justice.

No. 998.

[Re-assignment of No. 869. See Letters of Registration for 1880, page 247.]



A.D. 1881, 15th October. No. 999.

IMPROVEMENTS IN MACHINES FOR BORING IN THE EARTH.

LETTERS OF REGISTRATION to William Stephens, for Improvements in and relating to Machines for boring in the earth.

[Registered on the 15th day of October, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS WILLIAM STEPHENS, of Melbourne, in the Colony of Victoria, engineer, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in and relating to Machines for boring in the earth," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said William Stephens, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said William Stephens, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said William Stephens shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this fifteenth day of October, in the year of our Lord one thousand eight hundred and eighty-one.

[L.s.]

AUGUSTUS LOFTUS.

Improvements in Machines for boring in the earth.

SPECIFICATION of WILLIAM STEPHENS, of Melbourne, in the Colony of Victoria, engineer, for an invention entitled "Improvements in and relating to Machines for boring in the earth."

THIS invention of improvements in and relating to machines for boring in the earth has reference, first, to the contrivances used in giving the lift and fall or jiggling motion to the jumpers or drills used in passing through rock; and, secondly, to an improved reamer for enlarging a previously bored hole in clay or other earth not being rock.

Referring to the contrivances used in giving the lift and fall motion, I have devised these in order to lessen the wear and tear of the rope as it travels over the several pulleys; and for this purpose I make a part of the framing which supports one of these pulleys to swing to and fro, so as to put a strain on the rope, and thus lift the drill when swinging in one direction, and so as to release the rope from such strain, and thus allow the drill to fall when swinging back again to its seat; and I make these pulleys to adjust themselves to the rope as it winds and unwinds on the winch barrel.

In order, however, that this part of my invention may be clearly understood, I will now refer to the drawings hereto attached, in which figure 1 shows plan figure, 2 side elevation, and figure 3 front view of these contrivances, A being the top of the ordinary winch framing, and B the rope leading to the winch barrel. C C are iron standards securely bolted to framing A, as shown. At top of these iron standards are bearings C¹ for rocking shaft D, to which are securely fastened the side brackets E, which bend over and form arms or stays F to the upper end of quadrant pieces G G, to which they are bolted, and between which passes the chain H, which is attached at the top to pin E', and at the bottom to any suitable contrivances for giving what is known as the trip motion. F¹ is an extra stay, springing from one of the brackets, E, and reaching to the quadrant pieces G, which it assists to support. Fitting loosely on rocking shaft D are two arms, J J, supporting on a spindle, J¹, at the top a loose pulley, J², and between them on the rocking shaft is another loose pulley, J³, both of which pulleys, as well as the arms J J, are free to slide on the rock shaft, so as to adjust themselves to the rope as it winds and unwinds on the winch barrel. K is a cross-head reaching from side to side.

The mode of operation is as follows: When the jumper or drill has to be lifted, the trip motion contrivances wind up the chain H, and as it winds it pulls over the side brackets E and the cross-head K on these, brings over the arms J J and the straining pulley J², which forces the rope from the position shown in full lines in figure 2 to the position shown by dotted line B¹ in the same figure, and then, when the trip is given, the jumper or drill falls, and these contrivances all swing back to their original position, the pulleys J² and J³ giving to the rope as it winds and unwinds on the winch barrel, so as to form permanent and self-adjusting guides for it. Of course the rope as it proceeds upward passes over the pulley at the top of the ladder or framing which is ordinarily used for such purposes.

Referring to my improved reamer, it has been devised for the purpose of enlarging a previously bored hole, when such hole is in clay or other earth not being either drift or rock, and is especially useful where (say) a 6-inch bore has been put down through the drift and a 6-inch pipe forced into it; then clay is reached, in which it is necessary to make a smaller bore. I then continue to bore until I pass through the clay and again reach drift, in which case the clay bore must be lined, and for that reason must be enlarged to the full extent of the outer diameter of the pipe. For this purpose my improved reamer is especially useful, as it will pass down the 6-inch or other bore and then automatically open out its cutters so as to ream out the extra width, allowing the reamed-out earth to fall meanwhile into the bottom of the bore, and when reaching the bottom of the pipes will by the very act of meeting them and reversing their motion close in the reamers as at the first, so as to allow of the tool being drawn out of the bore.

In order, however, that this part of my invention may be clearly understood, I will now refer to the drawings thereof hereto attached, in which figure 4 shows face view of my improved reamer with the cutters closed as in the act of descending, and figure 5 similar view, with the cutters expanded as in the act of reaming out; figure 6 is side view of same; figure 7 plan; figure 8, horizontal section on line *a a* in figure 5; figure 9, view looking upward from line *b b* in figure 5; figure 10 is plan of the nose of the tool.

L is a solid wrought-iron stem, which widens as it descends, and from the bottom of which there projects downwards a pin, L¹ on which the nose L² swivels. At each shoulder of this nose is a lug, L³, on top of which are two pins, L⁴. Between these pins there works the lower prong of a forked cutter, M, which swivels on pin M¹, and has a cutting edge, M². On each side of the widened face of the lower end of stem L is a stud or pin, L⁵, for steadying the cutter and keeping it up to its work. N is a wrought-iron ring of the exact size of the bore that my improved reamer is intended to work in, and P P are stays therefor. In figure 5, X is the piping of the original bore, Y the clay which is to be reamed out, and Z the bore enlarged.

When my improved reamer is intended to be used, it is lowered down the bore in the condition shown in figure 4, and which bore it must just fit. When it has reached the bottom of the bore it beds itself in the earth, and then, if turned in the direction so as to open the reamers, the upper portion of the tool will revolve on the nose, the pins L⁴ carrying the forked cutters with them so as to assume the position shown in figure 5. By continuing the revolving motion, and giving an upward strain to the tool, it will ream out the extra belt of earth forming the inside of the bore so as to widen it to the extent that the cutters will reach, and when it has reached the pipes or tubes in the upper part of the bore, where the tool is no longer required, its very contact with the pipes and reversal of its motion will carry round the cutters and close them again, as in figure 4, when it can be lifted out of the bore.

Having thus described the nature of my invention and the manner of performing same, I would have it understood that what I claim as my improvements in and relating to machines for boring in the earth is—

- 1st.—The self-adjusting pulleys J² and J³, which slide across and across the framing on the rocking shaft D so as to accommodate themselves to and form permanent guides for the rope as it winds and unwinds from the winch barrel.
- 2nd.—The combination with the winch framing of the standard C, rocking shaft D, side brackets E with the bent arms F, quadrant pieces G, chain H, pin E', arms J, loose pulleys J² and J³, and cross-head K.

3rd.

Improvements in Machines for boring in the earth.

3rd.—Constructing reamers with the upper part swivelling on the lower part or nose, and with contrivances, such as are herein described, for opening out the cutters (or reamers proper) when required, and for closing them again when required, substantially as herein described and explained, and as illustrated in my drawings.

4th.—The special combination of parts as shown in figures 4 to 8 of my drawings, forming my improved reamer.

In witness whereof, I, the said William Stephens, have hereto set my hand and seal, this second day of September, one thousand eight hundred and eighty-one.

WM. STEPHENS.

Witness—

EDWD. WATERS,
Melbourne, Patent Agent.

This is the specification referred to in the annexed Letters of Registration granted to William Stephens, this fifteenth day of October, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 14 September, 1881.

We do ourselves the honor to state, in reply to your blank cover communication of the 7th instant, No. 8,708, transmitting Mr. William Stephens' Petition for the registration of "Improvements in and relating to Machines for boring in the earth," that we are of opinion the prayer of Mr. Stephens' Petition may be granted, in terms of his specification, drawings, and claim.

We have, &c.,

E. C. CRACKNELL.
G. K. MANN.

The Under Secretary of Justice.

[Drawings—one sheet.]

W. STEPHEN'S PATENT.

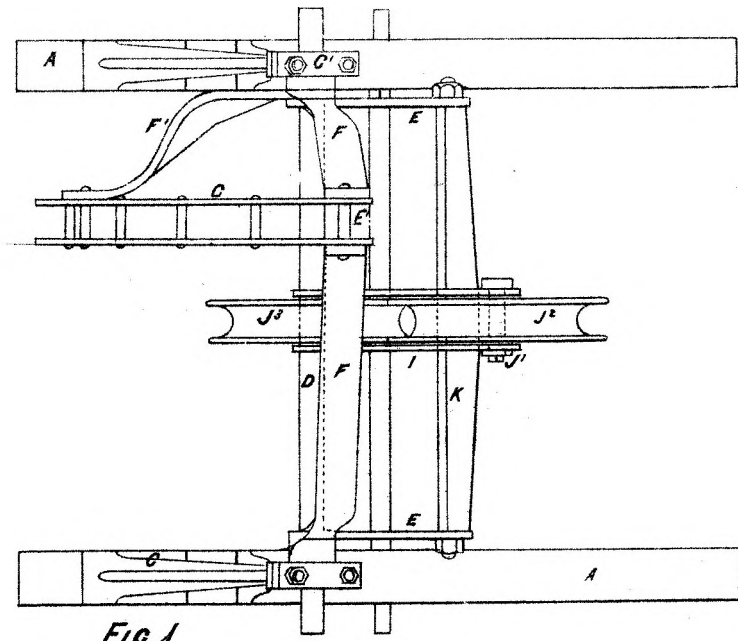


Fig. 1

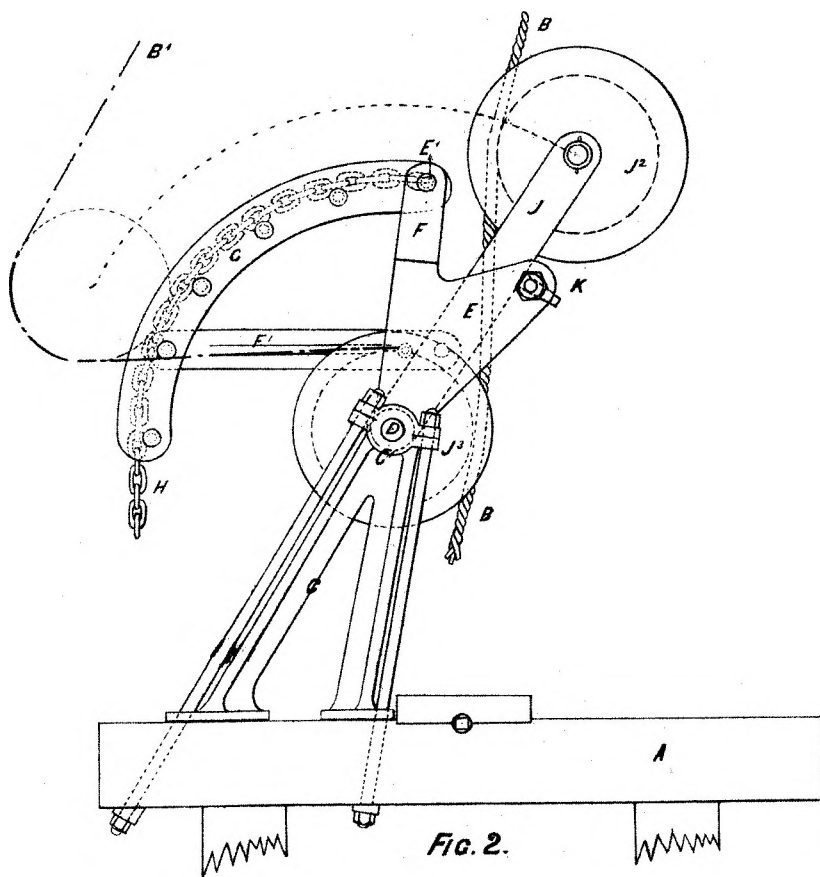


Fig. 2.

Scale 1 1/2 ins = 1 foot

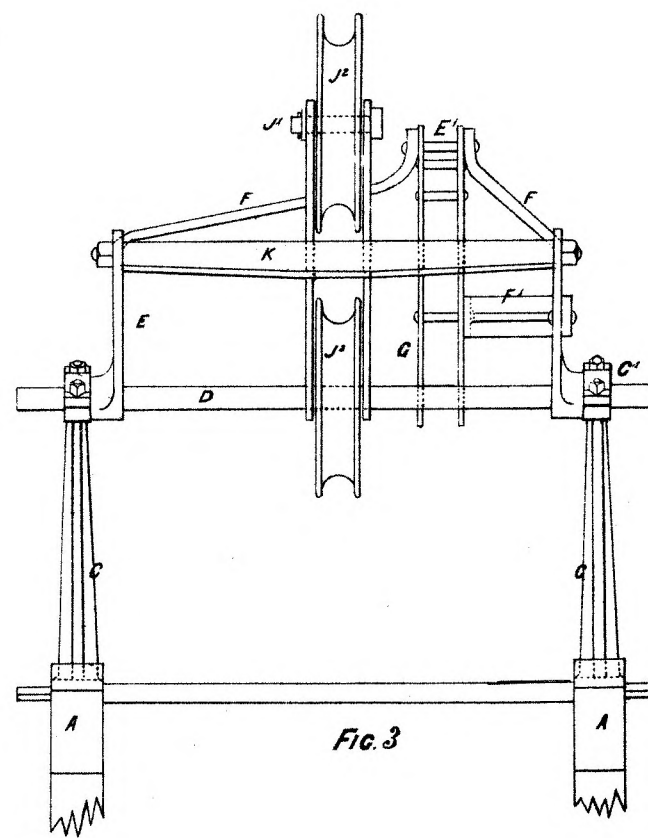


Fig. 3

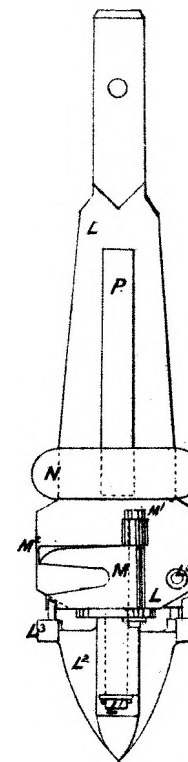


Fig. 4

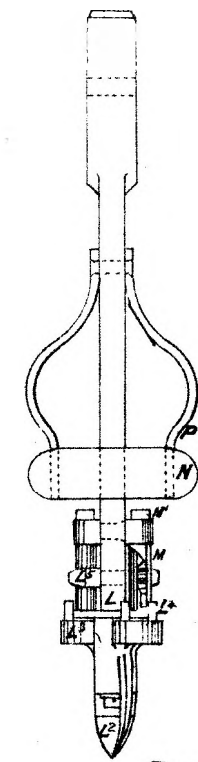


Fig. 6

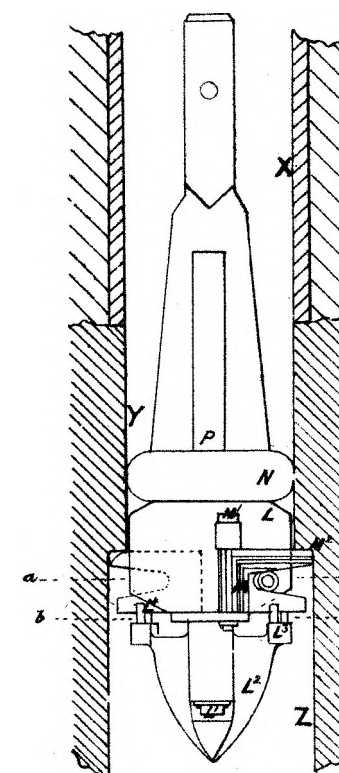


Fig. 5

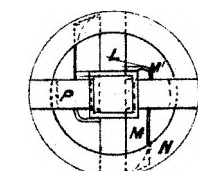


Fig. 7

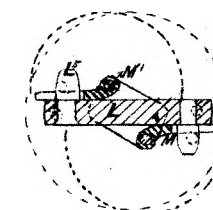


Fig. 8

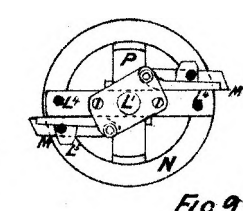


Fig. 9

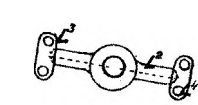


Fig. 10

Scale 3 ins = 1 foot

This is the Sheet of Drawings referred to in the annexed Letters of Registration granted to William Stephen this Fifteenth day of October, A.D. 1881. Augustus Loftus.



A.D. 1881, 15th October. No. 1000.

**IMPROVEMENTS IN SEWING MACHINERY FOR THE MANUFACTURE OF
BOOTS AND SHOES.**

LETTERS OF REGISTRATION to Charles Frederic Gardner, for Improvements
in Sewing Machinery, chiefly designed for the manufacture of Boots and Shoes.

[Registered on the 15th day of October, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS
(commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of
the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-
Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS CHARLES FREDERIC GARDNER, of London, England, Managing Director of the Blake
and Goodyear Boot and Shoe Machinery Company (Limited), hath by his Petition humbly represented to
me that he is the author or designer of a certain invention or improvement in manufactures, that is to say,
of an invention entitled "Improvements in Sewing Machinery chiefly designed for the manufacture of
Boots and Shoes," which is more particularly described in the specification, marked A, and the two
sheets of drawings, marked B and C respectively, which are hereunto annexed ; and that he, the said
Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the
sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as
required by the Act of Council, sixteenth Victoria, number twenty-four ; and hath humbly prayed that I
would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the
said invention or improvement might be secured to him for a period of fourteen years : And I, being
willing to give encouragement to all inventions and improvements in the arts or manufactures which may
be for the public good, and having received a report favourable to the prayer of the said Petition, from
competent persons appointed by me to examine and consider the matters stated therein and to report
thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the
power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registra-
tion grant unto the said Charles Frederic Gardner, his executors, administrators, and assigns, the exclusive
enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years
from the date hereof ; to have, hold, and exercise unto the said Charles Frederic Gardner, his executors,
administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the
full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully
to be complete and ended : Provided always, that if the said Charles Frederic Gardner shall not, within
three days after the granting of these Letters of Registration, register the same in the proper office in
the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration,
and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of
Registration to be sealed with the seal of the said Colony of New South Wales, at Govern-
ment House, Sydney, in New South Wales, this fifteenth day of October, in the year of our
Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Sewing Machinery for the manufacture of Boots and Shoes.

A.

SPECIFICATION of CHARLES FREDERIC GARDNER, of London, England, Managing Director of the Blake and Goodyear Boot and Shoe Machinery Company (Limited), for an invention entitled "Improvements in Sewing Machinery chiefly designed for the manufacture of Boots and Shoes."

THIS invention consists in improvements in sewing-machines which are chiefly designed for the manufacture of boots and shoes, and in which a curved needle works with a single thread to produce the kind of sewing termed the chain stitch, such machines being utilized more especially for stitching the outer sole to the welt or whatever part may be used in place of the welt in a boot or shoe.

The said invention is illustrated in the accompanying drawings, in which figure 1 is a plan of my improved machine, and figure 2 is a side elevation of the same; figure 3 is a plan, and figure 4 a side elevation of the needle stock or carrier, the cast-off and their operating mechanism detached. Figure 5 is a side elevation of the awl and its stock and the toothed segment on the end of the awl-lever for operating the same. Similar letters indicate the same parts throughout the drawings.

A is the frame of the said machine, and a is the main shaft supported in suitable standards, a^1 , attached to the said frame; b is the needle-cam sheave, upon which also are cams for working the cast-off and the looper; c is the awl-cam sheave, which also carries a cam for moving the presser-foot and another cam connected with the devices for varying the length of the loop; d is the feed-cam sheave, also carrying a cam connected with the variable loop motion; e is the needle attached to the needle-stock or carrier e^1 , which oscillates on the pivot e^2 in the frame A. The remaining parts are hereinafter described.

The needle-stock or carrier e^1 is of segmental form, and is provided with teeth e^3 upon its periphery, which teeth gear with corresponding teeth, f^1 , upon the end of the lever f , which I term the needle-lever; this lever f is pivoted at f^2 , and is provided with a pin carrying a roller at f^3 , which enters a cam groove, b^1 , on the inside face of the cam b .

g is the awl, carried in the awl-stock g^1 , which is similar in form to the needle-stock e^1 , and is provided with teeth upon its periphery gearing with corresponding teeth, g^2 , on the end of the lever h , termed the awl-lever. This lever is pivoted at h^1 , and is provided with a pin carrying a roller at h^2 that enters and works in a cam-groove in the face of the awl cam-sheave c .

i represents the looper, which is carried on the looper-lever i^1 , pivoted at i^2 , in a universal joint, i^3 , swivelling in the frame A at i^4 ; one end of this looper lever i^1 is provided with two rollers, i^5 and i^6 ; the roller i^5 runs in a cam-groove cut in the outer face of the needle cam-sheave b , and the other roller, i^6 , rides on a raised cam upon the outer face or periphery of the said cam-sheave. The movement of the roller i^5 in the cam-groove causes the looper-lever i^1 to oscillate about the pivot i^2 , and the roller i^6 riding on the raised cam oscillates the lever i^1 about the pivot i^2 , these two movements being at right angles to each other. The combined action of these two rollers causes the looper i to partake of a circular movement around the needle, so as to lay the thread in its barb just at the time that the said needle is at its lowest point. The roller i^6 is held in contact with the cam face of the needle-cam sheave b by the piston or stud i^7 , which is pressed forward and into contact with the lever i^1 by a spring arranged behind it.

j represents the cast-off device or cast-off, which is provided with an eye at one side to serve as a guide to the needle; the said cast-off is carried on a projection upon a toothed ring or segment, j^1 , which oscillates on a boss on the needle-stock or carrier e^1 ; this toothed segment j^1 gears with a pinion, j^2 , whose spindle is carried in the frame A. On the outer end of this spindle, j^3 , is a small toothed segment, j^4 , which engages with a toothed lever, j^5 , pivoted to the frame A at j^6 ; the said lever j^5 is furnished with a roller, j^7 , which runs upon a cam on the periphery of the needle-cam b , and is kept up to it by a spring, j^8 , connected to a pin on the lever j^5 and to the frame A. The arrangement of the cast-off mechanism in the position above described is one of the contrivances whereby I leave a clear space for the manipulation of the boot or shoe in the stitching of the same.

The awl-stock pivot g is carried in a piece, k , termed the feed-slide, which moves in a slide, k^1 , in the frame A. This feed-slide k is provided with a slot, k^2 , in which a pin, k^3 , can slide; by means of the handle k^4 this pin can be moved from end to end of the slot k^2 . The said pin k^3 passes through a slot in the feed-lever l , which is pivoted at one end at l^1 . The opposite end of the said lever is provided with a pin and roller at l^2 , which roller runs in a cam-groove in the periphery of the cam d . The part of the pivot pin l^1 which enters the frame A is made eccentric to the other part or body of the said pin, so that by turning it partially round on its axis the position of the pivot of the feed-lever l may be varied, and consequently the position of the feed-slide k may, within slight limits, be adjusted nearer to or further from the needle. By this arrangement the feed-slide k is caused to slide backwards and forwards by the cam-groove d^1 , and the awl-stock and awl being carried upon the said slide partake of its movement.

On the face of the feed-slide k is a slide, m^1 , which carries the presser-foot or channel-gauge m . On this slide m^1 is a slide-block or pin, m^2 , which enters the slotted end of the lift lever m^3 , fulcrumed at m^4 upon the piece k . On the opposite end of the said lever m^3 is a pin carrying a roller, m^5 , which runs on a cam formed on the periphery of the awl-cam c . n represents the lower jaw of the machine, usually termed the "table." This table is attached to a lever, n^1 , pivoted at n^2 . This pivot or axis n^2 is so arranged relatively to the needle axis e^2 that the table n moves in an arc nearly coincident with that of the movement of the needle. The aforesaid lever n^1 has an arm, n^3 , whose end is furnished with a pin and a slide-block, n^4 . This slide-block works in the fork o^1 formed on the end of the locking slide o . This locking slide o works in the caps or covers o^2 and o^3 , and is locked except during a certain interval, when it is released by the locking lever p , which is pivoted at p^1 . The toe p^2 of this lever bears on the washer plate p^3 , which rests on the locking slide and passes through a hole or aperture in the cover o^2 . A spring, p^5 , serves to continually draw the end p^4 of the aforesaid locking lever upward and to press the toe p^2 of the said lever hard upon the plate p^3 . This spring is carried by the post or pillar A through the medium of the screw-threaded link p^6 and nut l .

The unlocking of the slide o , while the awl and channel-gauge return or recede from the work, is accomplished by means of the pin and roller arranged at p^* , on the side of the locking lever p , and actuated by a cam which is formed on the periphery of the feed-cam d , and which presses upon this roller, p^* , at regular intervals to release the slide from the pressure of the toe p^2 . o^4 represents a spring, which

is

Improvements in Sewing Machinery for the manufacture of Boots and Shoes.

is attached at one end to a stationary or fixed pin, o^5 , and at the other end to a pin in the locking slide o . This spring exercises a constant pressure on the slide o , and through it presses the table n up towards the channel-gauge m .

q is a hand-lever for depressing the table n to admit the work between it and the channel-gauge m . When the said lever is forced backward its projection q^1 presses against the part p^0 of the locking lever p , and relieves the slide o from the pressure of the toe p^2 of the said lever, and the part q^2 of the body of the latter bears against the pin n^* in the table-lever n^1 and causes the said table to descend.

The construction and position of the table and its adjuncts in my improved machine have been very carefully considered, with a view to the result which is partially effected by the hereinbefore described arrangement of the cast-off mechanism; and it will be observed that all of the parts in this machine on both sides of the stitching point (that is to say, the point to which the needle, the awl, and the table converge) are so arranged as to allow a clear space around this point for the turning of the boot or shoe in sewing or stitching the same from one end to the other of the line of stitching; that is to say, the stitching point projects from the body of the said machine so that the boot or shoe will not foul or come in contact with any part of the mechanism, even during the stitching around the hollow curves of the inside or outside of the waist. This result is very important, as it greatly facilitates and accelerates the work.

The operating of the parts of my improved sewing-machine thus far described is as follows, that is to say:—The machine is first adjusted by turning the shaft a until the piece k , under the influence of the feed-cam, is in the position in which it is nearest to the needle and the points of the needle and awl are nearest to each other; the pivot of the feed-lever is then turned until the needle and awl are exactly in a line with each other, and the pin k^3 in the slot of the feed-lever l is moved or adjusted by the handle k^4 to give the extent of feed or length of stitch required. The shaft is then moved round until the needle and awl, under the influence of their respective cams, are withdrawn from each other as far as possible. The operator then presses back the hand-lever q to depress the table n , thus forming a space between the holding jaws of the machine, namely, the channel-gauge m and the table n . Into this space he then introduces the sole or other work, so placing it that the welt rests on the table and the point of the channel-gauge m enters the channel. He then releases the hand-lever q , and the spring o^4 so acts on the slide as to force the table n upward, thus nipping the work between the latter and the channel-gauge m , and by the same movement the toe of the locking lever, no longer held up by the projection q^1 , bears with the full force of the spring p^5 on the slide o and locks it securely in its place. The machine is then set in motion in the direction of the arrow; the awl passes up through the table n and pierces the work and rests; at the same moment the cam upon the periphery of the feed-cam d presses on the roller of the locking-lever p and relieves the locking-slide o of the pressure of the locking spring, leaving it free except with regard to the pressure of the spring o^4 . The feed-cam is so timed as to come into action at this moment, and moves the feed-slide k , the channel-gauge, and the awl, with the work, towards the needle e , a distance equal to the length of one stitch. Immediately the feed is effected the locking-lever p locks the slide o , and consequently the table n , in the position shown in figure 2. The awl g then descends and is immediately followed by the needle e , which enters the hole made and now vacated by the said awl. The awl then at once retires to its rearmost position, the cam on the periphery of the awl-cam permits the spring m^* to lift the channel-gauge m , and the feed-cam causes the feed-slide k to return to its position furthest from the needle and remain stationary, and the needle follows to the extremity of its travel and rests. As soon as the said needle comes to rest the looper i , actuated by the cams as above described, makes its movement and lays the thread around the barb, the needle commencing its return movement just before this movement of the looper is completed. The cast-off follows the needle in its descent, and is so adjusted as to come to rest just as it touches the bottom of the channel, and it remains in this position until the needle has returned through the work, drawing up the thread with it; as soon as the barb of the said needle has passed fairly within the point of the cast-off the latter returns with it and retires from it in the usual manner, leaving the barb free to shed or drop the loop. The awl by this time is ready to pierce the work again, and the above described operations are repeated throughout the operation of sewing.

For the production of good work it is a matter of great importance that the length of the loop of thread drawn up by the needle at each stitch should bear a certain proportion to the thickness of the material being sewn. This result may be obtained by altering the position of the needle in the needle-stock so as to cause the needle to draw up a longer or a shorter loop. In practice, however, the thickness of the material varies continually, not only in the different articles consecutively subjected to the action of the machine, but also frequently in different parts of the same article, so that the variation of the quantity of thread in the loops by continued or repeated re-adjustments of the position of the needle by hand is obviously impracticable. I have therefore devised the mechanism, which I will now proceed to describe, for effecting automatically the adjustment of the length of the loop to the thickness of the material by and during the action of the machine.

The pivot or fulcrum f^2 of the needle-segment f is carried upon a post, f^4 , which is preferably so inclined that its centre line is tangential to a circle struck from the centre of the needle-stock pivot e^2 . This post f^4 is free to move in the direction of its length in guides or bearings, $f^* f^*$, carried on the pillar A^1 , which is formed on or attached to the frame A , and in so moving the said post effects the adjustment of the fulcrum f^2 of the needle-segment. The aforesaid post, f^4 , is provided with an adjustable collar, f^5 , which by coming in contact with the under side of the upper bearing f^* limits the upward movement of the said post.

Beneath the post f^4 the frame A has in it a groove, A^2 , in which is fitted a wedge, r , that is capable of sliding in the said groove. This wedge is sufficiently large or deep at its thick end, r^1 , to entirely fill the space left between the foot of the post f^4 and the bottom of the groove A^2 when the said post is raised as high as the collar f^5 will permit. The thin end, r^2 , of the said wedge is so small that when such end is under the post f^4 the maximum downward movement of the said post and the pivot f^2 is permitted.

f^0 represents an adjustable friction cushion, which is fixed in the frame A of the machine. This friction cushion is employed in combination with the automatically adjustable pivot or fulcrum f^2 , to render certain the effect of the adjustment of the latter.

Improvements in Sewing Machinery for the manufacture of Boots and Shoes.

The end o^* of the locking-slide o is so bent or formed as to extend across the groove A^2 , in which the wedge r moves, and form a stop to limit the forward movement of the said wedge. This forward movement is imparted to the wedge by a spring, s , attached to the wedge r at r^* and to the frame A by a bracket, s^1 , to which the said spring is connected at s^2 . This spring s exercises a constant pressure upon the said wedge r to draw it forward or under the post f^4 .

As the table n and channel-gauge m hold the work between them, and as the said channel-gauge is practically fixed as regards the vertical direction (although during the time the "feed movement" takes place it has a slight up and down motion), it will be readily understood that any variation in the thickness of the leather or other material must occasion a movement of the table n . This movement is communicated to the locking-slide o and the stop o^* , and consequently the position the wedge is free to assume under the post f^4 is dependent upon the thickness of the leather upon the table n .

I have described the action of the spring s , which imparts the forward movement to the said wedge, and I will now describe the devices which I prefer to use and which I have devised for drawing back the said wedge. Upon the awl-cam c there is formed a cam-groove, c^1 , in which works the cam-roller t^1 on the end of the bell-crank lever t , pivoted at t^* . The arm t^2 of this bell-crank lever carries a pawl, t^3 . The wedge r has a prolongation furnished with ratchet teeth, r^3 , with which the said pawl t^3 engages. This pawl is lifted out of or disengaged from the teeth r^3 at a certain period in the working of the machine by the action of a lever, u , and cam u^1 . This lever u is pivoted at u^2 , and is furnished at one end with an anti-friction roller, u^3 , its other end being extended to form a tail, u^4 , which extends under a projection or shoulder, t^4 , at the side of the pawl t^3 . When in the working of the machine the cam projection u^1 depresses the roller u^3 , the tail u^4 of the lever u , acting on the shoulder t^4 , raises the pawl t^3 out of engagement with the teeth r^3 , the said lever and pawl remaining in this position until the cam surface u^1 has passed out of contact with the roller u^3 .

So long as the fulcrum f^2 of the needle segment f remains stationary, the needle-stock e^1 will receive the whole of the motion that the cam b^1 can impart to it through the needle segment; but if the said fulcrum f^2 is free to move endwise in its bearings without limitation, and at the same time a sufficient resistance is offered by the cushion f^0 or otherwise to the movement of the opposite end of the needle segment, it is obvious that the whole effect of the cam on the needle segment will be dissipated in moving the fulcrum f^2 up and down, and the needle-stock e^1 will remain stationary. As, however, the movement of the fulcrum f^2 is controlled or restrained within narrow limits by the collar f^5 and the wedge r , the action of the said cam will be expended first in moving the fulcrum f^2 and then in actuating the needle-stock e , which will thus have its motion diminished in proportion to the extent of movement of the fulcrum f^2 , and as the extent of movement of this fulcrum is regulated, the length of the loop drawn up is controlled, for the reason that this length depends on the distance the barb of the needle e rises above the table n .

In operating with the said machine, when a piece of leather or other material of any thickness within the capacity of the machine is placed between the table n and the channel-gauge m , the stop o^* assumes a position corresponding with the thickness of such material. The machine being then set in motion, the awl having passed upward and pierced the work and the feed having taken place, the locking-slide o and stop o^* are locked fast in the position they were caused to assume by the table; the needle-cam b^1 then lifts the fulcrum post f^4 until the collar f^5 touches the bearing f^6 , and then rotates the needle-stock until the needle has reached its lowest position. In the meantime the cam c^1 acts upon the bell-crank lever t , and by means of the pawl t^3 , which engages with the teeth r^3 , draws back the wedge r , retains it in position until the cam by its revolution acts upon the lever u , and lifting the pawl t^3 out of the said teeth allows the spring s to draw the wedge rapidly forward to the stop o^* ; consequently, by the time the cams have revolved to such an extent that it is time for the needle to return and draw up the loop, the wedge is already in a position to determine the extent of movement of the fulcrum f^2 , which movement by the action of the devices herein described will be proportionate to the thickness of the material being sewn in the machine.

CLAIMS.

- First—In a machine for stitching soles to the welts of boots and shoes, the mechanism consisting of the upper jaw or channel-gauge (which is stationary or immovable, except at the moment when it and the awl are returning after each feed movement) and the lower jaw or table, which is movable on an axis, so arranged relatively to that of the needle that the said table moves in an arc nearly coincident with that of the movement of the needle, the said jaws being alternately or intermittently locked and released after every stitch, while properly holding the boot or shoe during the operation of sewing, all substantially as and for the purposes specified.
- Second—The combination with the said lower jaw or table of the devices substantially as described and shown for locking and releasing the same at the proper times during the working of the machine, as and for the purposes set forth.
- Third—The mechanism whereby the awl, after having pierced the leather but before leaving the hole, is caused to move laterally with the boot or shoe sole toward the needle, and then after it is withdrawn from the hole and while the needle is in the latter is caused to return to its normal position in readiness to make another hole in the leather, thereby feeding the work along stitch by stitch, all substantially as set forth.
- Fourth—The cast-off mechanism arranged in the position shown and combined with the needle and awl and their adjuncts, substantially as and for the purpose specified.
- Fifth—The improvements relating to the novel arrangement of the cast-off mechanism and the lower jaw or table, whereby the stitching or sewing point of the machine projects from the body of the same in such a manner as to leave a clear space or path for the turning of the boot or shoe around the said stitching point, as above set forth.

Sixth—

Improvements in Sewing Machinery for the manufacture of Boots and Shoes.

- Sixth—A boot or shoe sole sewing-machine, in which the above described improvements relating to the upper and lower jaws, the devices for locking and releasing the lower jaw or table, the awl-feeding mechanism, the cast-off mechanism, and the toothed arms or segments geared with the needle and awl-stocks, are arranged in combination with each other and with the other parts of the said machine, substantially as shown in the drawings (either with or without the provision for varying the length of the loops in proportion to the thickness of the material being sewn), so that all parts of the mechanism co-operate to properly effect the sewing or stitching of the boots or shoes, as above set forth.
- Seventh—The employment of a curved needle actuated by a segment, lever, or arm, which has an adjustable or movable fulcrum, the extent of whose movement is regulated or determined (through the action of the devices above described or other suitable devices) by and according to the thickness of the material being sewn, for the purpose specified.
- Eighth—The combination of parts comprising the movable needle, lever, or segment, and the post carrying the fulcrum of the said lever or segment, whether the same is geared with the needle-stock or holder as shown or has the needle fixed in it, or is otherwise arranged for operating the said needle.
- Ninth—The combination with the said sliding or moving post or other adjustable support for the needle lever fulcrum of a wedge, for the purpose of varying the travel or movement of the said fulcrum, to effect the regulation or variation of the length of the loops, in proportion or according to the thickness of the material being sewn, substantially as set forth.
- Tenth—The combination with the movable jaw or table, and with the aforesaid wedge or equivalent device, substantially as set forth, of a stop which governs or limits the movement of the said wedge or device, and thereby controls the adjustment or movement of the needle lever fulcrum in proportion to the thickness of the material being sewn.
- Eleventh—The curved needle carried by the needle-stock operated by the needle lever or segment, which has an adjustable fulcrum supported in a movable post; the wedge for limiting the movement of the said post and fulcrum, and the stop for controlling the position of the said wedge connected with the lower jaw or table, and adjusted or actuated by the same according to the variations in the thickness of the material placed between the two jaws; the springs and other parts arranged and combined substantially as shown in the accompanying drawings and operating as and for the purpose specified.

In witness whereof, I, the said Charles Frederic Gardner, have hereto set my hand and seal, this seventh day of July, 1881.

C. F. GARDNER,

By his duly authorized Attorney,
EDWD. WATERS.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to Charles Frederic Gardner, this fifteenth day of October, A.D. 1881.

AUGUSTUS LOFTUS.

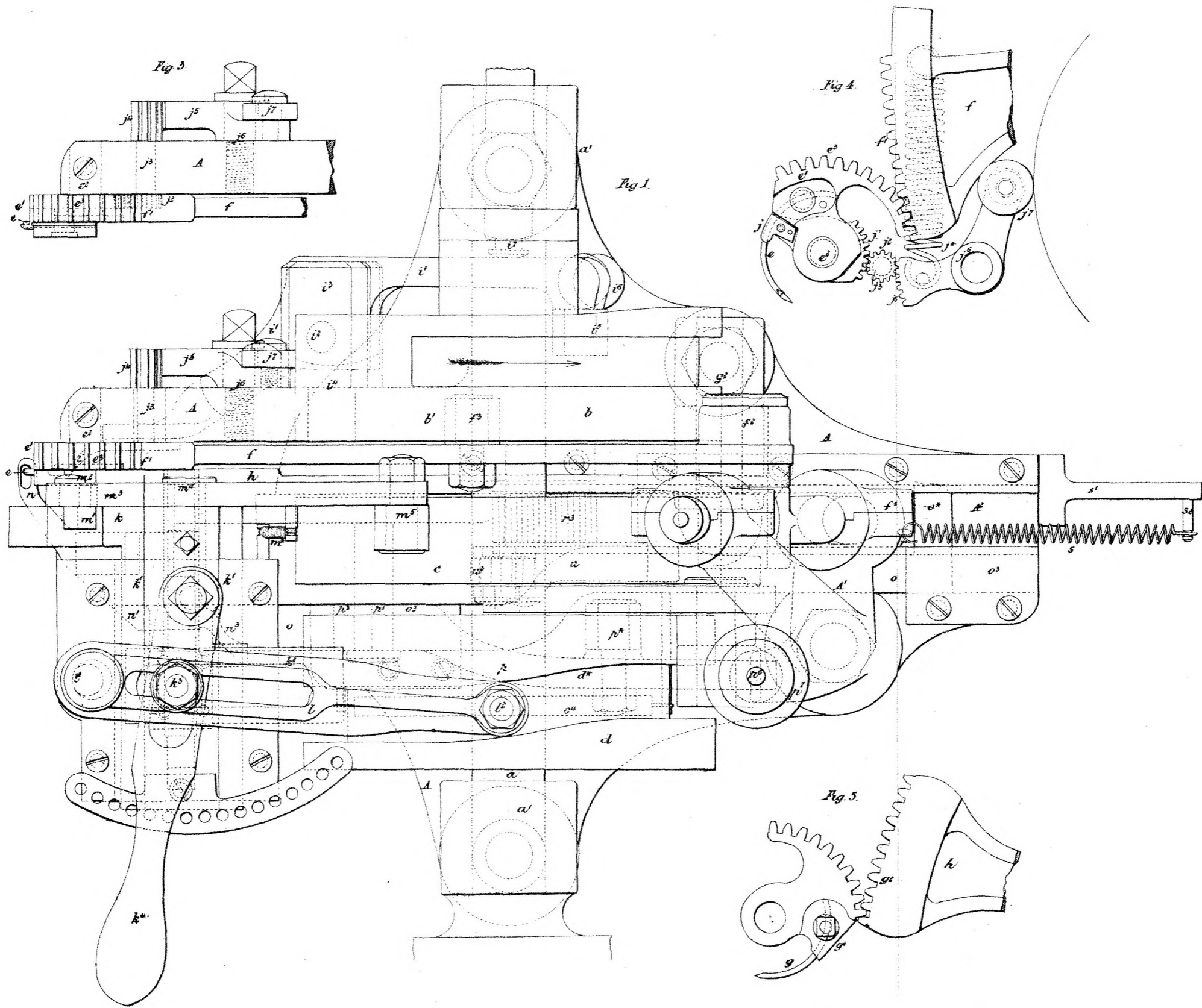
REPORT.

Sir,
We do ourselves the honor to report, in reply to your blank cover communication of the 27th ultimo, No. 8,388, transmitting the Petition of Mr. Charles Frederic Gardner, Managing Director of the Blake and Goodyear Boot and Shoe Machinery Company, that we are of opinion the prayer of the petitioner may be granted, in terms of his specification, drawings, and claim.

We have, &c.,
E. C. CRACKNELL.
G. K. MANN.

The Under Secretary of Justice.

[Drawings—two sheets.]

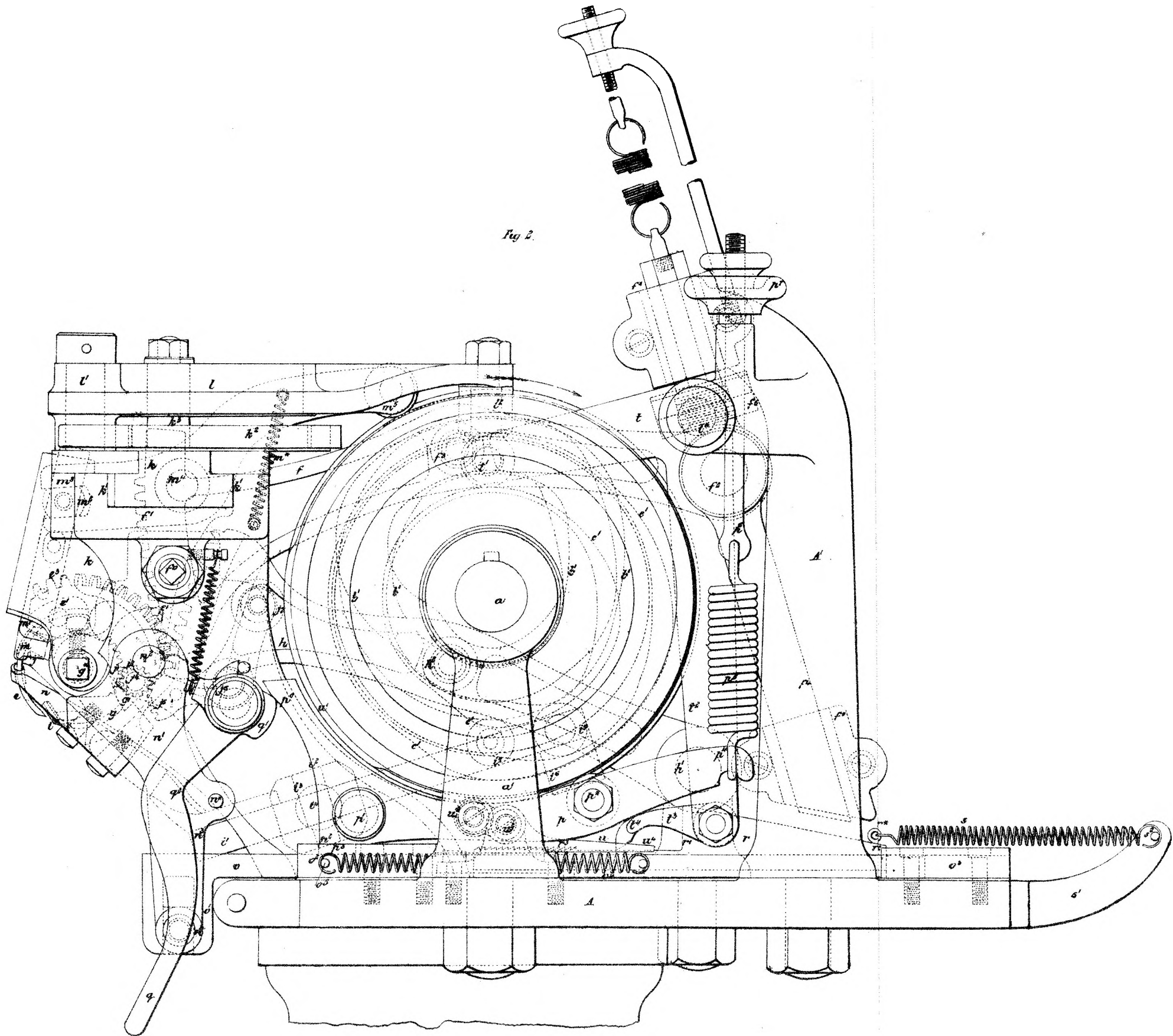


This is the sheet of Description marked "Discovered" in the annexed Letters of Appointment granted to Charles August Gardiner this fifteenth day of October 1837
 "Augustus Loffler"

C.

[1000]

Fig 2.



This is the first of drawings marked C referred to in the annexed Letters of Patent, &c. granted to Charles Adams Gardner the fifteenth day of October, A.D. 1881.
Augustus L. Lott.



A.D. 1881, 15th October. No. 1001.

AN IMPROVED DOOR-FASTENING.

LETTERS OF REGISTRATION to the Escape Door Lock Company (Limited),
for an Improved Door-fastening.

[Registered on the 15th day of October, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting:

WHEREAS the ESCAPE DOOR LOCK COMPANY (LIMITED), of the city of Nelson, in the Colony of New Zealand, hath by its Petition humbly represented to me that it is the assignee of James Palmer Black, of Nelson aforesaid, gentleman, who is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "An improved Door-fastening," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed; and that it, the said Company, hath deposited with the Honorable the Treasurer of the said Colony or New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to the said Company for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the Escape Door Lock Company (Limited) aforesaid, and its assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said Escape Door Lock Company (Limited), aforesaid, and its assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said Escape Door Lock Company (Limited) shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this fifteenth day of October, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

An improved Door-fastening.

SPECIFICATION of the ESCAPE DOOR LOCK COMPANY (LIMITED) (Incorporated under an Act of the General Assembly of New Zealand, intituled "The Joint Stock Companies Act, 1860"), of the city of Nelson, in the Colony of New Zealand (the assignees of James Palmer Black, of Nelson aforesaid, gentleman), for an invention entitled an "Improved Door-fastening."

THIS invention has been designed for the purpose of providing a simple and effectual door-fastening which can be opened with ease, so as to facilitate the exit of people from places in which they congregate for public entertainment or otherwise, in case of fire or other cause of panic.

It consists of two bolts, one at the bottom and the other at the top of the door, fitting into sockets made to receive them (say in the architrave and sill respectively), and kept therein by means of a thrust spring attached to each. When they are required to be withdrawn, we overcome the pressure of these springs by means of cords or wires, or chains, one attached to each bolt, and each strained over the grooved periphery of a circular disc, toothed for about one quarter of its circumference, and gearing the one into the other, and both fixed inside a protecting plate secured at a convenient height upon the door, and operated by means of a handle on a short lever attached to one of them. When once the bolts are withdrawn, a pawl falls into a ratchet tooth on one of the circular discs, and prevents the return of the bolts to their sockets by preventing the return motion of the circular discs. When required to be re-fastened the pawl must be removed from the ratchet tooth, when the bolts will fly back into their sockets by the pressure of their respective thrust springs.

In the drawings hereto attached figure 1 shows the bolts in their sockets; figure 2, the bolts withdrawn; and figure 3 shows the appearance of our fastening upon a door. AA are the bolts, and A¹A¹ the thrust springs which force them into their sockets BB; CC are the cords, wires, or chains, the one attached to and passing over a groove in the periphery of circular disc D, and the other attached to and passing over a similar groove in the periphery of circular disc E, both discs working on plate D²; D¹ is a ratchet tooth to receive pawl F; F¹ is a button to remove pawl F from its tooth D¹, when the door is to be shut; E¹ is a short lever terminating in a knob or handle, E², with which to withdraw the bolts when occasion requires; and E³ is a slot to allow of the passage of the spindle of knob E².

It will thus be seen that if the door be shut, it is only necessary to press down the knob or handle E², when both bolts will be instantly withdrawn and the door fly open, the pawl F holding back the bolts until it is released from the ratchet tooth. This simple operation can be performed no matter what pressure there is bearing upon the door at the time.

We do not of course confine ourselves to the precise size, shape, or position of the various parts of our invention so long as its essence be retained, but what we claim as new and of our invention is—The combination of parts forming our improved door-fastening, substantially as herein described and explained, and illustrated in our drawings.

In witness whereof, the said The Escape Door Lock Company (Limited) have hereto set their name and seal, this thirtieth day of August, one thousand eight hundred and eighty-one.

THE ESCAPE DOOR LOCK CO. (LIMITED),

By its duly authorized Attorney, T. PARFITT.

Witness—

EDWD. WATERS,
Melbourne, Patent Agent.

This is the specification referred to in the annexed Letters of Registration granted to the Escape Door Lock Company (Limited), this fifteenth day of October, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,
The application of the Escape Door Lock Company (Limited) for Letters of Registration for an invention of an "Improved Door-fastening" having been referred to us, we have examined the specification and drawings accompanying the same, and have now the honor to report that we see no objection to the issue of Letters of Registration as prayed for.

We have, &c.,
JAMES BARNET.
E. C. CRACKNELL.

The Under Secretary of Justice.

[Drawings—one sheet.]

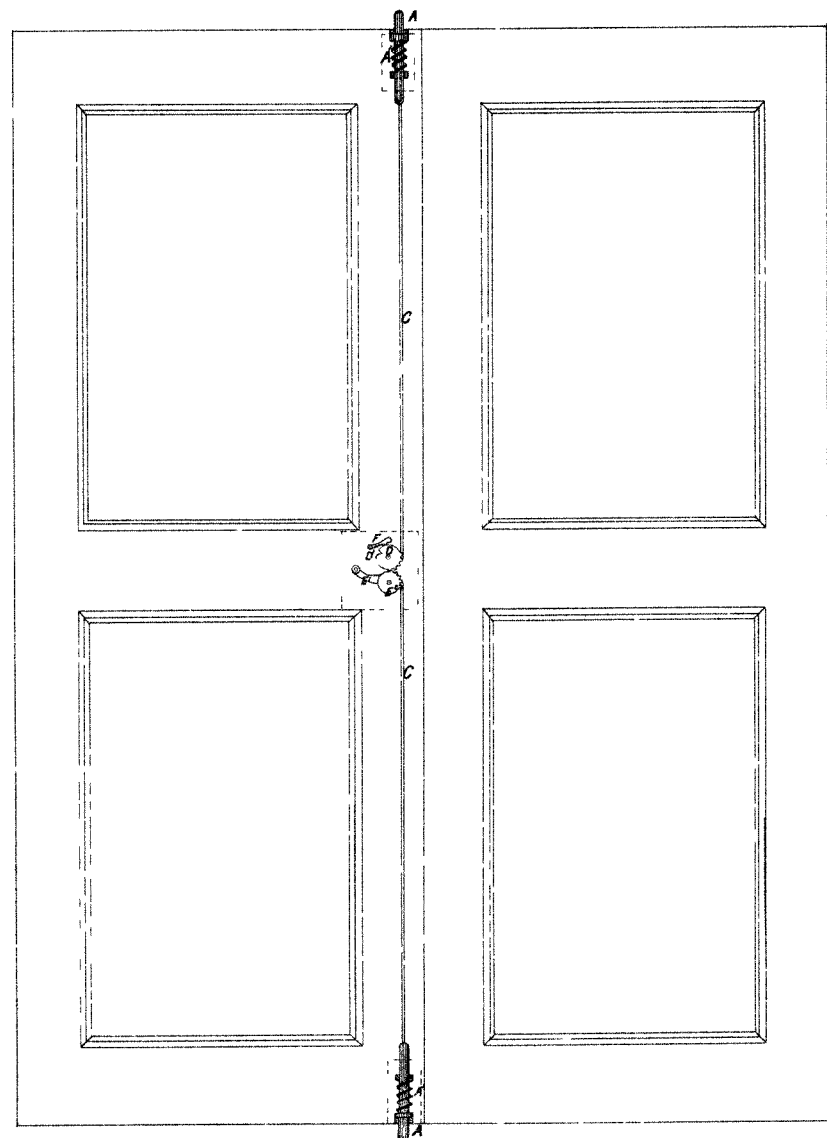


FIG. 1.

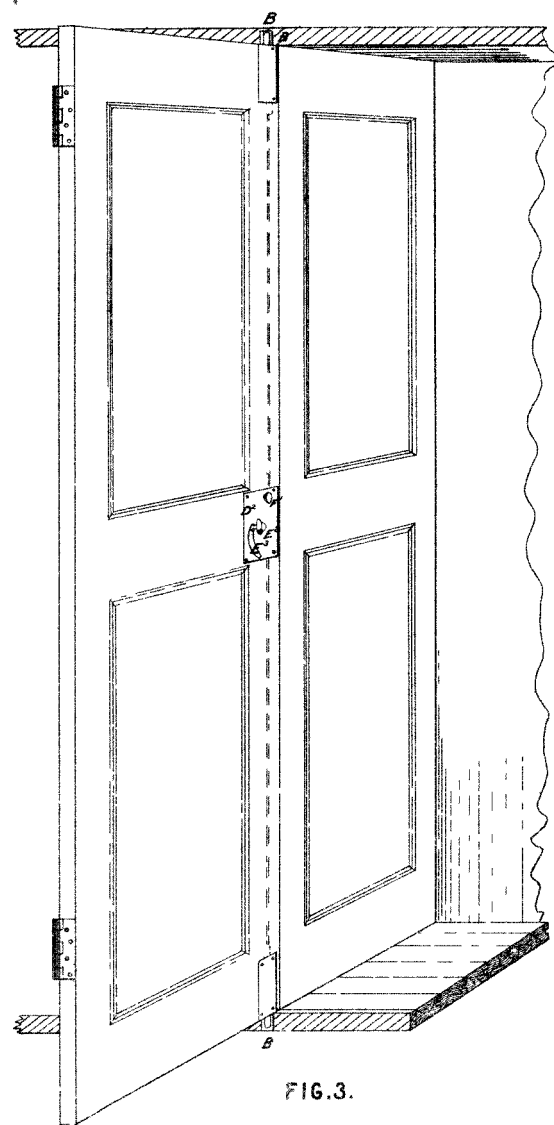


FIG. 3.

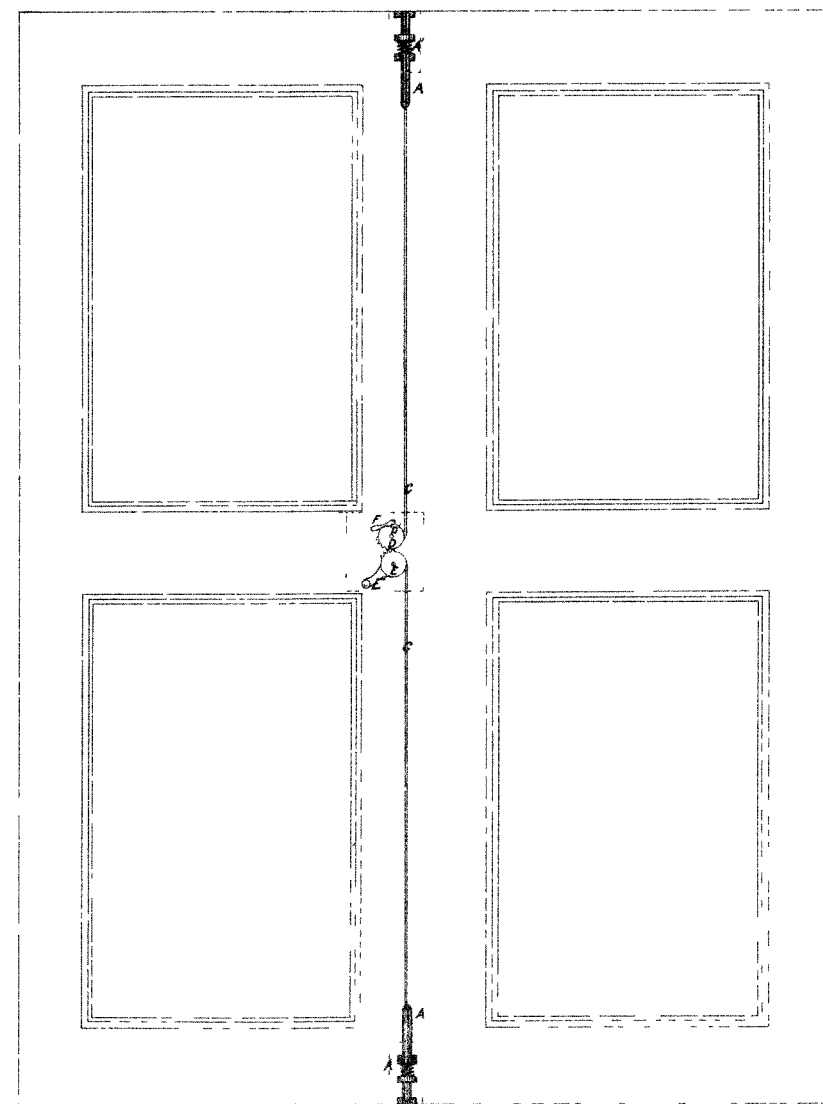


FIG. 2.

*This is the Sheet of Drawings referred to in the annexed
 Letters of Registration, granted to The Escape Door Lock
 Company Limited this fifteenth day of October, A.D., 1881.
 Augustus Loftus.*



A.D. 1881, 26th October. No. 1002.

IMPROVEMENTS IN ELECTRIC LIGHTS AND FITTINGS, &c.

LETTERS OF REGISTRATION to Thomas Alva Edison, for Improvements in Electric Lights and Fittings and Fixtures therefor.

[Registered on the 26th day of October, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS THOMAS ALVA EDISON, of Menlo Park, in the State of New Jersey, one of the United States of America, electrician, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in Electric Lights and Fittings, and Fixtures therefor," which is more particularly described in the specification, marked A, and the three sheets of drawings, marked B, C, and D, respectively, which are hereunto annexed; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Thomas Alva Edison, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said Thomas Alva Edison, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said Thomas Alva Edison shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in South Wales, this twenty-sixth day of October, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Electric Lights and Fittings, &c.

A.

SPECIFICATION.

TO ALL WHOM IT MAY CONCERN: Be it known that I, THOMAS ALVA EDISON, of Menlo Park, in the State of New Jersey, United States of America, electrician, have invented certain "Improvements in Electric Lights and Fittings, and Fixtures therefor," of which the following is a specification:—

IN a system of electric lighting where the lamps used consist of an incandescing conductor, hermetically sealed in a glass enclosing globe, it is desirable that the lamp and its supporting socket should be so constructed that the lamp may be readily removed from or placed in the socket, and that at the same time, by the act of placing in or removing the lamp from the socket, the appropriate circuit connections to the conductor, subject, however, and only to the control of a suitable circuit-controller for throwing the current through the lamp when desired, shall be completed.

Such an arrangement of a separate complete removable electric lamp, and suitable socket or holder, is shown in a prior patent hitherto granted to me.

In such, the lamp is held to the socket by the friction between the neck of the lamp and the socket. It is desirable, however, to sometimes reverse the ordinary relation in space of the lamp and socket, that is, to hang the lamp from the socket, or to support the lamp horizontally, in order that the light therefrom may be unimpeded beneath the lamp by any shadow-producing parts.

In such an event, a more positive and reliable connection than friction is desirable between the lamp and its socket or holder, to furnish which is the object of a portion of this invention.

This may be accomplished in the following manner:—Secured to the glass neck of the lamp is a second neck designated hereinafter *the neck*, made of any suitable insulating material, upon the exterior of which are fastened two metal bands, one clamp of the incandescing conductor being connected electrically to one band, and the other clamp to the other band. One of the bands is formed with a male screw-thread.

The socket is also made of insulating material, hollowed out to receive the neck from one end, and formed with a screw-thread at the other end by which it may be attached to any ordinary gas fixture, chandelier, or bracket.

The socket is provided with a suitable circuit-controller, preferably such a one as is hereinafter described, to which one of the main conductors is connected. Upon the interior of the socket is a metal band, which may be formed into a female screw-thread, and to which leads the other main conductor. One or two turns of the screw-thread is sufficient, and the parts are so arranged and proportioned that when the lamp is placed in position, one of the metal bands upon the neck takes upon and forms contact with one within the socket, while the other band upon the neck is in position to be impinged upon by the circuit-controller when manipulated.

Another method—instead of forming one of the neck bands into a screw-thread—is to make it concave, and to attach to the band or ring within the socket curved spring fingers, which shall take therein and hold the lamp firmly within the socket; or the insulated neck may be bevelled slightly and two concavities made therein, one on either side, in the bottoms of which are metal plates, to which lead the wires from the two clamps of the incandescing conductor. From the bottom of the interior of the socket two spring fingers rise, terminating in small balls which take and are held into the concavities by the resilience of the spring fingers; or upon the exterior of the neck a ledge or projection may be formed, over which slip spring fingers attached to the outside of the socket.

All these forms serve to carry out the idea of this invention, holding the lamp securely within the socket, irrespective of the relative position of the two.

A circuit-controller is also desirable in which arrangement or provision is made to indicate when it is in the best position to complete or to break the circuit, and to retain it securely in such position until it be positively and designedly moved therefrom, to furnish which is the object of another portion of this invention. This may be accomplished in the following manner:—The circuit-controller is seated in the wall of the socket, and forms the socket terminal of one of the conductors leading thereto.

The part seated therein should be screw-threaded for attachment to the socket, and is made hollow for a portion of its length. Through it and its otherwise solid outer head passes a rod, carrying the contact point upon its inner end, and terminating upon the outside in a suitable thumb-piece of insulating material. The solid outer head has two grooves or indentations extending across the diameter at right angles to each other, one being somewhat deeper than the other. These have bevelled sides, in order that a pin secured to and extending from the rod before mentioned may be easily forced therefrom by force applied to the thumb-piece.

Near the inner end of the rod is a washer against which takes a spiral spring wound around the rod, so that it forces the rod inwardly so far as is permitted by the pin thereon. When the rod is turned by the thumb-piece so that the pin takes in the deeper indentation, the spring forces the rod inwardly sufficiently to close the circuit, while when the pin takes in the shallower, the circuit remains open; in either event, however, the stress of the spring holding the pin in the indentation or groove into which it has been turned against any accidental misplacement.

The construction of the neck and socket for the lamp and of the circuit-controller is clearly shown in the drawings; in which figures 1, 2, 3, 4, 5, and 6, show the forms of neck and socket, and figures 7, 8, and 9, details of the circuit-controller.

In figures 1, 2, 3, 4, 5, and 6, S is the socket, made of insulating material, hollowed out to receive the neck B of lamp L, the lamps in figures 2, 3, 4, 5, and 6, being indicated by lines representing their lower portion only. The socket is provided with the screw-threaded end F made of a separate piece attached to the socket, or made integral with the socket, for attachment to any suitable support or fixture.

Secured in the socket is the circuit-controller C formed as follows:—*t*, its stem, is a cylinder of insulating material, screw-threaded at one end, *v*, for its securement to S, over which, if desired, may be a sleeve, *v'*, of insulating material, as shown in figure 7. The outer end of the cylinder is a head, *o'*, solid except for an aperture, through which passes the rod *x*, carrying the contact point *u*. Upon the rod *x* is a head or washer, *u*, filling the inner end of the cavity in *t*, and forming a bearing, against which takes the spring

Improvements in Electric Lights and Fittings, &c.

spring x wound around x , and serving to force $u u'$ out from t . Upon the head c' of t are cut the diametrical grooves $E E'$ of which one, E , is much deeper than the other as shown, both having inclined or bevelled sides. A pin, y , attached to and extending out from x takes in these grooves.

Upon its extreme outer end the rod x should be provided with an insulating thumb-piece, D .

From this it will be seen that as D is turned, the stress of the spring x pulls y into one of the grooves and holds it there, unless force be applied sufficient to raise it therefrom, so that when the pin y falls into E the extra depth thereof permits the spring to force u out further than when the pin takes in E' , and these distances are so proportioned that when the pin y is in E the circuit shall be closed, and broken when the pin y is in E' .

In figure 1, two metal bands or rings, $a b$, are put upon the neck B , one of which, a , is formed into a male screw-thread; from these bands, in all the forms shown, wires 3 4 lead to the clamps $c c$ of the incandescing material.

Upon the interior of the socket is the metal band e (figure 1), formed into a female screw-thread, to which is connected the main conductor 1, the other main conductor, 2, being connected to C . The act of placing B within S and fastening it therein by the screws $a e$, completes also the circuit connection, one branch then being 1 $e a 3 c$, the other being 2 $C b 4 c$.

In figure 2 $d d'$ are the rings or bands upon the neck, connected to $c c$, the screw-thread being formed separately therefrom at h and integral with the body of the neck if desired.

When placed in position the band or ring d' takes upon and contacts with f in the socket, completing the circuit 1 $f d' 3 c$, while d is in position for C to complete the circuit 2 $C d 4 c$.

In figure 3 $i k$ are the rings or bands upon the neck k , being formed with a concavity. l is a ring within S from which extend curved springs m rounded at their outer extremities.

When placed in position, the fingers m take in the concavity of k , holding the two parts together, while at the same time a circuit 1 $l m k 4 c$ is completed, and i is in position for C to control the circuit 2 $C i 3 c$.

In figure 4, the bands $o p$ on B are plain, a screw, s , being turned to take against p , completing circuit 1 $s p 3 c$, and at the same time holding the lamp and socket together, while o is put in position for r , a simple screw circuit-closer, to control the circuit 2 $r o 4 c$.

It is to be noticed that the arrangement of the bands in these forms, one above the other, ensures proper connections irrespective of the relative position of any two points in the same longitudinal or transverse plane of the lamp and socket, and obviates the necessity of a careful adjustment, present when the contact plates are in the same longitudinal or transverse plane.

In figure 5, a shoulder, e' , is formed upon the exterior of B , over which slide and take fingers f' attached to S , whereby the two are held together.

In figure 6, the lower part of B is bevelled; at the top of the bevel, grooves or concaves $a' b'$ being made upon opposite sides, in the bottom of which are metal plates connected to $c c$ by conductors 3 4. Extending upwardly from the base of S are spring fingers, $c' d'$, ending in small balls (or the ends thereof may be simply curved), to one of which, c' , is connected the main conductor 1. When the parts are placed in position, the round or ball ends of $c' d'$ take into the concavities of B , holding the two parts together, while one circuit is completed, *via* 1 $c' a' 3 c'$ and d' is in such position that r' may control the other, *via* 2 $r' d' 4 c$.

By any of these forms the lamp is held to its socket in so firm a manner that the lamp may be placed in any desired position relatively to its socket or holder, while the act of placing or removing the lamp completes or destroys automatically the circuit connections therethrough.

Another portion of this invention relates to improved means for hanging pendent electric lamps in an incandescing system, so that while applicable to a single lamp, they may readily, when desired, be grouped into a chandelier.

As set forth by me in a prior Patent, it is desirable that there be interposed in the lamp-circuit pieces of conductors which are not affected by the current normally passing to a lamp, but which, when the lamp circuit is short-circuited, or is otherwise affected, to permit an abnormal flow of current, melts, and so breaks its particular circuit, a device now sometimes called a "safety catch."

A part of this invention relates to the arrangement of such a "safety catch" in position to control the circuit of a pendent lamp, or of a group or chandelier thereof, and of the conductors leading to the lamp or chandelier in such way as that the connections are protected, and the molten metal of the "safety-catch" caught by a removable cap.

To this end, upon the ceiling or other support is fixed a base piece arranged to receive and support the stem of the chandelier, and upon which are fastened the conductors, in one of which is inserted a small piece of "safety-catch" wire, preferably lead wire, and from which base the conductors pass to the interior of the lamp or chandelier standard.

Such an arrangement of the lamp's neck and socket has been hereinbefore described as will permit of the lamp being placed in any desired position relatively to the socket, in order that the lamp may be so placed in use that all shadow-producing portions are above the light-giving part. It is desirable, when lamps are so used, that the shade or reflector be so arranged that all its supporting mechanism does not interfere with the reflection of the light.

A part of this invention relates to such an arrangement, and the end may be attained as follows:—

A shade or reflector is used, having a flange around the edge of its upper or smaller portion, on which take the fingers of a spider suspended from the chandelier arm. Or a shade or reflector may be made, conical in shape, and solid at the top, except for a small opening large enough to pass over the screw-threaded tip upon which the lamp socket is to be secured. So made, the shade or reflector is slipped over the top and the socket screwed into place, the shade or reflector being nipped between the two and held in position, the lamp depending from the interior, and its light-giving part being below any shadow-producing portions.

These points are illustrated in figures 10, 11, 12, 13, 14, and 15, of the drawings, in which figure 10 is a view of a chandelier with dependent lamps; figure 11, a section of the base piece and cap; figure 12, an elevation of the base piece; figure 13 and 14, a plan and section of a shade or reflector, and figure 15, a section of the same shade or reflector, with the lamp in position. In

Improvements in Electric Lights and Fittings, &c.

In figures 11 and 12, A is the base piece of insulating material to which the conductors 1 2 lead, 2 ending in a block, 5, to which one of the wires, 7, of the chandelier is connected, so that a circuit *via* 2, 5, 7, is made. 1 ends in a block 3, while the other wire of the chandelier, 8, terminates in a block, 4; these blocks 3 4 being electrically connected to complete the other portion of the circuit by the bit of "safety-catch" wire 6, which is preferably a lead wire.

This base piece has a central screw-threaded aperture to receive and support the stem H of the single lamp or chandelier as the case may be.

B is an ornamental or plain cap of metal, made by any suitable process, and having a central aperture permitting it to be moved along the standard of the chandelier D. Bayonet catches or slots *a* are made at several points in the side of B, taking upon pins in the side of A, so as to hold it thereto, although any other effective fastening may be used.

The cap B thus hides and protects the connections upon the base piece, and is in position to catch the molten metal should the "safety-catch" 6 ever be melted.

Attached to the arms of the chandelier are lamps provided with necks and sockets, made as hereinbefore described, so that the lamps may be reversed as shown.

Above the sockets are secured spiders, F, with fingers *f* rigidly connected but springy in one case, pivoted in the other.

The ends of these fingers *f* take under the flange *i* at the top of the shades or reflectors S, and so support them from above.

In figures 13, 14, and 15, a shade or reflector is shown, in which the flanged opening of the shades or reflectors in figure 10 is closed by material *c* homogeneous with and forming part of the shade or reflector, in the centre of which is left the small aperture *i'*, which takes over the end of the pipe M, and rests against the usual shoulder thereon. The socket E is then screwed upon the end of M and holds S in place, as shown in figure 15. It is evident that S in this case may be made without the flange *i*.

By such an arrangement as has just been described the lamps and shades may be placed in any desired position, so that the light unimpaired by shadows may be thrown in the proper direction.

In a system of electric lighting such as I have shown, wherein the lamps are intended to normally give only the volume of light of a standard sixteen candle-power gas-jet, it is desirable that fittings for carrying and supporting the lamps should be devised as nearly resembling those which experience has shown to be most desirable in gas-lighting as the difference in the lighting agents will admit.

Among the most useful devices used in gas-lighting is the swinging bracket, as it enables the position of the light to be adjusted within certain limits. One object of this invention is to provide a device having similar adjustability for electric lamps, to do which it is necessary to connect two arms by a pivoted connection so constructed that two complete circuit connections may be maintained through the pivotal connection in any position of the arms relatively to each other.

One of the arms is provided with a box or casing of suitable size at its end, in which the pivot proper is to turn. To the other arm is secured the pivot made of insulating material, upon which is secured two separate metal bands or rings which form the terminals of the conductors passing through the arm. The pivot passes into the interior of the box or case upon the other arm, through an aperture in its top, the sides of the aperture forming a bearing for the pivot, the bottom of the pivot resting upon the bottom of the box or case, and there secured by a screw passing through the bottom of the box into it, and forming a centre upon which it may turn.

The conductors in the arm carrying the box pass through the arm into the box and terminate therein, each in a spring, the two springs being insulated from each other and secured at one end to the interior of the box, from which they are also insulated, their other ends bearing upon the metal bands or rings of the pivot, one on each. As each spring then bears upon its ring or band during the entire rotation of the arm, it is evident that the circuit is always completed from one arm to the other irrespective of their relative positions, and so an electrical lamp-bracket is made possible.

The bracket may consist of any number of such arms pivoted together in like manner.

Instead of springs within the box, an insulating cylinder with interior metal rings arranged to coincide with the rings upon the pivot may be used; or the box itself may be of insulating material with such pivotal cavities; or to an insulated pivot or spindle, springs may be fixed to bear upon rings in the interior of an insulated cylinder or pivot receptacle; or one ring and one spring may be used, a single conductor passing through the bracket, the metal of the bracket and system of pipes being used for the other conductor, but such modifications would only be equivalents of the springs and rings as described.

Instead of having a circuit-controller located upon the fixed support of the bracket, as is the gas-cock upon the gas-light bracket, it may be preferable to have it at the lamp itself. In such case a projecting key or circuit-controller, such as I have before described, would be in danger of accidental displacement or breakage.

Another object of this invention then is to provide a circuit-controller which shall have no projecting parts, and in which all the electrical connections are so placed as to be protected and to be free from all danger of accidental displacement or contact.

To this end a circuit-controller is made in which the movable part accessible to the user is simply a plain band or ring of insulating material.

A socket for the lamp is used such as I have before shown, consisting of a piece of insulated material hollowed out at the top, and provided at its base with means for its attachment to a pipe, bracket, or chandelier arm. Upon the interior of the socket are two metal rings or bands, or plates, forming terminals of the conductors leading through the pipe or otherwise to the socket. Upon the neck or base of the lamp are two rings, sockets, or plates, forming terminals to the conductors leading from the incandescing conductor of the lamp, and so arranged that they coincide with the rings, bands, or plates of the socket, when the lamp is placed therein, so that the circuit is completed except as modified by the circuit-controller, by the act of placing the lamp in its socket.

The conductor leading to one of the rings, bands, or plates, is interrupted or broken, the conductor leading to a pin upon the exterior of the socket, while a second pin is placed above and contiguous thereto, which is connected to one of the rings, bands, or plates of the socket.

Improvements in Electric Lights and Fittings, &c.

The socket is shouldered upon the exterior, and upon this shoulder rests a ring of insulating material larger than the part of the socket it encloses, but with a flange extending inwardly at the top, so as to approach closely the upper part, a chamber being formed thereby, the socket forming its inner wall, the shoulder its base, and the flange its top. Upon the interior of this ring is fixed a wedge, which may be solid, but which is preferably made of a spring piece of metal bent back upon itself, and of such size that its extreme edges contact with and close circuit between the two pins before noted.

Upon the socket within the ring a spring pawl may be fastened, taking into recesses cut upon the interior of the ring so as to limit the movement of the ring upon the socket, and also indicate by the click of the pawl passing into a recess when the necessary amount of movement has been given. Or a screw may pass through the ring and play in a slot in the socket, or *vice versa*, to determine the movement which may be given the socket. By this arrangement a reliable circuit-controller is furnished which may be placed at the lamp itself or in exposed situations without danger of accidental manipulation or breakage.

These various arrangements are clearly illustrated in figures 16, 17, 18, and 19 of the drawings, of which figure 16 is a view of the socket and controller in section, and of the base or neck of the lamp in elevation; figure 17, a view of a bracket arm partly in section with socket thereon, the movable circuit-controller ring being removed therefrom, while figure 18 shows the removed ring in perspective, and figure 19 shows the pivot, rings, and springs.

A F figure 17, are two arms of a bracket, of which A supports at its outer end the lamp socket C, while at its inner end there is secured to it the pivot K of insulating material, upon which are the metal bands or rings *u v*, the conductor 7 being attached to *u* and 8 to *v*.

This pivot is placed and rotates in a box or casing, L, upon the end of the arm F, being secured thereto by a screw, M, passing through the bottom of the box or casing into the pivot K, the screw M serving as a centre of motion therefor.

To the interior of the box are secured, insulated from it and each other, the springs H G, to which are secured the conductors 1 2 as shown, 1 to G and 2 to H. This rotation of the springs and rings is clearly shown in figure 19.

It is evident from this that 1 G *u* 7 are always electrically connected, and that so are 2 H *v* 8, no matter what the relative positions of A and F may be.

It is evident also that as many arms as desired may be connected in this way, and that they may be connected to work at right angles, so that the lamp may be placed in any desired position within the limits of the net length of the bracket arms.

It is also evident that the modifications and changes hereinbefore noted may be made without departing from the spirit of this portion of the invention.

E, figure 16, is the base or neck of the lamp L' (partly shown) of insulating material, and having upon it the metal plates *x y*, to which are connected respectively the conductors 3 4, leading to the incandescing conductor. Of these *y* is formed with a screw-thread to engage with *d* upon the interior of the socket C, so that the lamp be positively held therein. One of the main conductors, 8, leads, and is connected to *d*, so that when the lamp is in position one portion of the circuit is completed *via* 8 *d y* 4.

The socket is formed with a shoulder, *w*, extending out from it as seen in figures 16 and 17. Upon the exterior of the socket, and one above the other, are two pins, *a b*, the main conductor 7 leading and connected to *b*, while *a* is connected to the plate *f* within the socket, with which *x* contacts when the lamp is in position upon the socket. Upon the shoulder is placed a ring, B, having at its top an inwardly extending flange, *o*, closing around the top of the socket, a chamber being left between the flange *o* and shoulder *w*.

Upon the interior of the ring is secured a wedge, *n*, seen in figure 18, which may be of solid metal, but which is preferably as shown, made of a strip of springy metal bent back upon itself, and of a size to fill the space between *a* and *b*, and make contact with both when forced between them.

To determine the movement of the ring B and to hold it from coming off, a screw, *p'*, passes there-through, and plays in a slot or recess, *p*, cut in the side of C.

If desired to indicate audibly when the proper amount of movement has been given B, a spring pawl, *c*, with bevelled or wedge-shaped end may be attached to C, and corresponding recesses *c'* cut in the interior of B at proper points, whereby the movement of B would be limited as well as an audible indication given.

As before stated, when the lamp is in position, the connection 8 *d y* 4 is complete, but the connection 7 *b a f x* 3 is broken between *a* and *b*. If now the ring B be turned in the proper direction (and from the limiting action of *p p'* or of *c c'*, if the latter be used it can be turned in no other direction) the spring wedge *n* is carried between the pins *a b*, electrically connecting them, and completing the connections 7 *b a f x* 3, while movement in the other direction removes the spring wedge from between them and breaks the circuit.

As the manipulative part of the circuit-controller is a simple ring, B, with no projecting parts to receive a blow or to catch upon or be caught by anything, there is no danger of accidental operation or disarrangement of the circuit-controller.

In an electric lighting system using incandescent lamps, it is often desirable to group a number of them, two or more, for which purpose a device like the ordinary gas chandelier is exceedingly useful, and this portion of my invention relates to what may be called an electrical chandelier.

A chandelier consisting of a body and two or more arms, often highly ornamented, is not in good shape for packing or shipment, hence it has become customary to make the ordinary gas chandelier so that they come apart into many pieces which may be packed securely and compactly for shipment, and then reassembled. Manufactured goods of all classes are so made, and are usually designated to the trade as "knock-down" goods.

With gas chandeliers the task is an easy one, as the "circuit," so to speak, for the fluid is simply a pipe, and it is only necessary to see that the junctions are tightly screwed together. With an electrical chandelier, a complete electrical circuit must be made to each lamp or burner.

The object of this portion of my invention is to furnish an electrical "knock-down" chandelier, so arranged with circuit connections and contacts upon or in its various parts, that the act of assembling the parts to form the chandelier shall at the same time complete the necessary electrical connections.

Improvements in Electric Lights and Fittings, &c.

A further object of the invention is to utilize wood or any suitable insulating material capable of economical manipulation and ornamentation in the manufacture of chandeliers and other electric lamp fixtures.

Suppose that the chandelier is to be of metal, or that an ordinary gas chandelier is to be changed into a "knock-down" electrical chandelier. The chandelier is composed of three elements: the arms carrying the lamps or burners, of which there may be any desired number; the standard and attached base into which the arms are fastened, and the ornamentation, usually of struckup metal or ornamental castings, slipped over or fastened upon the standard and arms.

Through each arm the two conducting wires are passed, being either left free at the outer end for attachment to the lamp socket, or if the socket is then in position, attached thereto. The inner end of the arm is screw-threaded for attachment to the base; beyond the screw-threaded end extends an insulating block or tube terminating in a metal tip, to which one of the conductors is fastened. Upon the exterior of the block is a metal ring to which the other conductor is led.

Within the base attached to the pendant or standard of the chandelier is fixed a block of insulating material serving as a base for the parts to be therein placed, or they may be insulated from each other by a special insulation to each. Near to the location of each arm, and in such position within the base that the metal tip and ring shall impinge thereon when the arm is put in position, are two springs. One is somewhat J-shaped, with its longer member bent at right angles, forming a shoulder by which it is fastened to and depends from the base, its free or spring member being toward the periphery of the base; the other is a curved or bowed spring of sheet metal rigidly fixed at one end to the base, and secured at the other by a screw passing through a slot, so that it may be more or less bowed. The main conductors pass down through the standard of the chandelier to the base, at which point they branch at each arm, a branch from one main conductor being connected to the pendent spring, while a branch from the other is connected to the curved spring.

When the arm is screwed into place, the metal tip upon its end impinges against the pendent spring, while the ring takes upon the curved spring, the resilience of these parts ensuring good contact, so that the necessary circuit connections are immediately and automatically formed.

I have found that tasteful and inexpensive chandeliers may be made of wood, which may be ornamented with the ordinary metal ornamentations when desired. Such, however, may be turned or carved so that the ornamentation of the standard and base are integral therewith, and the base hollowed out to form a chamber for receiving the circuit-completing devices described.

Figures 20, 21, and 22 of the drawings represent these devices: figure 20 being a section, and figure 21, a bottom view of part of a chandelier, constructed as a "knock-down" electrical chandelier; and figure 22 shows a wooden chandelier.

A is the standard or leading tube of the chandelier, through which pass the main conductors 1 2, and which is surrounded by any ornamental casing, C, or other desired ornamentation. Attached thereto is the base B for the reception and support of the burner or lamp-carrying arms D D', of which there may be any necessary number.

Upon its interior is the insulating base *b*, to which are attached springs E E' G H, there being one spring E and one spring G for each arm. E is made as a pendent spring secured at one end with its free end bent upward toward the periphery of the base, while G H are bowed flat springs rigidly secured at one end, and at the other by slots in which take screws *g h* so that their height or bow in the centre may be varied. To each spring E E' and G H a branch from a conductor leads, care being taken that the branches leading to the springs E G or E' H of each set shall be from different main conductors.

The arms are all alike, and the description of one answers for all.

The arm D is arranged to be screw-seated in the base, and it carries upon its inner end the insulating block *d* at whose end is fixed the metal tip F in contact with one of the conductors, 4, leading through the arm to the lamp. Upon the exterior of the block *d* is secured a metal band or ring *e* to which the other conductor, 3, is secured.

The springs E G and the tip F and ring *e* are so arranged relatively to each other that when the arms are put in position the parts shall be as shown in figure 20, viz., with F and E in contact and G and *e*, these contacts being rendered firm and reliable by the resilience of the springs E G.

In these figures the conductor 1 branches to spring E of one arm, and to spring H in the other, and conductor 2 to spring E' in one case and spring G in the other. One conductor, however, may branch to all the springs of one type, and the other branch to the springs of another type.

One set of springs and one conductor may be used where metal chandeliers are used, the metal of the chandelier and its connected system of pipes being used for the return system although it is preferable in systems of incandescent lighting to use a complete wire circuit.

It is evident that many modifications may be made in the form and arrangement of the contacts and springs, the feasibility of making a "knock-down" electrical chandelier being here shown.

For instance, the tip F may be a lug upon *d*, to strike against a shoulder, or G may be a semi-circular projection upon the base, in which *e* is to take, or F may be a spring. The number of such modifications evident to all ingenious minds is almost beyond cataloguing.

In figure 22 is shown a chandelier made of wood or other insulating material, in which the standard A is turned or carved into proper shape. The base B may be a piece separate from or integral with A, and the arms D D' may be of wood or metal as desired. The base B being of wood, the insulating piece *b* can be dispensed with.

The arms D D' and base and standard may each be made and sold as separate articles of manufacture, so that repairs of any broken or damaged part of the chandelier may be readily made without its removal from its location.

What I claim as my invention is—

First—The combination with a lamp and a socket detachable from each other, of controllable means for positively holding them together, and means for automatically completing the necessary circuit connections through the lamp, by the act of placing them together, substantially as set forth.

Second—

Improvements in Electric Lights and Fittings, &c.

- Second—The base or neck of the lamp, provided with contact plates or rings, arranged in different longitudinal or transverse planes, substantially as set forth.
- Third—The socket or holder provided with a contact plate or ring and a circuit-controller arranged in different longitudinal or transverse planes, substantially as set forth.
- Fourth—The combination with a separate removable lamp and a socket, of means for holding them positively in position relatively to each other, substantially as set forth.
- Fifth—A circuit-controller for an electric lamp to make or break the circuit, provided with means for retaining it in either position as desired, against accidental displacement, substantially as set forth.
- Sixth—A circuit-controller consisting of a spring-seated rod within a cylinder, and means for limiting and determining at will the action of the spring upon the rod, substantially as set forth.
- Seventh—In a circuit-controller for electric lamps, the combination of a cylinder with grooves as described, upon its head, a spring-seated contact rod passing therethrough, and a pin attached to the rod and taking in the grooves, substantially as set forth.
- Eighth—The combination of a base piece adapted to receive and support the standard of a lamp or chandelier, a lamp or chandelier standard, and means upon the base piece for completing the circuit connections to the lamp or lamps, substantially as set forth.
- Ninth—The combination of a base piece such as described, a lamp or chandelier standard, a safety catch, and a cap covering the base piece, substantially as set forth.
- Tenth—The combination of a chandelier or bracket arm, a lamp, and means for attaching the lamp thereto, and maintaining it in a reversed or other than upright position; substantially as set forth.
- Eleventh—The combination with an electric lamp, and a shade or reflector, of means located above the lamp, and supporting and holding the shade, substantially as set forth.
- Twelfth—A shade or reflector for an electric lamp, constructed and adapted to be held in position above the lamp by the socket of the lamp, substantially as set forth.
- Thirteenth—The combination of two bracket arms and a pivotal connection therefor arranged to constantly maintain electrical connection from a conductor in one arm to a conductor in the other, substantially as set forth.
- Fourteenth—The combination of two bracket arms, one pivoted upon or within the other so as to rotate freely, and means substantially as described for constantly maintaining electrical connection between a conductor or conductors in each arm, substantially as set forth.
- Fifteenth—The combination of a bracket arm provided with an insulated pivotal piece having thereon one or more metal rings, and a bracket arm having a box or casing to receive the pivotal piece, and provided with a spring or springs, constantly bearing upon the ring or rings, and electrical connections from the spring or springs, and ring or rings, substantially as set forth.
- Sixteenth—A swinging electrical lamp bracket composed of two or more arms, provided with means for constantly maintaining the proper electrical connections therethrough, substantially as set forth.
- Seventeenth—A circuit-controller for an electric lamp, in which the manipulative portion is a simple band or ring, substantially as set forth.
- Eighteenth—The combination with a broken electrical circuit, of a circuit-closer attached to the interior of a band or ring, substantially as set forth.
- Nineteenth—The combination with the socket of an electric lamp, of a circuit-controller operated by a ring or band encircling the socket, substantially as set forth.
- Twentieth—The combination with an electric circuit of two pins whereat the circuit is broken, and a wedge for closing such break attached to the interior of a band encircling and hiding the pins and circuit connection, substantially as set forth.
- Twenty-first—The combination with a circular or ring circuit controller, of means for limiting its motion, substantially as set forth.
- Twenty-second—The combination with a circular or ring circuit-controller, of means for audibly indicating when the proper amount of movement has been given, substantially as set forth.
- Twenty-third—An electrical “knock-down” chandelier, substantially as shown and described.
- Twenty-fourth—The combination with the standard and base of an electrical chandelier, of circuit terminals for completing the circuit to the arms, when placed in position, substantially as set forth.
- Twenty-fifth—An electrical chandelier arm provided with conductors and circuit terminals for completing the circuits when placed in position, substantially as set forth.
- Twenty-sixth—The combination in an electrical chandelier, of a base, an arm or arms, for carrying the lamps, suitable conductors, and means for completing the circuit connections throughout the chandelier automatically upon the proper joining of the base and arms, substantially as set forth.
- Twenty-seventh—The arrangement within the base of a chandelier of circuit terminals and contacts for completing the circuits throughout the chandelier, substantially as set forth.

Improvements in Electric Lights and Fittings, &c.

Twenty-eighth—An electrical chandelier made principally of wood, and provided with necessary electrical conductors, substantially as set forth.

Signed by me, this ninth day of June, A.D. 1881,—

THOMAS ALVA EDISON.

Witnesses—

CHAS. H. SMITH.
GEO. T. PINCKNEY.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to Thomas Alva Edison, this twenty-sixth day of October, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

We do ourselves the honor to state, in reply to your blank cover communication of the 12th instant, No. 8,882, transmitting Mr. Thomas Alva Edison's Petition for Letters of Registration for an invention entitled "Improvements in Electric Lights and Fittings and Fixtures therefor," that we are of opinion the prayer of Mr. Edison's Petition may be granted, in terms of his specification, drawings, and claim.

Sydney, 20 September, 1881.

We have, &c.,

E. C. CRACKNELL.
GOTHER K. MANN.

The Under Secretary of Justice.

[Drawings—three sheets.]

B.

1002

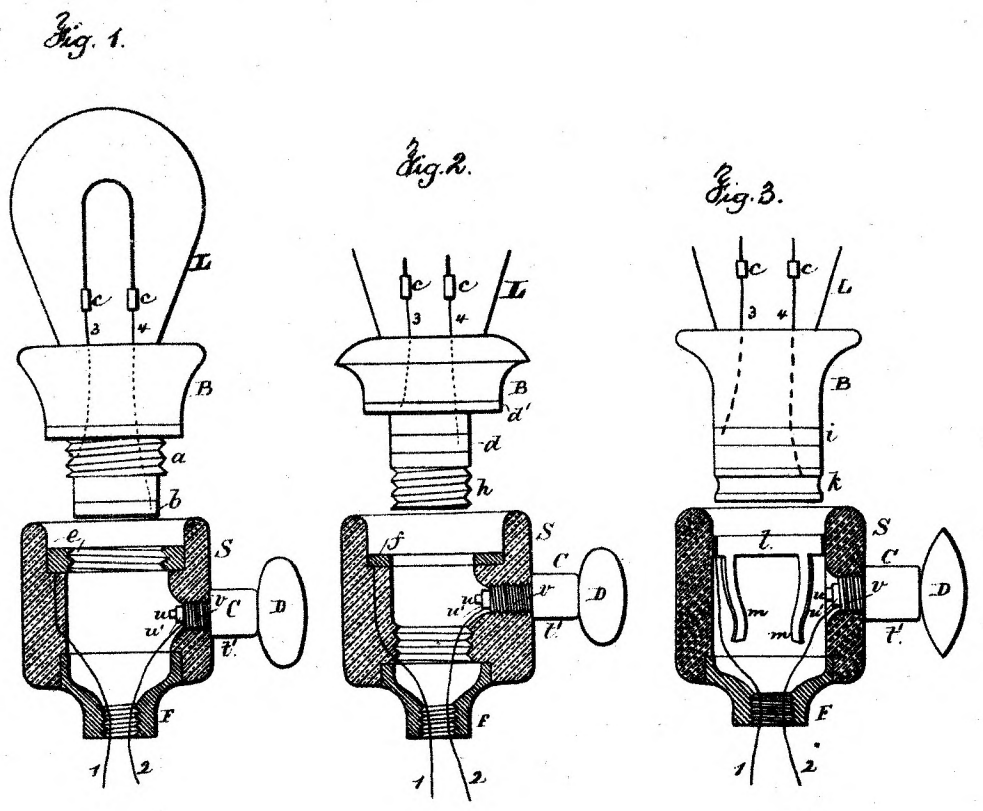
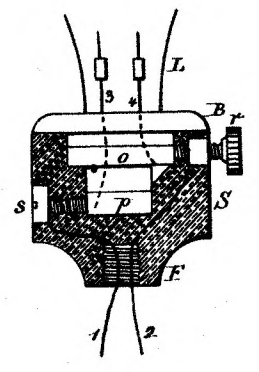
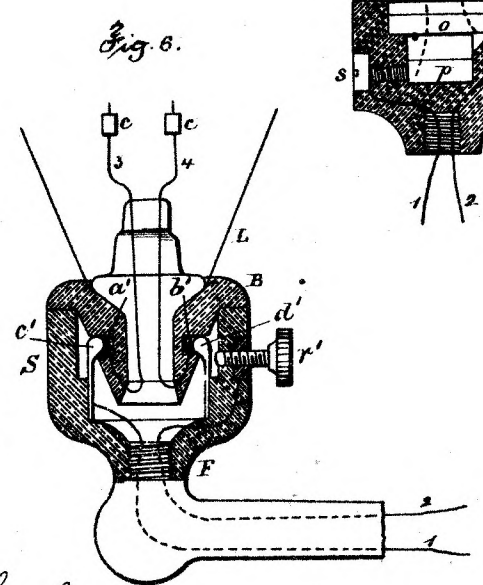
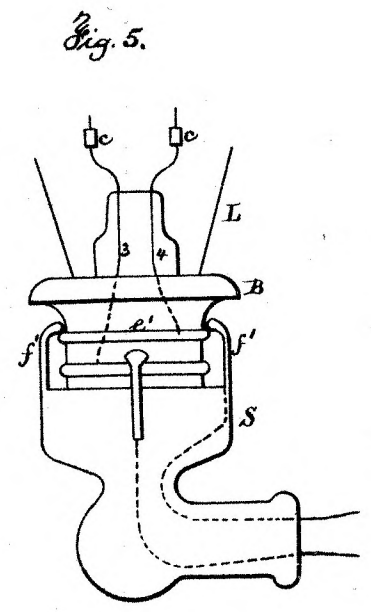


Fig. 4.



Witness
 Chas. H. Smith
 J. Frank

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 SYDNEY, NEW SOUTH WALES.

Thomas Alva Edison

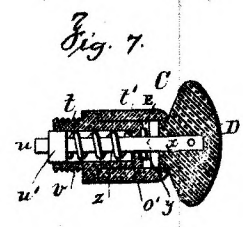


Fig. 10.

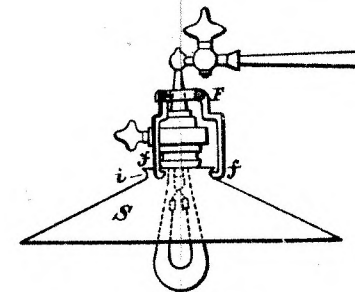
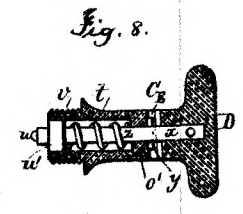


Fig. 9.

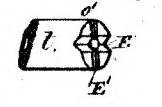


Fig. 11.

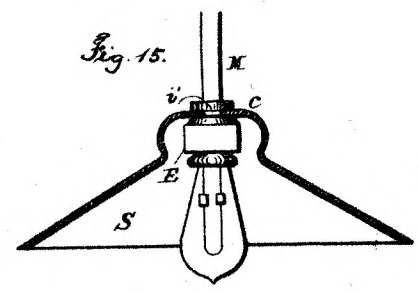
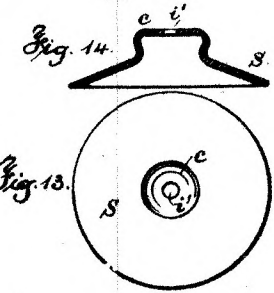
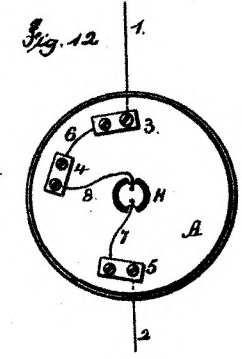
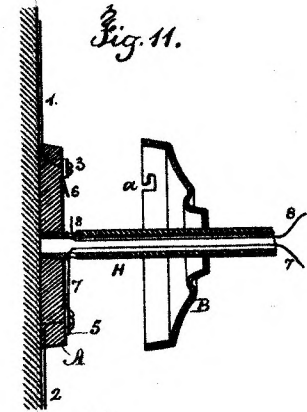


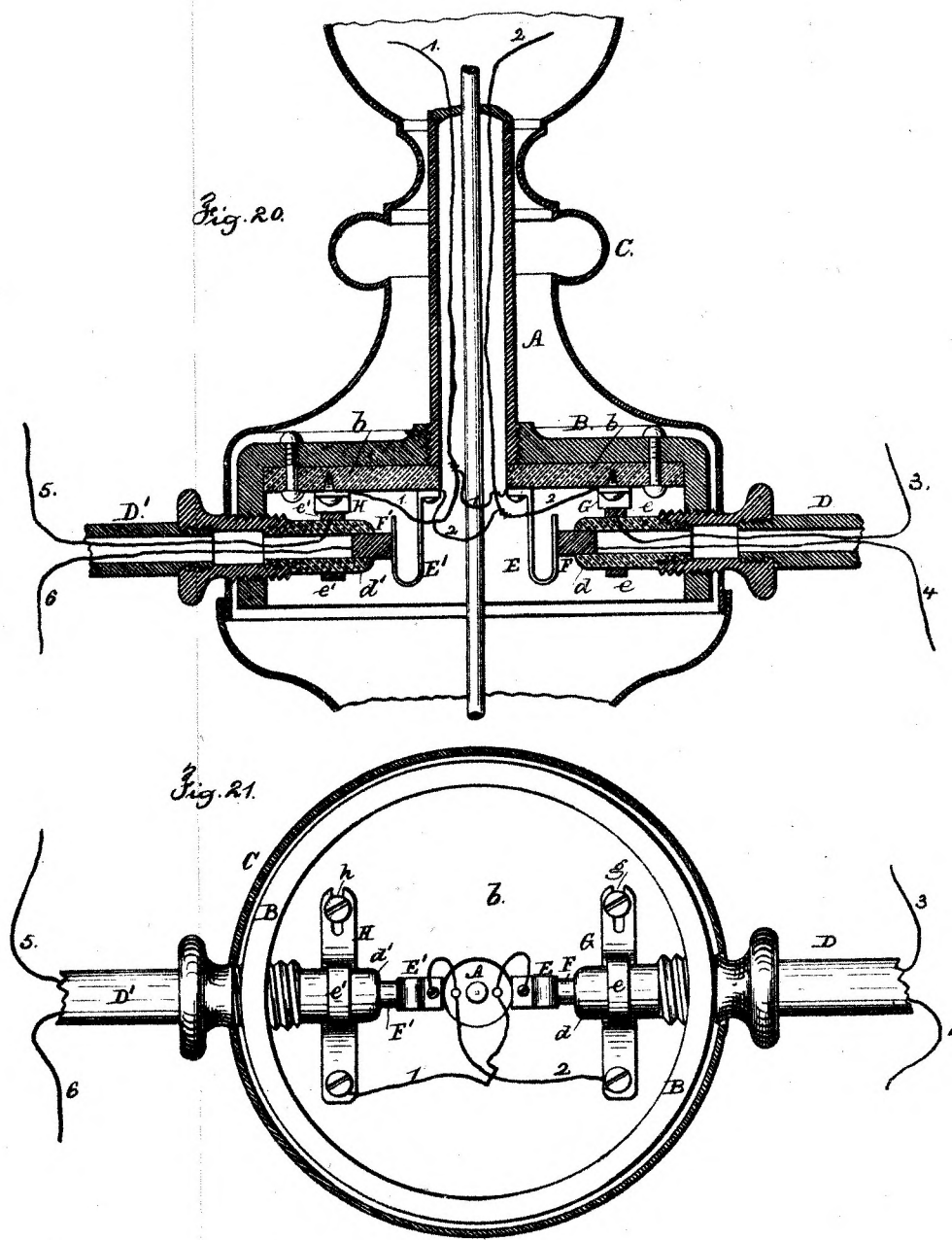
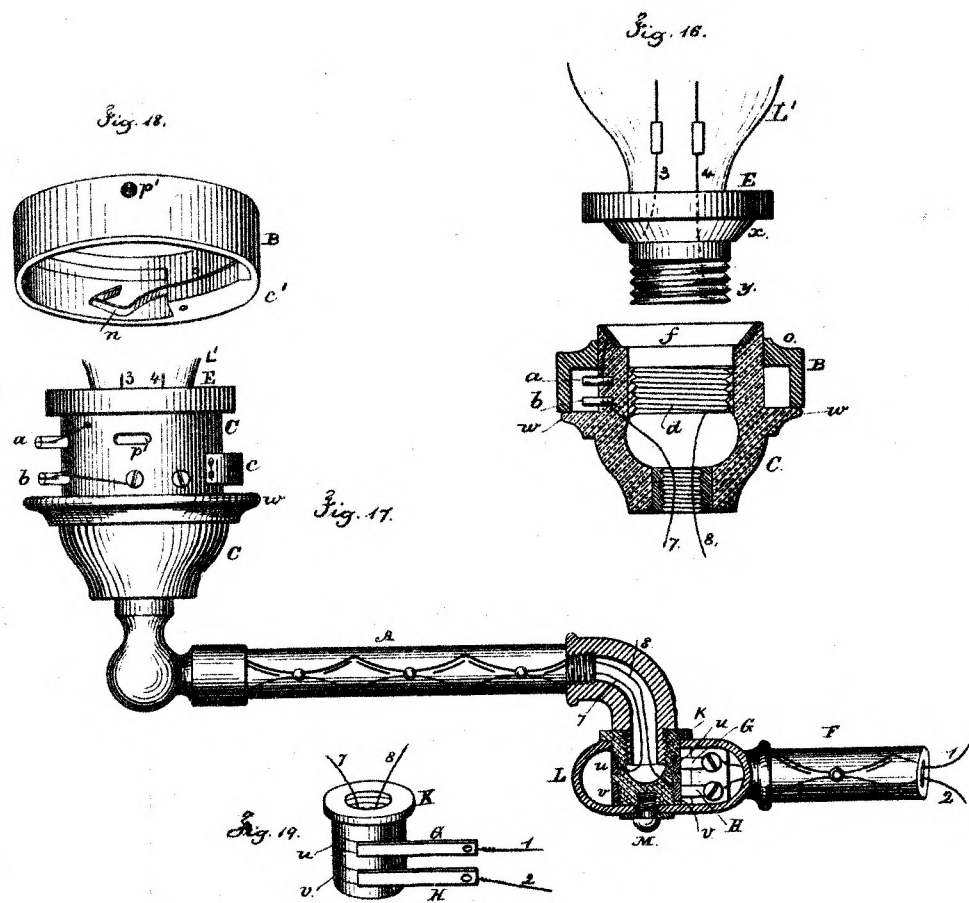
Fig. 15.

This is the Sheet of Drawings marked B referred to in the annexed
 Letters of Registration, granted to Thomas Alva Edison this twenty-
 sixth day of October, A.D. 1882.

Augustus Loftus.

C.

[1002]



Witnesses

Chas. H. Smith
J. Haite

Thomas Alva Edison

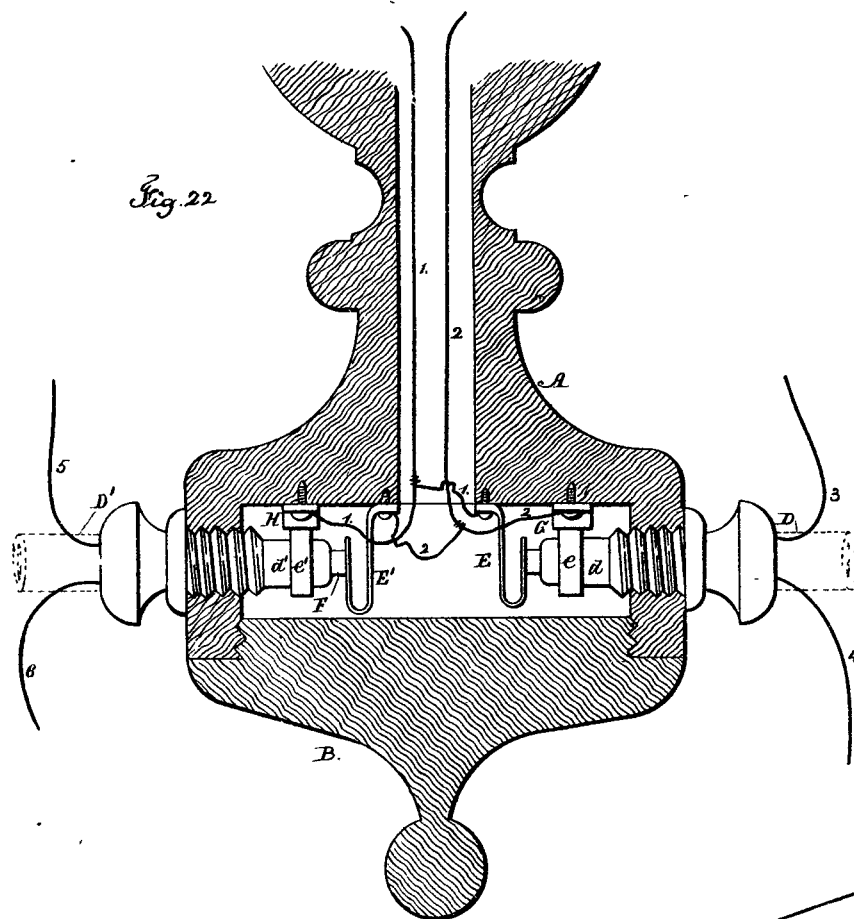
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SYDNEY, NEW SOUTH WALES.

"This is the Sheet of Drawings marked C referred to in the annexed
Letters of Registration, granted to Thomas Alva Edison, this
twenty-sixth day of October, AD 1881.

Augustus Loftus.

D.

[1002]



Witnesses

Chas H. Smith
J. Hail

Thomas Alva Edison

PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE
 SYDNEY, NEW SOUTH WALES.

*This is the Sheet of Drawings marked D referred to in the annexed
 Letters of Registration, granted to Thomas Alva Edison this
 twenty-sixth day of October, A.D. 1887.*

Augustus Loftus.



A.D. 1881, 26th October. No. 1003.

IMPROVEMENTS IN ELECTRIC ARC LIGHTS.

LETTERS OF REGISTRATION to Thomas Alva Edison, for Improvements in Electric Arc Lights.

[Registered on the 26th day of October, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS THOMAS ALVA EDISON, of Menlo Park, in the State of New Jersey, United States of America, electrician, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in Electric Arc Lights," which is more particularly described in the specification and sheet of drawings which are hereunto annexed; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Thomas Alva Edison, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said Thomas Alva Edison, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said Thomas Alva Edison shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this twenty-sixth day of October, in the year of our Lord one thousand eight hundred and eighty-one.

[L.s.]

AUGUSTUS LOFTUS.

Improvements in Electric Arc Lights.

SPECIFICATION.

TO ALL WHOM IT MAY CONCERN: Be it known that I, THOMAS ALVA EDISON, of Menlo Park, in the State of New Jersey, United States of America, electrician, have invented certain Improvements in Electric Arc Lights, of which the following is a specification.

MY invention relates to electric arc lights using carbon pencils or rods, one or both of the carbons being fed forward lengthwise; and the object I have in view is such an improvement that the arc will remain perfectly steady at all times (except perhaps for an instant occasionally when the feeding of the carbon or carbons takes place), and the carbons will be consumed evenly.

This I accomplish by rotating either or both of the carbon pencils or rods around the longitudinal axis or axes of the same, the rotating mechanism not interfering with the feeding of the carbon or carbons.

I have found it necessary, in order to make an absolutely steady arc and secure an even and smooth consumption of the carbon points, to rotate one of the carbons at a high speed, as, for instance, from two to three thousand revolutions per minute; but a higher rate of speed could be used, and a lower speed might be found under favourable conditions to answer the purpose. It is evident that if both carbon pencils are rotated in opposite directions, only half the speed for each would be required. For rotating one carbon I may use an electro-motor, of the Pacinatti or other suitable construction, arranged in the lamp circuit, or in a shunt or derived circuit therefrom, or otherwise suitably connected with the source of energy; or, instead of an electro-motor, a spring or weight actuated mechanism could be used. If both carbons are rotated, connections may be made with one motor or driving mechanism, or a separate motor or driving mechanism can be used for rotating each carbon.

If a feeding carbon is rotated, the metal rod that carries it will be connected with a revolving part of the motor, by a feather or other device, so that the metal rod can slide freely through the part of the motor that rotates it.

The revolving carbon pencil is preferably secured to its rod by a universal joint (a ball and socket joint with locking pin and slot answering well for this purpose), and is guided near its point so that any vibrating or wobbling movement of the metal rod will not change sensibly the position of the carbon point.

For feeding one or both carbons any mechanism can be used, so far as the main features of my invention are concerned; I prefer, however, to regulate the feed of the upper or positive carbon by means of an armature, through an opening in which the metal holding rod passes. This armature carries two pawls that clamp the rod to hold it up, the armature being supported by an electro-magnet in the lamp circuit. When, however, the resistance of the lamp circuit is increased to a certain point by the lengthening of the arc, or when the arc is ruptured, a magnet in a shunt or multiple-arc circuit overcomes the first magnet and draws the armature downwardly. The clamping pawls have arms which strike stops when the armature reaches its lowest position, and throw the pawls away from the holding rod, allowing the carbon to drop. The magnet in the lamp circuit again becomes the more powerful, and stops the further descent of the carbon, or raises the armature and carbon to re-establish the arc when ruptured.

The preferred manner of carrying out this invention is shown in the accompanying drawing, in which the figure represents a side elevation and partial section of the lamp and regulating mechanism.

A is the frame, B the lower or negative carbon, and C the upper or positive carbon connected with the metal holding rod D, by ball and socket joint *a*, and guided near its point by guide *b*. 1 2 are the main conductors. E is the electro-magnet of the motor, the coils of which are in derived circuit 3 4, and are located on the frame A, on opposite sides of the holding-rod D. The revolving armature F of the motor is supported by sleeve *c* from top of frame A, through which sleeve slides the rod D, the rod and sleeve being connected so as to rotate together by a feather or other suitable device. The commutator springs of the motor are represented by *d e*, while *f* is the revolving circuit-breaker. An adjustable resistance, R, is placed in the motor circuit 3 4, by means of which the speed of the motor can be regulated.

G is a horizontal armature lever, pivoted on the frame above the motor, and playing in the fields of two electro-magnets, H I, the movement of the armature being limited by stops *g h*. The magnet H is in the lamp circuit 1 2, while I is in motor circuit 3 4.

The rod D passes through an opening in lever G, such lever being provided with spring pawls *i k*, that clamp downwardly on such rod. The pawls have arms, *l m*, and stops *n o* are located at such points on the frame that the pawls are thrown upwardly away from rod D when the armature lever reaches a certain point in its downward movement.

What I claim is—

First—The method of producing a steady arc and insuring the smooth consumption of the carbons in an electric arc light employing carbon pencils or rods, consisting in revolving one or both of such carbon pencils or rods, substantially as set forth.

Second—In an electric arc light, the combination of the carbon pencils or rods with a motor or mechanism for revolving either or both of such carbon pencils or rods, substantially as set forth.

Third—In an electric arc light, the combination of the motor or mechanism for revolving either or both of the carbon pencils or rods, with a guide or guides near the point of the revolving carbon or carbons, substantially as set forth.

Fourth—In an electric arc light, the combination with the carbon pencils or rods of an electro-motor, for revolving either or both of the carbon pencils, substantially as set forth.

Fifth—In an electric arc light, the combination with a motor or driving mechanism of a carbon-holding rod, sliding freely through a part revolved by the motor, but connected so as to turn with such part, and mechanism for controlling the longitudinal movement of such rod, substantially as and for the purpose set forth.

Sixth—

Improvements in Electric Arc Lights.

Sixth—In an electric arc light, the combination with the carbon-holding rod of the armature lever, playing between two magnets and governing the feed of the carbon carried by such rod, substantially as set forth.

Seventh—In an electric arc light, the combination with the carbon-holding rod of the armature lever, controlled by two magnets connected in multiple arc, such lever being connected with the holding-rod, so as to govern its movement, substantially as set forth.

Eighth—In an electric arc light, the combination with the rod D of the armature lever G, controlled by magnets H I, and carrying pawls *i k*, having arms *l m*, and the stops *n o*, substantially as set forth.

Signed by me, this fourteenth day of June, A.D. 1881,—

Witnesses—

CHAS. H. SMITH.
GEO. T. PINCKNEY.

THOMAS ALVA EDISON.

This is the specification referred to in the annexed Letters of Registration granted to Thomas Alva Edison, this twenty-sixth day of October, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

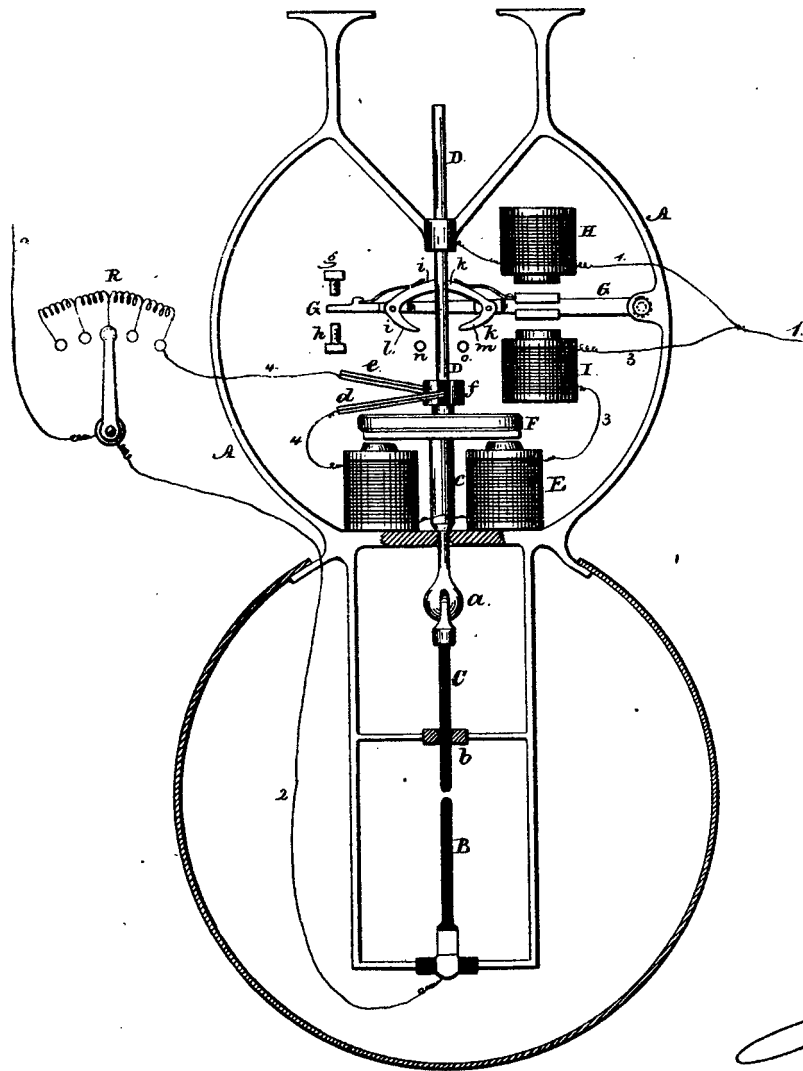
We do ourselves the honor to report, in reply to your blank cover communication of the 12th instant, No. 8,881, transmitting Mr. Thomas Alva Edison's Petition for Letters of Registration for an invention entitled "Improvements in Electric Arc Lights," that we are of opinion the prayer of the Petition may be granted, in terms of his specification, drawings, and claim.

We have, &c.,

E. C. CRACKNELL.
GOTHER K. MANN.

The Under Secretary of Justice.

[Drawings—one sheet.]



Thomas Alva Edison

Witnesses

Chas. H. Smith
J. Hall

PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE,
SYDNEY, NEW SOUTH WALES.

*This is the Sheet of Drawings referred to in the annexed
Letters of Registration, granted to Thomas Alva Edison
this twenty sixth day of October, A.D. 1881. Augustus Loftus*



A.D. 1881, 26th October. No. 1004.

**IMPROVEMENTS IN MAGNETO AND DYNAMO ELECTRIC MACHINES OR
MOTORS, &c.**

**LETTERS OF REGISTRATION to Thomas Alva Edison, for Improvements in
Magneto and Dynamo Electric Machines or Motors, &c.**

[Registered on the 26th day of October, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting:

WHEREAS THOMAS ALVA EDISON, of Menlo Park, in the State of New Jersey, United States of America, electrician, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in Magneto and Dynamo Electric Machines or Motors, and means and methods for controlling their generative force," which is more particularly described in the specification and sheet of drawings which are hereunto annexed; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Thomas Alva Edison, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said Thomas Alva Edison, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said Thomas Alva Edison shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this twenty-sixth day of October, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Magneto and Dynamo Electric Machines or Motors, &c.

SPECIFICATION.

TO ALL WHOM IT MAY CONCERN : Be it known that I, THOMAS ALVA EDISON, of Menlo Park, in the State of New Jersey, United States of America, electrician, have invented certain Improvements in Magneto and Dynamo Electric Machines or Motors, and means and methods for controlling their generative force, of which the following is a specification :—

In a system for supplying electricity from one source for a number of translating devices, it is desirable that there be such an arrangement as will ensure the generation of the proper amount of current and the preservation of the proper pressure, no matter how many or how few of the devices supplied in the system be in circuit, so that the amount of current requisite, and of the proper pressure or electro-motive force be supplied to each device in circuit, without regard to the increase or decrease of the total number in circuit. The object of a portion of this invention is to attain such result.

One method of accomplishing this may be stated in general terms as consisting, where a special dynamo or magneto electric machine is used for generating the current for the excitation of the field of force magnets, of one or a battery of generators connected to the main or consumption circuit, in actuating such special generator, which may be termed the prime generator, by a special motor engine to which it is geared directly, or from which it receives motion, and then governing this special motor engine so as to vary the speed of the special or field current generator by controlling its cut-off mechanism by an adjustable governor, which operation proportionately varies the current sent through the field circuit of the one or battery of generators supplying the system, which in turn is followed by a proportionate variation in the generative capacity, while a constant electro-motive force is maintained.

Where a single generator either magneto or dynamo is used, it is connected to an engine governed in the same manner.

To accomplish this, an ordinary centrifugal governor is used, with which is combined a weight adjustable upon an arm or lever, and acting in conjunction with or in opposition to the governor balls, dependent upon the fulcruming of the lever, so that the resistance of the governor to the forces acting upon it may be controllably varied by movement of the weight upon the arm or lever, the resultant being that the special motor engine may run at any one time with a speed proportionate to the demands of the system upon it.

A simple effective governor, with a constant amount of work upon the engine, would keep the engine at a constant speed and the generative capacity of the driven machine at a constant point ; but as the number of translating devices in circuit varies, the amount of current generated must be varied, while the electro-motive force of the system remains constant.

This is effected by varying the amount of energy developed by the prime generator, which varies the strength of the field magnets included in its circuit, making the field-of-force through which the generative coils pass of greater or less intensity.

This variation of generative capacity of the prime generator is accomplished by varying the speed of its connected engine by means of the adjustable weight connected to the governor, as before mentioned, whereby the required changes in strength of magnetic field and in the development of energy are ensured, while a constant pressure or electro-motive force of the system is maintained independently of the number of devices in circuit.

This is illustrated in figures 1, 2, 3, and 4 of the drawings.

Figure 1 is a diagrammatic view of a system embodying this method of regulation, figure 2, a detailed view of a governor suitable for the purpose ; and figures 3 and 4, details of such a governor.

B C D E represent a battery of generators, in this instance magneto-electric machines, whose revolving armatures or inducing bobbins are connected by multiple arcs, *a a*, with the main conductors 1 2, of a system in which 3 4 and 5 6 represent consumption circuits in which are placed translating devices, such as lamps 8, 9, 10, and motors 7.

A is the special dynamo or magneto electric machine, which may be termed the prime generator, whose circuit F C includes all the coils of the field of force magnets of the generators B C D E, which may be more or less in number.

This prime generator A is geared directly to and driven by the special motor engine E', while the other or supply generators may be driven each by its own engine *e*, or the whole series or battery may be driven by or from one engine.

The prime motor engine E' is provided with an adjustable governor, G, having the usual centrifugal weights or balls, and sliding sleeve attached thereto and moving therewith, which gives motion to two pivoted levers, L and L'. Of these, L', through a connecting rod *l*, controls the valve motion of the engine by controlling the cut-off mechanism.

The other lever L carries the weight W, which is suspended from a saddle or stirrup, S, capable of movement longitudinally upon the lever. To give it this movement the lever L carries a screw-rod, *r*, with an attached hand-wheel, R, for turning it. In the thread of the screw takes a pin from the saddle or stirrup, so that rotation of the screw *r* by its handle R moves the weight along the lever L.

At the central station where A B C D E are supposed to be located, is also an indicator showing any variations in the electro-motive force or pressure, in this case represented by an electro-dynamometer, V, in the derived circuit *d d*.

As seen in figure 2, the power or effect of W is in unison with that of the governor balls *g g*, so that as it is moved toward the outer end of L the governor tends to operate the cut-off at a less speed than it otherwise would, while when it is moved to the extreme limit of inward movement the balls do not operate except when the speed necessary for the total work of the circuit has been exceeded.

From this it will be seen that the production of current may be easily controlled, and the electro-motive force or pressure maintained constant.

For instance : few translating devices are in circuit, the engineer in charge moves the weight outwardly, so that the governor, readily or at comparatively slow speed, operates the cut-off, keeping the engine and field generator at low speed, sending a comparatively feeble current around the fields of the supply

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supply generators. As more devices are put into circuit, the increased needs of the circuit are indicated immediately upon V, and he moves the weight inwardly, so that higher speed is required to cause the balls to cut off the engine, which consequently with the field generator runs at a higher rate, sending more current through the field circuit, which acts upon the generators to cause an increased production of current.

As devices are taken out of circuit, the reverse takes place.

It is evident that when the necessities of the case require only one generator, it may be controlled in the same way, that is, that A may be a dynamo or other type of generator, itself supplying a consumption or main circuit.

It is evident that the form of governor, of generator, and of engine may be modified without departing from the spirit of this invention.

While the governor is here shown to be manually adjusted, it may be controlled and adjusted by a magnet in the main or in a derived circuit of the main line, so that it may be automatically regulated.

Another method of accomplishing the result of maintaining a constant current, without regard to the number of translating devices in circuit, consists in causing a greater or less electro-motive force from a magneto machine used as an engine to traverse the field circuit of the generator, the counter electro-motive force having the function of a resistance. This method may be put into practice in the following way:—An electro-motor of small or proportionately much less resistance than the generator is included in the circuit of the field of force magnets of the generator.

Upon the shaft of the revolving armature of the electro-motor is mounted a copper disc, which rotates between the polar extensions of an electro-magnet included in the field circuit, and also in the circuit leading to the translating devices to be supplied, which are arranged upon multiple arc circuits. This electro-magnet is wound with coarse wire, so as to have but little resistance.

When no translating devices are in circuit, the exterior circuit of the generator is only through the motor engine and the magnet, and there is but little current therein, energizing only feebly the magnet, so that it offers little resistance to the rotation of the disc cutting the lines of force between its polar extensions. This feeble retardation allows the engine to run at high speed, giving a counter electro-motive force in the field circuit, weakening the energizing current.

If now the circuit of translating devices be closed, so that the exterior circuit of the generator is through them, the resistance of the exterior circuit is decreased, causing a greater flow of current there-through, which intensifies the magnetization of the magnet referred to, which now offers increased resistance to the rotation through its lines of force of the disc, causing the electro-motor to run at a less rate, diminishing the counter electro-motive force in the field circuit, thereby strengthening the field, with the necessary resultant of increased generation. Upon devices being cut out of circuit, the reverse takes place.

This is illustrated in figure 5 of the drawings, in which G is the generator, and 1 2 the conductors leading thence for the supply of translating devices, represented by T T.

While only one generator and two translating devices are indicated, it is evident that any number may be used.

As shown, G is a dynamo-electric machine, whose field circuit 3 passes as a derived circuit from the commutator brushes or springs 4 5 around the field, and includes an electric motor, M, and a magnet, A, the latter being also included in one branch 2 of the exterior or supply circuit. Upon the shaft of M is a copper disc, C, which rotates between the polar extensions *a a* of magnet A, its rotation being opposed by the magnetic field between *a* and *a*, whose lines of force it is obliged to cut, and opposed proportionately to the strength of that magnetic field.

If now no translating devices be in circuit, the entire resistance of the exterior circuit of the generator is only that of A and M, which is comparatively large, consequently A has but a weak magnetization, offering but little resistance to the rotation of C, allowing the motor M to run at high speed, the result being that a considerable counter electro-motive force therefrom is thrown into the field circuit of the generator.

If now translating devices T be put in circuit, the resistance of the external circuit is decreased, resulting in greater flow of current in the exterior circuit, a stronger magnetization of A, a retardation of C, slowing the rate of the motor M, diminishing the counter electro-motive force thrown therefrom into the field circuit, so that the field circuit is strengthened substantially, the eventual result being that aimed at,—an increase in the generative capacity of the generator G, and a uniform pressure or electro-motive force throughout the system.

By this arrangement the generators may be automatically controlled so that the generation of current is kept just adequate to the demands of the supply or consumption circuit, and the pressure or electro-motive force maintained constant.

While the generator herein shown is a dynamo, it is evident that the method and means may be applied to magneto machines, or to that class in which the field is energized from an exterior source of energy.

Another portion of my invention has for its object to furnish means whereby, when one or a number of lamps are thrown into circuit, the act of so throwing them into circuit shall automatically and at the same time put into operation means whereby the generative capacity of the generators shall be proportionately increased.

This part of the invention is more particularly applicable to systems wherein there are a number of lamps with their multiple arc circuits, which may be connected in one sub-system which it is practicable to control by one circuit-closer, as for instance on ships, where the system may be divided into sub-systems, one for the cabin, one for the deck, and so on as may be desired, or in cities, where the street lamps may be arranged in special circuits or sub-systems.

To accomplish this, main conductors as usual lead from the generator; and across them in groups or sub-systems are a number of multiple arc or derived circuits containing lamps, one circuit-closer being arranged to control the circuit for one or an entire group.

The field magnet coils of the generator are in multiple arc to the main circuit, one terminal being connected directly to one of the conductors thereof, while the other terminal is carried to the groups, and from it branches are led, one at each group, arranged to be closed by the circuit-closer controlling the circuit of that group.

Improvements in Magneto and Dynamo Electric Machines or Motors, &c.

In each branch or derived circuit of the field coils is a resistance so proportioned that, as a group is turned on or used, only the amount of current is allowed to flow through the field coils as will suffice to give or to increase the degree of magnetic intensity to the field magnets, so as to ensure the generation of just enough current to properly supply that group.

The act of turning on the group first used closes the circuit to the field coils, so that the generator is energized just when and to that extent that call is made upon it.

If now another group be turned on, another multiple arc or branch circuit for the field coils is closed. As these circuits to the field coils are derived circuits, the closure of two diminishes the net resistance of the field coil circuit, permitting a flow of increased current through the field coils, increasing the magnetic intensity of the field magnets, and of course the generative capacity of the generator.

Figure 6 of the drawings illustrates these arrangements.

G is a generator composed of the field magnets F M, with polar extensions P P, between which is the revolving armature A, on whose commutator take the commutator springs C C'.

From the generator lead the main conductors 1 2, across which are the groups of multiple arcs 5 6, containing lamps, L.

The coils of the field magnets are connected on one side by a wire 7 directly to 1 of the main conductors; upon the other a conductor 3 leads to the most remote group, from which branch conductors lead at each group, as shown at 8 and 9, each branch having a resistance R or R'.

Each group is provided with a key or switch, S, constructed as shown, so as to close simultaneously the circuit of its group and a branch circuit to the field.

3 8 S, group 5 1 7, forms one, and 3 9 S, group 6 1 7, a second derived or multiple arc circuit for the field magnet coils.

If now S of group 5 be closed, it closes the circuit of 5, and simultaneously one circuit for F M, giving the proper degree of magnetization to P P for the work to be performed.

If then S of group 6 be closed, it puts into circuit the lamps of that group, closing simultaneously the next derived circuit, thus diminishing the total resistance of the field circuit, increasing consequently the current therein and the degree of magnetization of P P, strengthening the generator to meet the increased demand upon it.

The resistances R R' are proportioned, as before stated, so that only the needed amount of current to properly energize the field magnets will be permitted to pass through the field circuit. As groups are turned off, it is evident a reverse operation takes place.

In addition to the multiple arc circuits of the field described, another, 10, may be used, having a resistance, R², which circuit is constantly closed, so that a certain definite amount of current may be permitted to pass through the field coils, but not sufficient to bring the lamps up to the standard candle power, the closure of a branch circuit sufficing to throw enough current through such coils to bring the light up to the required standard.

Only one generator and two groups are shown, as they are sufficient to show the principle of the invention, but it is evident that any needed number of generators and groups or single lamps may be used with the same automatic regulation of generative force.

When an electric distribution system contains both lamps and motors, some of the latter requiring many times as much current as a lamp, there is apt, as such motors are placed in circuit, to be a momentary effect upon the lamps, visible in the shape of a jump or flicker or drop, before the motor has reached its proper speed. This is also due to the fact that the motors themselves are of much less resistance than the lamps used. When, however, a motor attains its maximum speed, it gives a counter electro-motive force in its own derived circuit, which has the function of a wire resistance and weakens the opposing current in its circuit in the same way as would a wire resistance, and compensates for the lessening of actual wire resistance.

It is known that a motor cannot attain its maximum speed immediately—that an interval of time—often very small—but still an appreciable quantity, elapses before the necessary degree of magnetization is reached, inertia overcome and the maximum speed attained.

The object of this portion of my invention is to prevent any effect upon the lamps, and to that end it consists, in general terms, in combining with a motor devices which, when the motor is placed in circuit, while preventing the motor from starting up immediately at full head, shall cause it to gradually attain its maximum power or speed, and to give the counter electro-motive force which takes the place of wire resistance.

This may be accomplished by placing in the armature circuit a resistance and a pivoted lever, normally closing the circuit to the armature through the entire resistance.

This lever is controlled by a governor leading from the engine in such manner that, as the speed of the engine increases, the governor carries the lever from contact to contact of the resistance, gradually cutting it out.

This increase of speed causes an increased counter electro-motive force in the motor circuit, which increase is always sufficient to compensate for the actual wire resistance cut out of circuit by the same cause.

Such an arrangement is shown in figure 7 of the drawings, in which 1 2 represent the main conductors, on derived circuits to which, 3 4, are placed lamps L L, there being any desired number of circuits and lamps. E M is an electro-motor arranged to work in the same system, its armature being in a derived circuit, 5, and its field coils in a derived circuit, 6, both circuits being controlled by a double switch, S, attached to a wire, 7.

In the circuit 5 of the armature is a resistance, R, and a lever L, pivoted at l. G is a centrifugal governor driven by a belt B from the shaft of the armature. The lever L is controlled by the governor, so that when the governor is at rest the lever shall make contact with the resistance in such manner as to include all the resistance in the circuit.

Upon closure of circuit through the motor it starts slowly, but as speed is increased the rotation of the governor causes the balls to fly out, the lever L is carried so as to cut out part of the resistance, a corresponding increased amount of counter electro-motive force being caused by the quickening of speed, until the motor attains its maximum speed giving an amount of counter electro-motive force which compensates for the resistance cut out.

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I have found that by this method of substituting counter electro-motive force for actual resistance, the conditions of the motor circuit may always be preserved practically unchanged so far as affecting the light is concerned, actual resistance and counter electro-motive force being exchanged for each other in rest and motion and proportionately as the rate of motion.

By such arrangement all sudden effect upon other translating devices is avoided, while the delay in bringing the motor to its maximum is very little, though sufficient to enable the proper compensation to be made.

The object of another portion of my invention is to furnish an arrangement of means whereby the field of force magnets of a number of Faradic machines may be readily and controllably energized.

To this end, in a derived circuit from the main or consumption circuit of the Faradic machines or generators, is placed an electro-motor which gives motion to a generator whose circuit is by multiple arcs, through all the field of force circuits of the generators.

In the circuit of the motor is an adjustable resistance, so that its action may be varied, which in turn controls the generative capacity of the Faradic machines.

In the circuit leading around the field of force coils is an adjustable resistance so that circuit may be controlled independently if desired, of the motor circuit, but with the same ultimate result.

This is illustrated in figure 8 of the drawings, in which D C are the Faradic machines or generators, with their bobbins connected in multiple arc to the main or supply or consumption circuit 1 2.

In a derived circuit 3 4 is the motor A which gives motion to the generator B. In this circuit 3 4 is an adjustable resistance, r , so that the amount of current energizing A may be controlled.

The motor A gives motion to the Faradic machine or generator B, whose circuit 5 leads by multiple arcs 6 around the field of force magnets of C D, energizing them. In this circuit is an adjustable resistance, R, so that, other things remaining equal, the force of the current around the field of C D, and consequently the generative capacity of those machines, may be readily controlled.

It will readily be seen that whenever C D send any current into the circuit 1 2 a portion thereof energizes A. This will occur whenever C D are started up, as their cores will retain sufficient residual magnetism for an initial current. A in turn drives B, whose current transversing the fields of C D strengthens them, causing an increased current through 1 2 and A.

By r A may be so controlled that its speed is varied to cause B to generate current enough only for the magnetization of the field to the degree necessary for the production of current requisite for the demands of the circuit 1 2; or the circuit 3 4 may be left constant, and the current through the field circuit controlled by R, to effect and regulate the generative capacity of C D.

As above stated, it may happen from various causes that momentary currents of a higher electro-motive force than those normally used may be generated or be present in the system.

The object of this part of my invention is to obviate any ill effects arising from this cause, to which end it consists in placing a condenser in multiple arc in each house or section, between the lamps or translating devices and the main conductors; this serving to absorb wholly or in part any momentary increase of electro-motive force, preventing wholly or in part any results therefrom in the circuit in which it is placed.

This is shown in figure 9 of the drawings.

1 2 are the main or street conductors, from which at the service box A, lead the house conductors 3 4, on which in multiple arcs 5 6, the lamps G G or other translating devices (as many as may be desired) are placed, a meter M being arranged in the circuit to measure the amount of current used.

Between the lamps or other translating devices and the street or main conductors 1 2 is a derived circuit 7, in which is placed the condenser P, which serves, as above stated, to absorb any momentary increase in the electro-motive force of the circuit.

What I claim is—

First—The method of regulating the generative force of one or a battery of electrical generators, by regulating the amount of current flowing through the field circuit thereof, by adjustably governing or regulating the speed of the engine driving the generator furnishing the current for the field circuit, substantially as herein set forth.

Second—The combination with an electrical generator or battery of electrical generators, of one magneto or dynamo electric machine furnishing the current for the field circuit of the generator or battery, and an engine driving said magneto or dynamo electric machine, and means for adjustably regulating the governor of the engine, substantially as set forth.

Third—The combination with a magneto or dynamo electric machine furnishing current for the field circuit of other electrical generators, of means for controllably and adjustably varying its speed, so as to regulate the field of force current, substantially as set forth.

Fourth—The combination with an electrical generator, of an engine, a governor controlling the cut-off mechanism of the engine, and means for adjustably controlling the governor so as to vary the speed of the engine, substantially as set forth.

Fifth—The method of controlling or regulating the generative force of a dynamo or magneto electric machine, consisting in throwing into the field magnet circuit a variable and controllable counter electro-motive force, substantially as set forth.

Sixth—The combination with a generator, of an electro-motor included in and regulating the field magnet circuit by its counter electro-motive force, substantially as set forth.

Seventh—The combination of a generator, an electro-motor included in the field magnet circuit, and a magnet in the supply or consumption circuit, controlling the rate of rotation of the motor, substantially as set forth.

Eighth—The method of controlling or regulating the rate of rotation of an electro-motor, by varying or regulating a magnetic field through which a disc, driven thereby, travels.

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Ninth—The combination with a generator and a lamp or groups of lamps, of means for automatically regulating the generative force of the generator, by regulating the current energizing the field of force coils simultaneously with controlling the lamps or groups of lamps, substantially as set forth.

Tenth—The combination with a generator and a lamp or groups of lamps of multiple arc or derived circuits for the field of force coils, one such circuit being connected to each group of lamps, substantially as set forth.

Eleventh—The combination with a generator and a lamp or groups of lamps, of multiple arc or derived circuits for the field of force coils, one such circuit being connected to each lamp or group of lamps, and controlled by the circuit-closer or switch of such lamp or group, substantially as set forth.

Twelfth—The combination with a generator and a lamp or group of lamps, of multiple arc or derived circuits for the field of force coils, one for each lamp or group of lamps, and a constant closed multiple arc or derived circuit, substantially as set forth.

Thirteenth—The combination with an electro-motor, of a resistance included in its circuit while at rest, and gradually cut out by the motor itself when in action, substantially as set forth.

Fourteenth—The combination of a motor, a resistance, and a governor operating to determine the amount of resistance included in the motor circuit, substantially as set forth.

Fifteenth—The combination with a battery of Faradic machines, of an electric motor in a derived circuit to the main circuit, and a generator driven thereby, and supplying the current for the fields of the battery of Faradic machines, substantially as set forth.

Sixteenth—The combination with an electric circuit containing translating devices, of a condenser arranged substantially as and for the purposes set forth.

Signed by me, this 16th day of June, A.D. 1881,—

THOMAS ALVA EDISON.

Witnesses—

CHAS. H. SMITH.
GEO. T. PINCKNEY.

This is the specification referred to in the annexed Letters of Registration granted to Thomas Alva Edison, this twenty-sixth day of October, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 19 September, 1881.

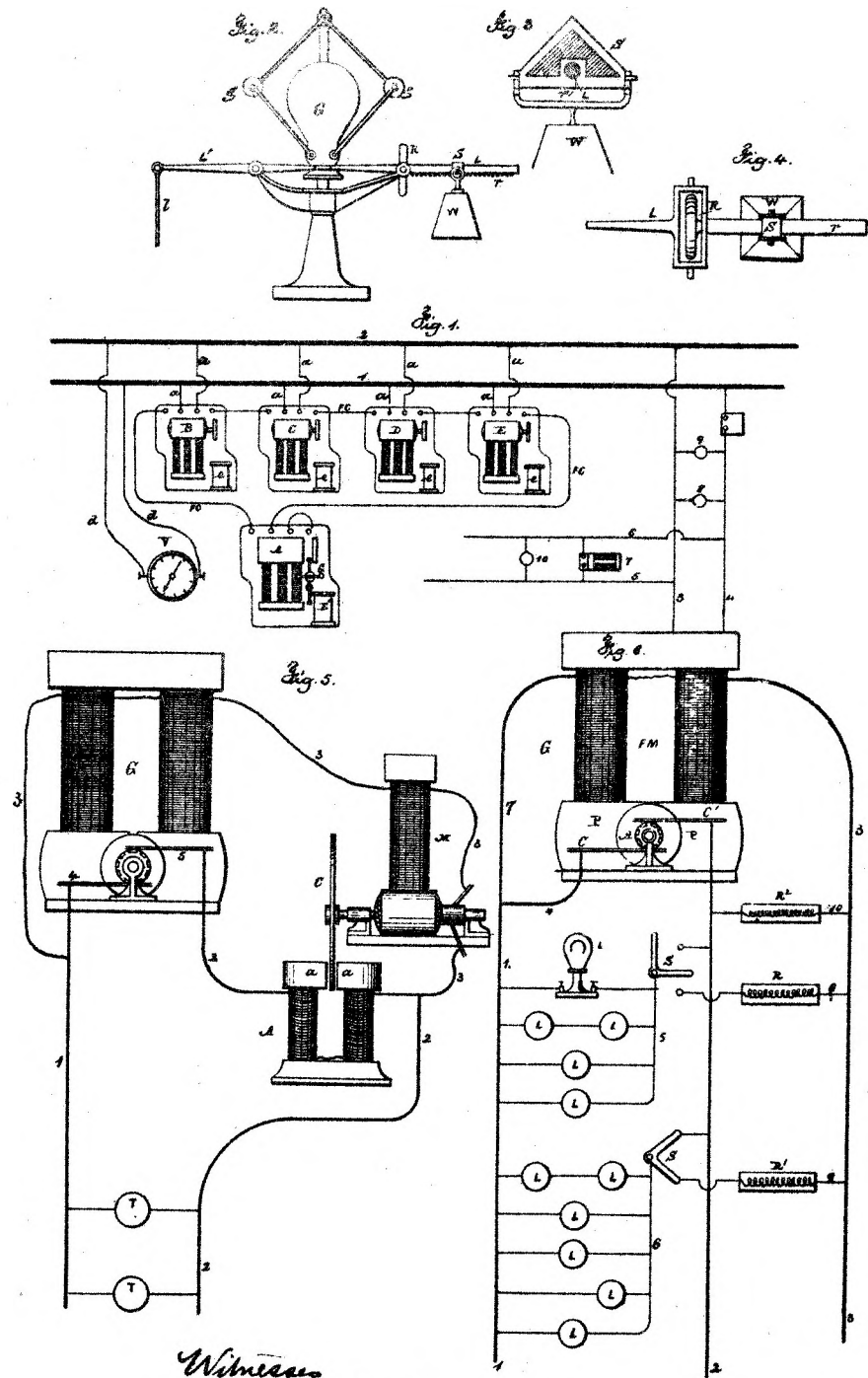
We do ourselves the honor to report, in reply to your blank cover communication of the 12th instant, No. 8,879, transmitting Mr. Thomas Alva Edison's Petition for the registration of an invention entitled "Improvements in Magneto and Dynamo Electric Machines or Motors, and means and methods for controlling their generative force," that we are of opinion the prayer of the Petitioner may be granted, in terms of his specification, drawings, and claim.

We have, &c.,

E. C. CRACKNELL.
GOTHER K. MANN.

The Under Secretary of Justice.

[Drawings—one sheet.]



Witness
Chas. Smith
J. Hall

Thomas Alva Edison

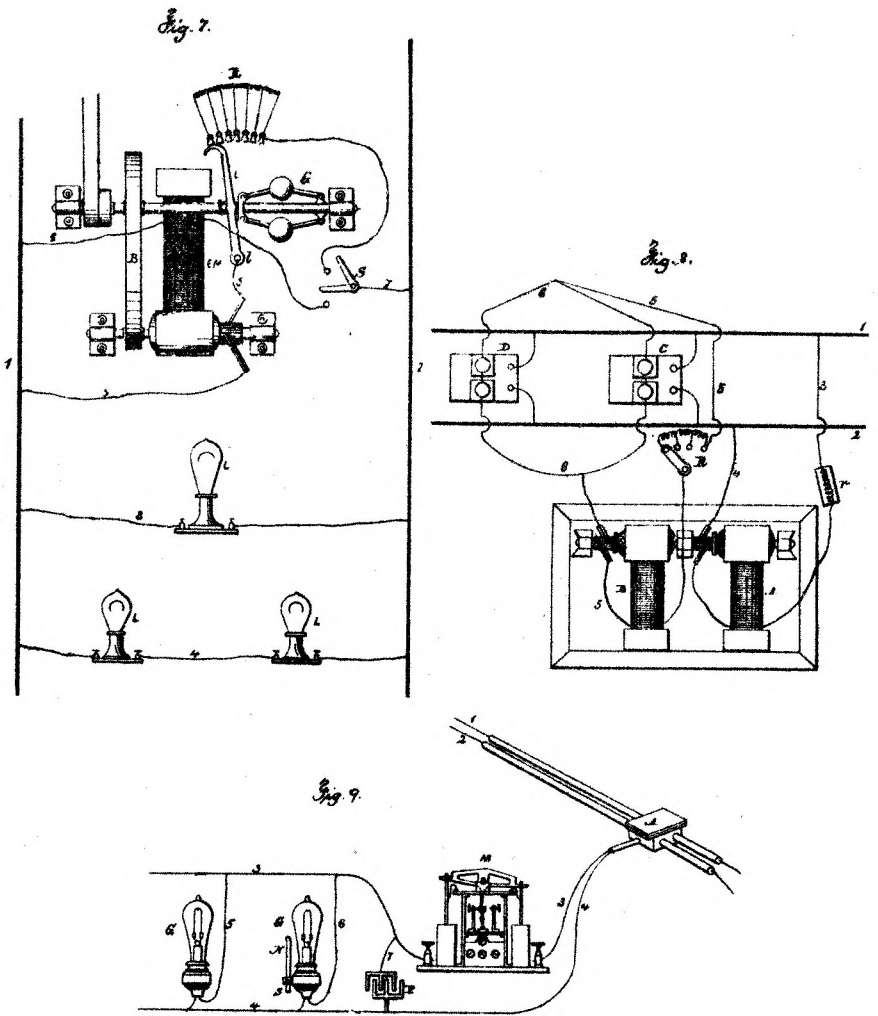


PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE,
 SYDNEY, NEW SOUTH WALES.

*This is the sheet of Drawings referred to in the annexed
 Letters of Registration, granted to Thomas Alva Edison
 this twenty-sixth day of October, A.D. 1881. Augustus L. oftus.*



A.D. 1881, 26th October. No. 1005.

IMPROVEMENTS IN HEADING AND HARVESTING MACHINES.

LETTERS OF REGISTRATION to Almerin Hubbell Lighthall, for Improvements in Heading and Harvesting Machines for heading and thrashing grain in the field.

[Registered on the 26th day of October, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS ALMERIN HUBBELL LIGHTHALL, of San Francisco, in the State of California, one of the United States of America, engineer, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled, "Improvements in Heading and Harvesting Machines for heading and thrashing grain in the field," which is more particularly described in the specification, marked A, and the four sheets of drawings, marked B, C, D, and E, respectively, which are hereunto annexed ; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four ; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years : And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Almerin Hubbell Lighthall, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof ; to have, hold, and exercise unto the said Almerin Hubbell Lighthall, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended : Provided always, that if the said Almerin Hubbell Lighthall shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this twenty-sixth day of October, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Heading and Harvesting Machines.

A.

SPECIFICATION of ALMERIN HUBBELL LIGHTHALL, of San Francisco, in the State of California, one of the United States of America, engineer, for an invention entitled, "Improvements in Heading and Harvesting Machines for heading and thrashing grain in the field."

My said invention relates to improvements in combined headers and thrashers, in which the thrasher may be detached from the header, and, each being a complete machine in itself, may be used separately and independently of the other; and it further relates to certain details of construction which will be hereinafter more fully explained, and the objects of my improvements are—first, to provide a means whereby the thrasher may be easily detached from the main framework of the header, and being placed upon trucks in the usual manner, be run as a separate machine, by making connection between a band-wheel and any suitable power-producing mechanism; second, to provide a means whereby the finger-bar, sickle-bar, and draper of the header may be raised and lowered at the will of the operator, to suit the height of the grain, and at the same time be kept in a perfect horizontal plane with the main frame, in order that when on level ground the stalks of the standing grain may be cut with a square cut, and not with a bevelled or sloping cut, and be evenly distributed upon the draper; third, to provide a main framework for the header, and upon which the thrasher rests, so constructed as to be easily detachable one part from the other, when it may become necessary to do so for the purpose of transportation, or for making repairs; fourth, to provide a means whereby the power may be divided between the two driving-wheels, and not confined to one alone, as has heretofore been the case; fifth, in providing the face of the driving-wheel with shoes or projections, so constructed that the toe or point of one shoe will engage with the surface of the earth before the heel of the one preceding it leaves the ground, and also in the manner in which the brake mechanism is applied to these driving-wheels; sixth, in the manner of constructing and attaching the push beam, whereby a long and light beam is had which may be easily attached to or detached from the machine; seventh, to provide a means whereby the headed grain, as it is carried up the inclined portion of the header draper, is prevented from falling down on to the horizontal portion thereof; eighth, to provide an improved way of applying tension to the stay or truss rods on the ends of the main framework; and lastly, to provide a steering-gear for the machine, the rudder-wheels of which are provided with a central flange projecting from the rim or tread.

I obtain these objects by the mechanism illustrated in the accompanying drawings, in which figure 1 is a front elevation, showing the principal working parts of the thrasher. Figure 2 (sheet 1) is a rear elevation, showing the principal working parts of the thrasher. Figure 3 (sheet 2) is a general plan of the main frame. Figure 4 (sheet 2) is a side view of the main frame, showing the elevating mechanism for the header, and the manner of operating the reel thereof. Figure 5 (sheet 2) is a plan view, showing the manner of operating the sickle-bar. Figure 6 (sheet 2) shows the manner of operating the draper for the header by means of an intermediate chain-wheel. Figure 7 (sheet 2) shows the manner of attaching the thrasher to the main framework. Figure 8 (sheet 2) is a side view, partly broken away, showing the manner of operating the shaft of the wheels upon which the chain is wound, which raises and lowers the draper and sickle-bar of the header. Figure 9 (sheet 3) is a rear view, partly broken away, of the same. Figure 10 (sheet 3) is a sectional plan view of the guide rollers or friction wheels, together with their supporting irons of the lifting device of the header. Figure 11 (sheet 3) is a detail view, showing the mechanism for regulating the height of the reel of the header. Figure 12 (sheet 3) is a side view showing one of the driving-wheels, and the brake mechanism thereof. Figure 13 (sheet 3) is a sectional side view, partly broken away, showing the steering mechanism. Figure 14 (sheet 3) shows a plan view of the rudder-wheels and their operating mechanism. Figure 15 (sheet 3) shows a side view of a portion of the steering mechanism. Figure 16 (sheet 3) is a perspective view showing the manner of making connection between two pieces of angle-iron. Figure 17 (sheet 3) is a perspective view of inner box or brace for push beam. Figure 18 (sheet 3) is a top view of coulter. Figure 19 (sheet 3) is an end view of the journal box of main driving wheels, showing the manner of applying tension to the truss rods. Figure 20 (sheet 4), detail view of journal box. Figure 21 (sheet 4), longitudinal sectional view of header draper. Figure 22 (sheet 4), top view, partly broken away, of the swinging draper. Similar letters refer to similar parts throughout the several views. I construct the main frame A of my machine of angle-iron in the form shown, and firmly bolted or riveted together. Upon the upper face of these angle-irons I bolt the boxes *a*, which receive the bearings of the gear and driving-wheels which actuate the different parts of the machine. The joint between two angle-irons I form in the manner shown in figure 16, a portion of one side of one angle-iron being flanged up, and this is bolted to the adjoining angle-iron, while bolts or rivets connect the straight side of one piece to the upper side of the piece adjoining. By this construction it will be seen that I obtain two bearing surfaces without weakening any part of the structure, and one which may be cheaply and easily made. The journal boxes *a* I construct in the form shown in figs. 19 and 20; that is to say, they are made in two sections, *s s*, held together by set bolts, *s*¹. Upon the upper face of the upper section I form a projection, *s*², as shown. This projection is hollowed out so as to receive the lower end of a threaded set bolt, *s*³, which has its head hollowed out to receive the stay or truss rod *s*⁴. By turning the nut *s*⁵ the depth to which the set bolt enters the projection *s*² can be regulated, and consequently the truss rod *s*⁴ will be held in position more or less rigidly. At either end of the main frame I place the driving-wheels B B¹, one of which is shown in section in fig. 3 (sheet 2), and the tire of these wheels is formed of a thin, broad piece of metal, *b*, having riveted upon its outer face or tread pieces of angle-iron, *b b*¹, bent into the form shown in fig. 3 (sheet 2). These pieces are so laid on that the toe of one piece projects beyond a line drawn from heel to heel of the shoe immediately preceding it, the object of this construction being to insure a continuous hold or grip of the shoes upon the surface of the ground over which the machine is propelled, and prevent settling down in the soil. Near either edge of the inner face of the tire *b* I rivet a band of angle-iron, *b*², which serves to strengthen the tire of the wheel, and also to form a bearing to which the spokes *b*³ are riveted. These spokes may be either of flat or T-iron, and their inner ends are riveted to the hub of the wheel. Upon the outer set of spokes I rivet
by

Improvements in Heading and Harvesting Machines.

by the flange a band of T-iron, B², the inner surface of the web of which forms a bearing for the brake shoes to press against, and the outer surface of the web furnishes a surface against which the brake shoes of an auxiliary brake may be pressed, if so desired. This brake is constructed, as shown in fig. 12 (sheet 3), that is to say, to the outer angle-iron A, and beneath the bearings of the driving wheels B B¹, I bolt the bearings which receive the pin which forms the fulcrum upon which the central lever *c* pivots. To the upper end of the lever is secured the rod which forms a connection with the lower end of the front lever *c*¹, the upper end of which is provided with a brake shoe. About midway between the pivotal point and the lower end of the central lever I attach a rod which connects with the lower end of the rear lever *c*², the upper end of which has a brake shoe, and both these side levers have their fulcrums on pins placed in bearings secured to the top of the outer angle-iron of the main frame. To the lower end of the central lever *c* I attach a long rod, *c*³, which passes to the front of the main frame, where it is attached to a transverse rod, *c*⁴, passing from end to end of the main frame, and held to place in suitable bearings. Near the centre of this transverse rod, and at right angles to it, is keyed a lever rod, *c*⁵, which passes backward for a short distance, and is connected to an upright rod, *c*⁶, provided with a foot-rest which an operator presses down when he wishes to throw on the brake. At the front end of the end pieces composing the main frame I bolt angle-irons, C C, which support the bearings for the shaft C, upon either end of which is keyed the two grooved pulleys *d* *d*, and spur-wheel *d*¹. To the angle-iron C is bolted the vertical channel iron or guide piece C², which is braced by suitable stay rods, and to its lower end I bolt a coulter or double plough point, D¹⁰, as seen in side elevation fig. 4, and in plan in fig. 18 (sheet 3), the office of this pilot or coulter being to plough through or ward any obstructions which might otherwise strike against the flat surface of the channel iron *c*². At the top of this guide piece I place a groove pulley, *d*². About midway between the two guide pieces I bolt a step, *d*³, figures 8 and 9 (sheet 2), which supports a worm gear, C³, the shaft of which is suitably braced, and the upper end provided with a hand-wheel, *d*⁴. The frame D, figure 4 (sheet 2), which supports the heading apparatus of my machine, is formed of T-iron, bent into the form shown, and has its outer end *d*⁵ turned up, and an angle-iron, *d*⁶, which extends from one end of my machine to any desired distance past the opposite end, as seen in figure 3 (sheet 2), and to this angle-iron is bolted the timber *d*⁷, to which is secured the finger guard *d*⁸, through which plays the sickle-bar. By this construction I prevent all warping of the finger guard and its timber, and also prevent the binding of the knives of the sickle-bar upon the fingers, and furthermore, by this construction, the knives are forced against the standing grain before it can be touched and forced down or borne away from the knives by the lower portions of the machine, or the lower edge of the finger beam. *d*⁹ *d*⁹ represent the guides over and under which the draper plays, and the carrying rollers for the draper are secured to the sides of the framework in any suitable manner. Upon the lower portion of the vertical part of the T-iron D, I place two friction rollers, E E (seen in detail at fig. 10, sheet 3), which play between the flanges of the upper channel iron C². Near the upper end of the T-iron D is bolted a bearing, E¹, which carries the friction rollers E² E², which play upon the back of the web of the channel iron or guide C², and thus the T-iron D will always be held in its proper position, and the sickle-bar and draper be kept perfectly horizontal when being raised or lowered by the chain E³, which is secured to the upper end of the T-iron D, and passes over the roller *d*², it being wound upon the pulley *d*, which is actuated by the spur-wheel *d*¹, and worm gear C³. But this hand-wheel *d*⁴ may be dispensed with if desired, and on the shaft of the worm gear may be placed a bevel gear and friction clutch, and this gear may be driven by a chain connection with the pin-wheel G⁴, which actuates the upper roller of the header draper. To the upright portion of the T-iron is secured standards F, and about midway the height of these standards I pivot arms, F¹, their outer ends being provided with bearings for the shaft of the reel F². Upon the reel shaft *f* is wound one end of a belt or cord, *f*¹, while the other end is wound upon a shaft, *f*², which has its bearings secured to the top of the standards F F. This shaft is provided with a pawl and ratchet and hand-wheel as shown in fig. 11 (sheet 3), and by revolving this hand-wheel the height of the reel can be regulated. A rotary motion is imparted to the reel by means of a chain-wheel, *f*³, connected by an endless chain or belt to a wheel, *f*⁴, placed upon the outer end of the shaft or axle of the driving-wheel B, fig. 4 (sheet 2). The shaft of the driving-wheel B is projected inwardly, and provided with a bevel wheel, G, which engages with bevel pinions G¹ and G². Both these pinions are provided with friction clutches, G³. The shaft of the bevel pinion G¹ extends outward past the front edge of the main frame, and is provided with a pin-wheel, G⁴, as seen in fig. 3 (sheet 2). Around this wheel an endless slack chain *g*, is passed, which connects with the intermediate pin-wheel G⁵, secured to the supporting framing for the reel, and this wheel is in its turn connected by the chain *g*¹ to the pin-wheel G⁶ upon the shaft which carries the roller actuating the draper of the header. The object of having the slack chain *g* is to secure for the draper a continuous motion, whether the header be set to cut high or low. At the upper end of the inclined portion of the header draper *t*⁵, I place a roller, *t*, actuated by a pin-wheel, *t*¹, and chain, *g*¹, upon either end of the roller *t*, and within the side boards of the inclined portion of the draper I secure the arms *t*², whose lower ends receive the journals of a roller, *t*³. This swinging draper *t*⁵ is pivoted at the upper roller *t*, and rises and falls according to the thickness of the mass of material passing upon the incline of the header draper, and it is prevented from falling down upon the header draper by the guide-pieces *t*⁴. By this construction it will be seen that no clogging up of the header draper can take place, as all heavy foreign substances, such as weeds, sunflowers, &c., which have a tendency to fall down off the inclined portion of the header draper, will be caught between the two drapers and drawn up, and be delivered along with the headed grain out of the top of the draper on to a transverse draper (not shown), which in turn conveys it to the feeding draper of the thrasher. The shaft of the driving-wheel B¹ is projected inwardly, and provided with a cog-wheel, H, which engages with a pinion, H¹, upon a shaft, H², to which is keyed the cog-wheel H³, which engages with a pinion, H⁴, provided with a friction clutch, H⁵, upon the shaft H⁶, to which is keyed the mitre gear-wheel H⁷, which engages with the mitre gear-wheel H⁸ upon the shaft I. This shaft I has its bearing as shown in fig. 3 (sheet 2) and fig. 5 (sheet 2), and is projected outwardly in front of the edge of the main frame, and on its outer end is keyed the pin-wheel I¹. Upon the shaft I, fig. 5 (sheet 2), on either side of the pin-wheel I¹, are placed the movable levers. I² I², the upper ends of which embrace the movable shaft I³, upon which the pin-wheels I⁴ I⁴ are keyed.

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keyed. To the shaft I^3 is connected the movable levers $i i$, the lower ends of which embrace the shaft i^1 , which is also provided with a pin-wheel I^2 , and connection is made between these wheels as shown. By means of this arrangement the shaft i^1 is caused to rotate, carrying with it the eccentric i^3 , to which one end of the pitman of the sickle-bar is connected, and thereby imparts to the sickle-bar a reciprocating movement. On the under side of the main frame I attach by clamps j the push beam J , fig. 3 (sheet 2), in such a manner as to be easily removable by simply taking off the clamps. This push beam is made of plate-iron, and of any desired length, and open on the under side, as seen in fig. 15 (sheet 3). Within this beam I place bearings J^1 , in which revolves a shaft, J^2 , which extends from end to end of the beam. At a point near the ends of the side pieces of the main frame I attach a stay or truss rod, Y , which passes under the push beam J , and assists in holding it firmly in place; and in order to prevent the crimping or buckling of the iron plates of which the push beam is composed, when the stay rods and clamp plates j are tightened up, I place within the push beam, and within that portion of it bounded by the stay rods and clamping bolts, the quadrangular box X seen in side elevation in fig. 2 (sheet 1), and in perspective in fig. 17 (sheet 3). Upon the front end of the shaft J^2 I key a chain wheel, J^3 , which is connected to a chain-wheel, J^4 , on a shaft J^1 , which has its inner bearing in a block under the tiller seat, j^2 , and this shaft is provided with a tiller wheel, J^5 , by which the tiller man revolves, by means of the connecting wheels and chains, the shaft J^2 upon the rear end of which is keyed the chain-wheel J^6 . To the under side of the push beam and beneath the chain-wheel J^6 , I clamp the transverse bar K , the outer ends of which are slotted for the reception of the two chain-wheels $K^1 K^1$, while to the top of this bar and adjoining the sides of the push beam I place the bearings for two binding chain-wheels, $K^2 K^2$; the office of these wheels being to draw down the chain N over the top of the wheel J^6 , and prevent all slipping between the chain N and wheel J^6 , when it is caused to rotate by the turning of animals. The animals are hitched to draw-bars, k^1 , secured at suitable points and in the usual manner to the tiller-wheel J^5 . To the rear end of the push beam I bolt a spring seat, k , for the driver of the the push beam. Projecting outwardly from the rear end of the push beam are the bearings $L L$, for a vertical shaft, L^1 , welded or otherwise secured to the axle M of the rudder-wheel $M^1 M^1$. These wheels are constructed with a central outwardly projecting flange, m , on either side of which the tread $m^1 m^1$ is formed. This construction prevents the wheels from sinking in sandy or soft soil, and also insures a good hold upon the ground when they are moved upon their vertical pivoted point. Between the pivotal point and the ends of the axle M , I attach the V-shaped rod or hounds m^2 , to the apex of which the chain N is secured, so that by revolving the chain-wheel J^6 , the point of the V-shaped rod is moved either to the right or left hand, causing the rudder-wheels to turn upon their vertical axes, and thus give direction to the movement of the machine. Upon the two central longitudinal angle-irons composing the main frame are bolted the angle-irons $O O$, thus forming a T-iron, and upon the web of this T-iron I set the standards O^1 of the thrashing-machine, and bolt them to the flange as shown in fig. 7 (sheet 2); the advantages of this construction being that, by removing the connections between the angle-iron O and the main frame, the thrasher may be easily removed from the header and used as a separate machine. When it is desired to transport the machine over bridges or through parts which are too narrow to admit of the passage of the connected machine, I detach the header draper and its connecting parts from the main frame, and by removing the two outside frame-pieces which receive the bearings of the two driving-wheels, I am enabled to easily remove the said driving-wheels without interfering with the rest of the machinery, and then, by placing trucks (shown in dotted lines in fig. 2, sheet 1), the entire main frame may be transported over and through narrow places. The shaft p of the bevel pinion G^2 is provided at its outer end with a band-wheel, P , which drives by intermediate gearing, such as is commonly used, the grain-carrier, straw-carrier, elevator, and shaker or shoe, while the band-wheel Q upon the shaft I drives the cylinder, transverse draper and thrasher draper. Thus it will be seen that the driving power is divided between the two driving-wheels B and B^1 , making the machine run much easier, and requiring less power to operate it. To the upper end of the straw-carrier a chute is attached, which conveys the straw to a point below the working parts of the machine, and distributes it upon the ground as the machine is pushed forward, and thus leaves it ready to be turned under as a manure. The upper end of this chute, Z , is provided with a straw-picker, z , which is actuated by any suitable gearing, and upon its being revolved, forces the straw, as it comes from the straw-carrier, down the chute, otherwise, owing to the light weight of the straw, the chute would become choked. If deemed preferable, the mechanism hereinbefore described may be modified somewhat, so as to conform to the arrangement illustrated in figs. 23, 24, and 25 (sheet 4). This modification consists in bolting to either side of the rear end of the push beam J , the goose-neck shaped irons $r r$, the rear ends of which approach each other, and occupy a vertical position, and form a support to and between which are bolted the bearings $r^1 r^1$, for the vertical shaft L^1 , which is firmly secured to the axle M of the rudder wheels $M^1 M^1$. The axle M is projected a sufficient distance beyond the wheels to permit of a circular horizontal band, R , of angle-iron being riveted upon the outer ends of said axle, as is clearly seen at figs. 23 and 24 (sheet 4). The angle-iron forming the band R is so bent that one flange will project upwardly and the other outwardly, and thereby form a seat or shelf to support a portion of the steering chain or cable N , which is firmly secured to a point upon the periphery of the band R , which is furthest to the rear. This chain passes up along the outer sides of the push beam J , and is connected to a tiller wheel on the front of the machine, and operated in the usual manner. The chain is prevented from rising up from off the band R , by means of small lengths of angle-iron, r^5 , seen in fig. 25 (sheet 4), and is held toward the push beam by means of the grooved friction rollers or pulleys $r^4 r^4$ placed in bearings, r^3 , which are riveted to the plate, r^2 , bolted to the end of the push beam.

Having thus described my said invention, what I claim and desire to secure by Letters Patent is—

First—In a combined header and thrasher, constructing the main framework of angle-irons as described, and having the connections made between the several pieces by flanging up one side of the angle-iron, and bolting it to the side of the adjoining angle-iron, while the straight side of the flanged-angle-iron is bolted to the top side of the said adjoining angle-iron.

Second—

Improvements in Heading and Harvesting Machines.

Second—In a combined header and thrasher, constructing the driving-wheels thereof of a band of flat iron, *b*, strengthened by bands of angle-iron, *b*² *b*³, with spokes of either flat or T-iron, *b*³ *b*³, and having the tread of the wheel provided with V-shaped angle-irons, or shoes arranged in the manner specified and shown; all constructed, arranged, and operating substantially in the manner as herein set forth and specified.

Third—In a combined thrasher and header, the driving-wheels provided with an interior flange, *B*³, against which the brake shoes press, said brake being so constructed and arranged as to give a pressure against the inner face of the flange, substantially as herein shown and specified.

Fourth—In a combined thrasher and header, the combination with the main frame thereof of the perpendicular channel iron *C*², having a coulter or plough point attached to its lower end, with the supporting framework *D* of the draper and sickle-bar, and its guide-wheels or friction pulleys *E*² *E*², chain or belt *E*³, roller *d*², pulley *d*, spur-wheel *d*¹, and worm-gear *C*³, constructed, arranged, and operating substantially as herein set forth and described.

Fifth—In a combined thrasher and header, constructing the push beam thereof of iron in the form shown, and having interior braces or stays, and attached by clamps to the main framing thereof in the manner substantially as herein set forth and specified.

Sixth—In a combined thrasher and header, the steering-gear, consisting of the chain-wheels *J*³ and *J*⁶, secured upon a shaft, *J*², running within and the entire length of the push beam *J*, and caused to operate upon the rudder-wheels *M*¹ *M*¹, pivoted to the rear end of the push beam by a chain connection with the hounds *m*², the whole being controlled and operated by the tiller-wheel *J*⁵ and chain-wheel *J*⁴, suitably connected to the chain-wheel *J*³, all constructed, arranged, and operated substantially in the manner as herein set forth and described.

Seventh—In the steering-gear for combined headers and thrashers, rudder-wheels *M*¹ *M*¹, axle *M*, vertical shaft *L*¹, bearings *L* *L*, and hounds *m*², the said wheels being constructed with a centrally projecting flange, *m*, and side flanges or treads, *m*¹ *m*¹, all constructed, arranged, and operating substantially as herein set forth and specified.

Eighth—In combination with the header draper *t*⁵, the swinging or hinged draper *t*⁶, when constructed, arranged, and operating substantially in the manner as herein specified.

Ninth—In a combined header and thrasher, providing the journal-boxes *S* *S* of the main driving-wheels *B* *B*¹, with a hollow projection, *s*², set bolt, *s*³, and nut, *s*⁵, for the purpose of regulating the tension on the truss rod *s*⁴, all constructed, arranged, and operating substantially as herein set forth and described.

In witness whereof, I, the said Almerin Hubbell Lighthall, have hereunto set my hand and seal, this
A.D. 1881.

ALMERIN HUBBELL LIGHTHALL.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to Almerin Hubbell Lighthall, this twenty-sixth day of October, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 16 September, 1881.

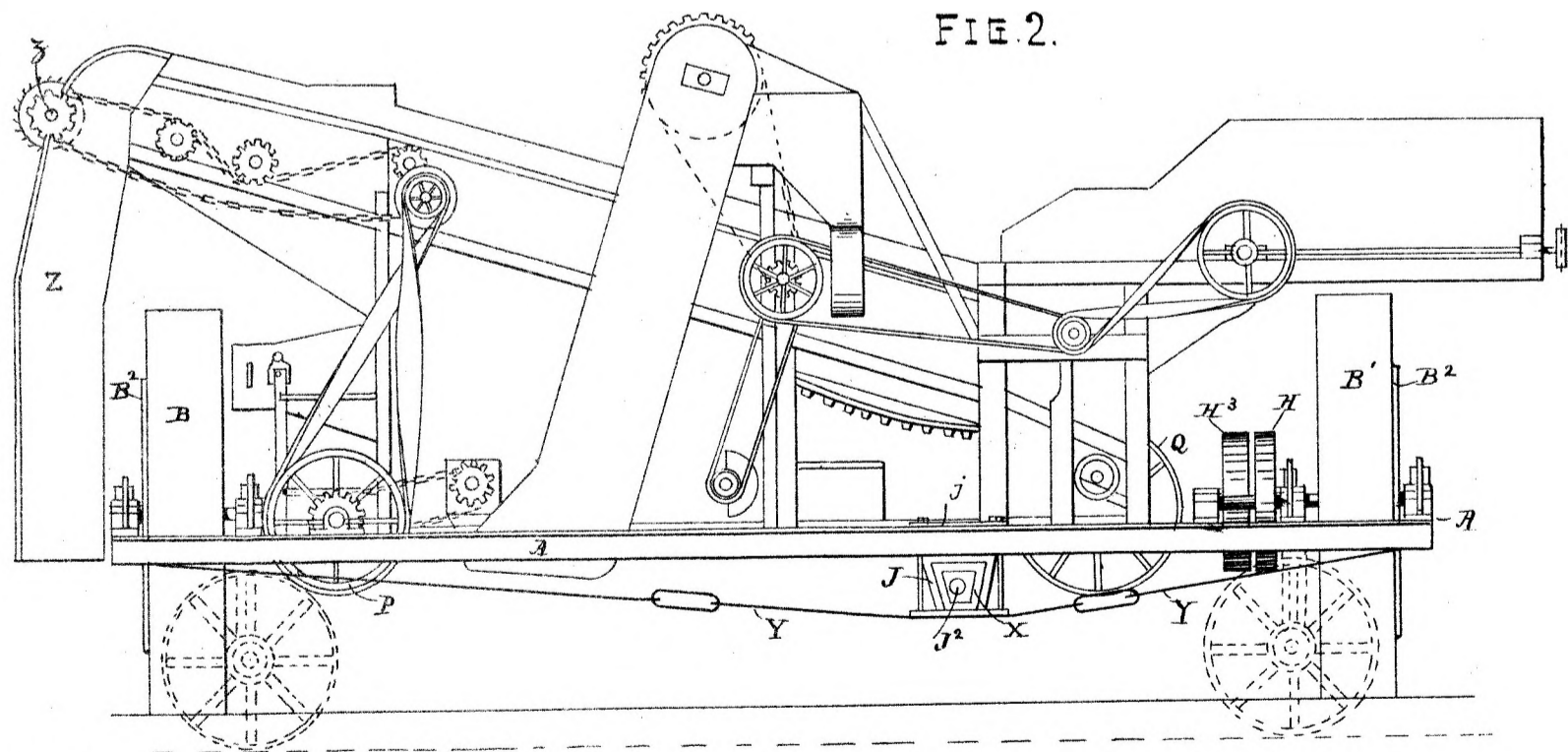
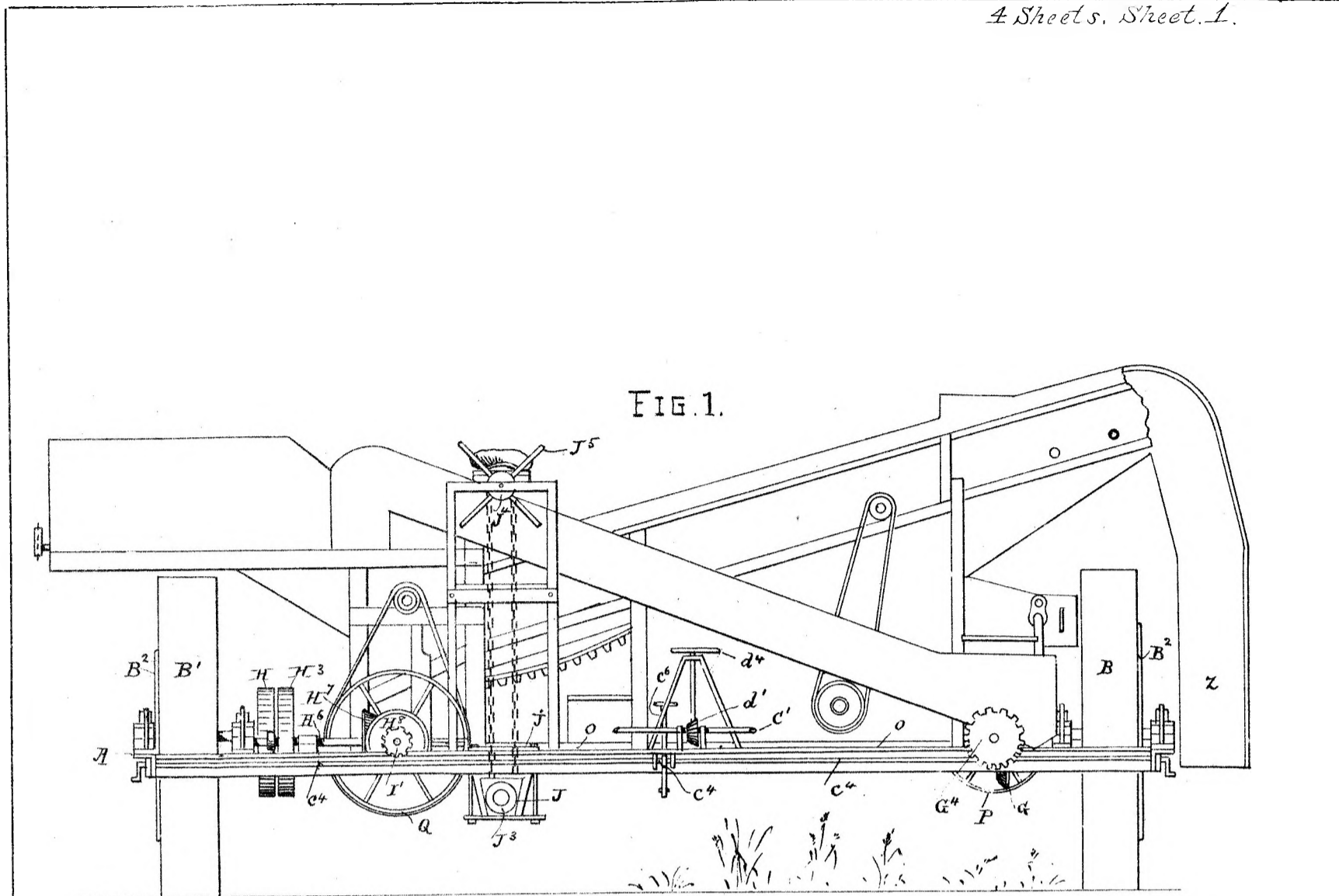
We do ourselves the honor to report, in reply to your blank cover communication of the 8th instant, No. 8,733, transmitting the Petition of Almerin Hubbell Lighthall, for the registration of an invention entitled "Improvements in Heading and Harvesting Machines," that we are of opinion the prayer of Mr. Lighthall's Petition may be granted, in terms of his specification, drawings, and claim.

We have, &c.,

G. K. MANN.
R. G. MASSIE.

The Under Secretary of Justice.

[Drawings—four sheets.]

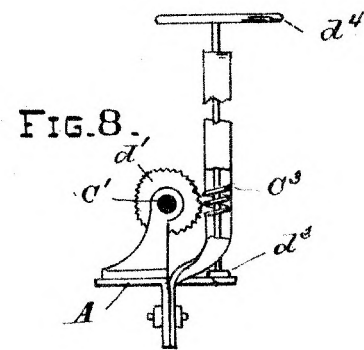
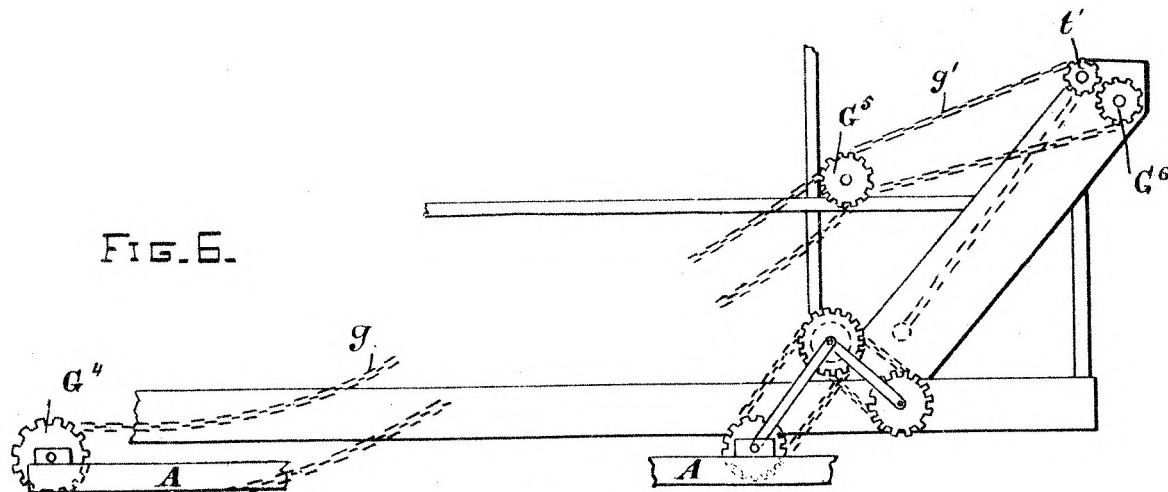
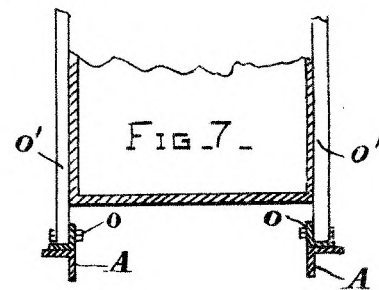
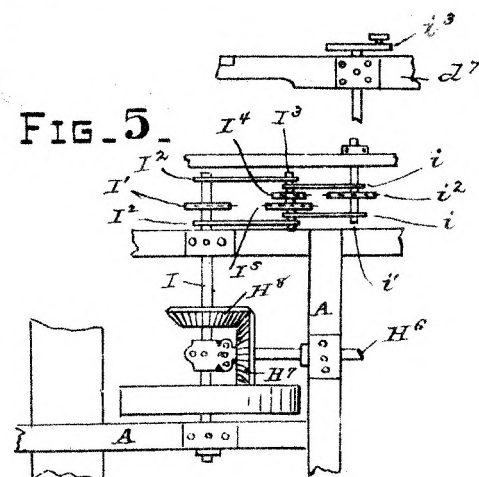
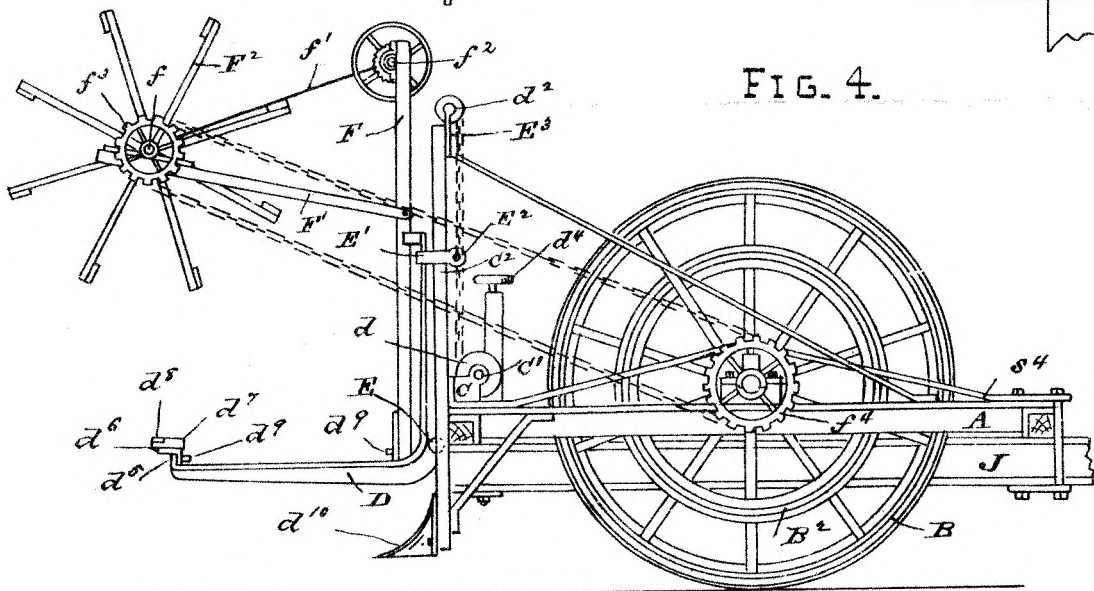
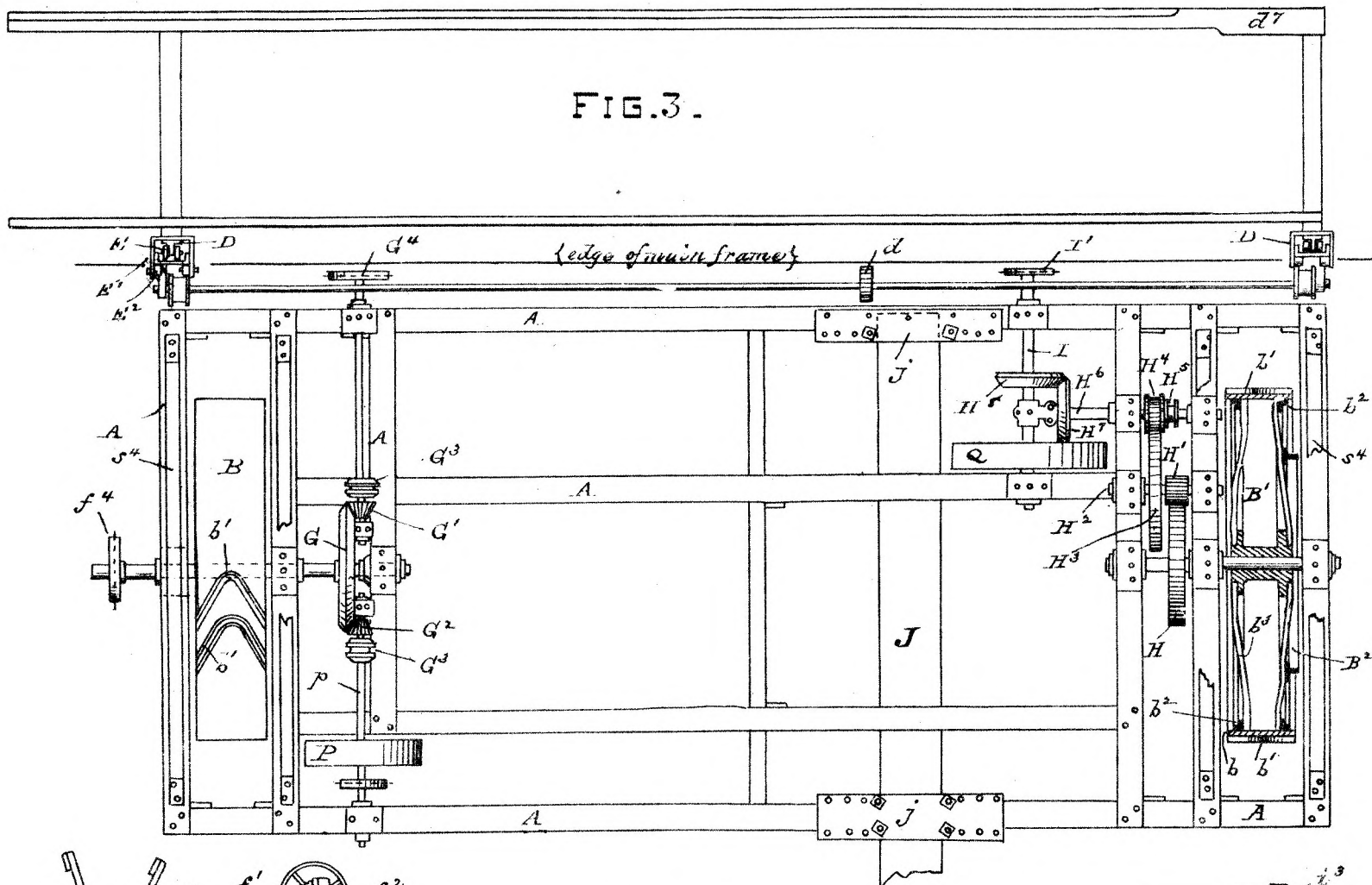


Signed in the presence of

and

This is the Sheet of Drawings marked *Breferred* to in annexed Letters of Registration granted to Almerin Hubbell Lighthall this twenty-sixth day of October, A. D. 1881. Augustus L. of U.S.

207. Sig. 34.



This is the Sheet of Drawings marked C referred to in the annexed Letters of Registration granted to Almerin Hubbell Lighthall this twenty-sixth day of October, A.D. 1881. Augustus Loftus.

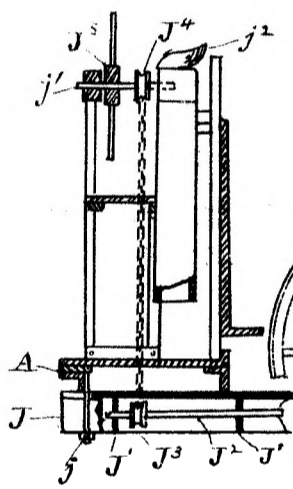
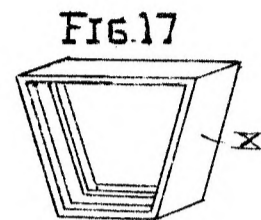
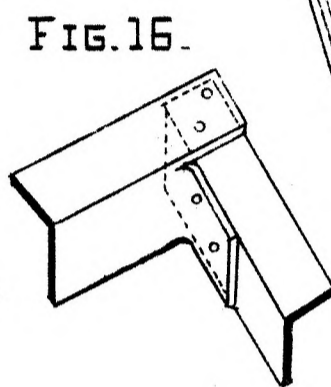
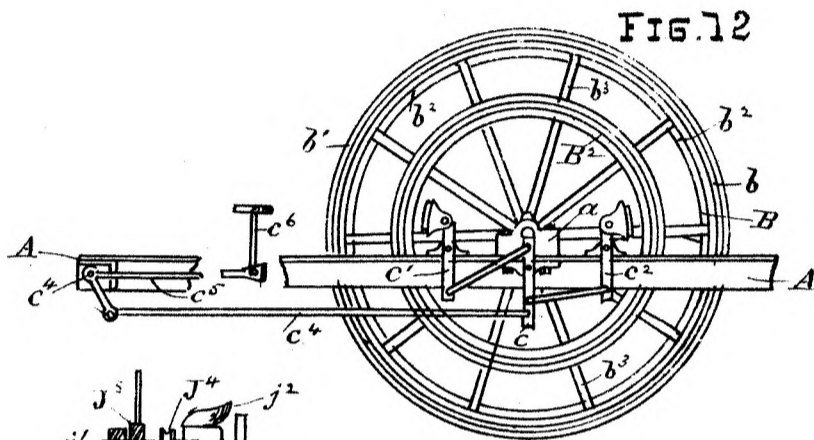
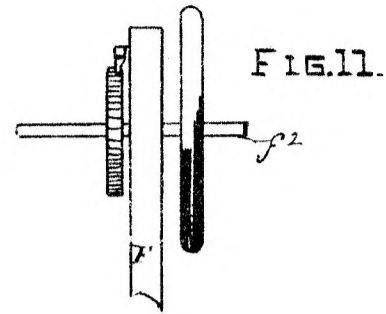
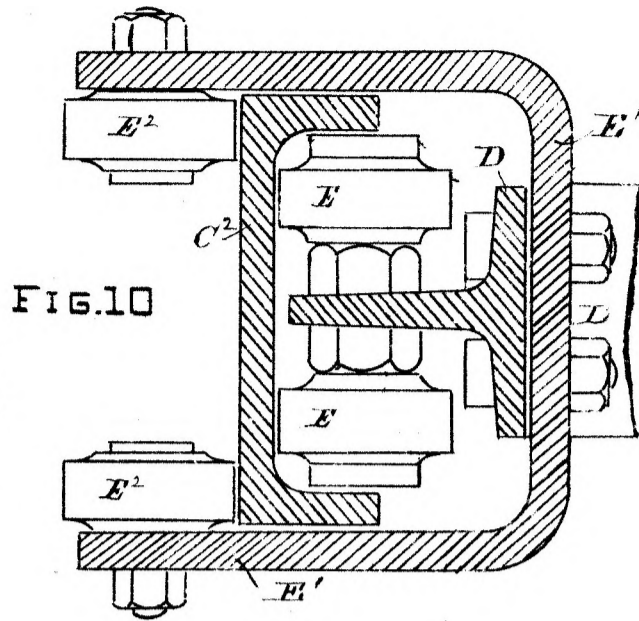
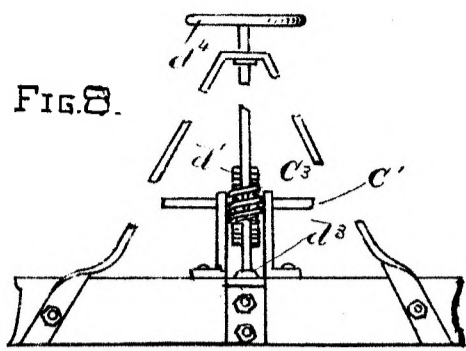


FIG. 13

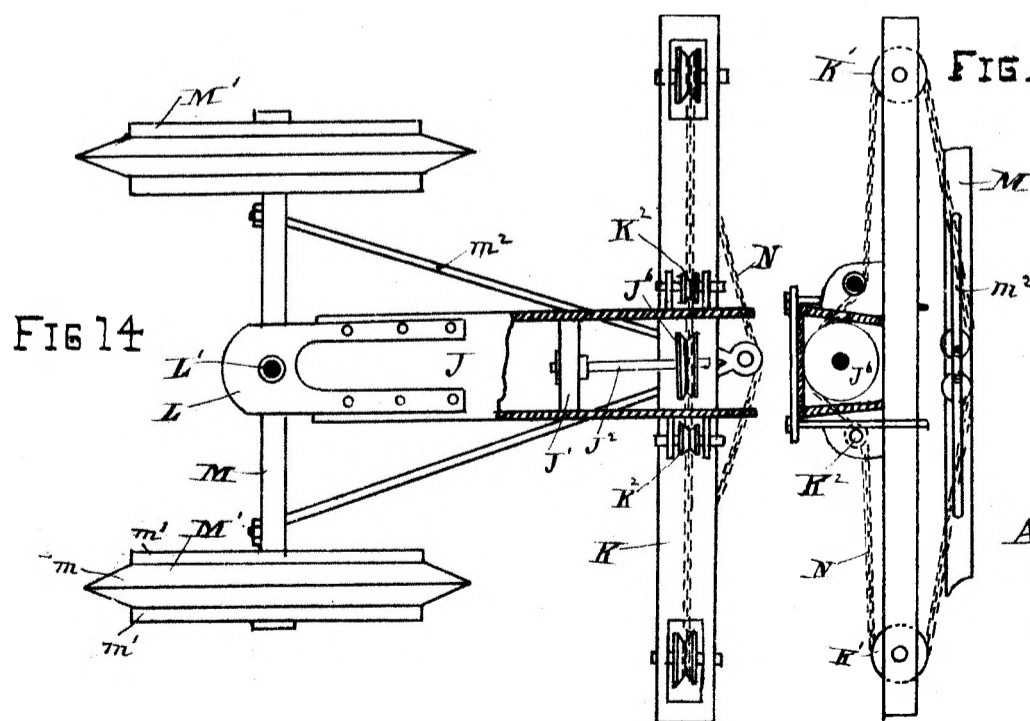
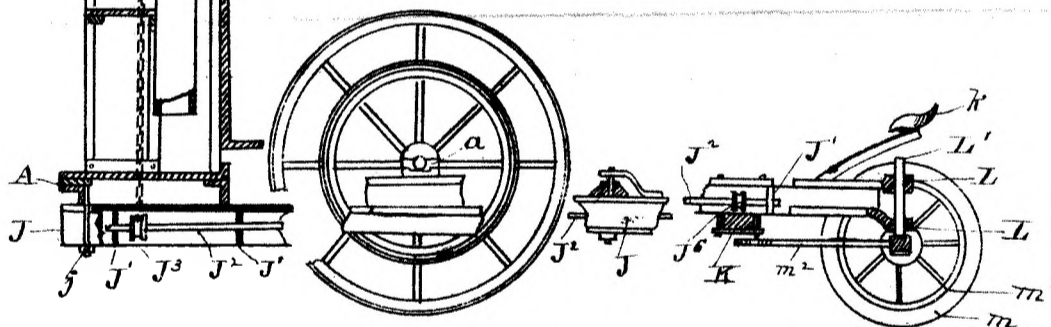
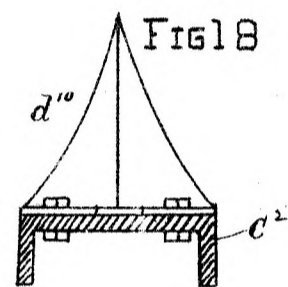


FIG. 14

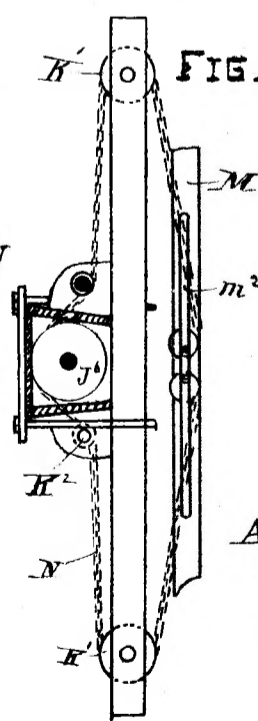


FIG. 15.

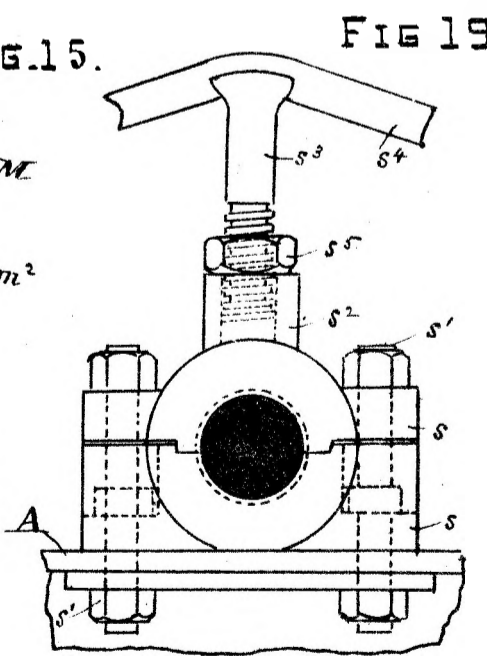


FIG. 19

PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE, SYDNEY, NEW SOUTH WALES.

This is the Sheet of Drawings marked D preferred to in the annexed Letters of Registration granted to Almerin Hubbell Lighthall this twenty sixth day of October, A.D. 1881. Augustus Loftus. Sig 34.

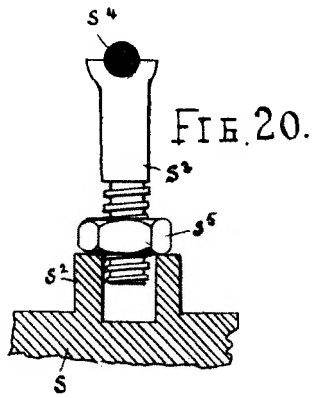


FIG. 20.

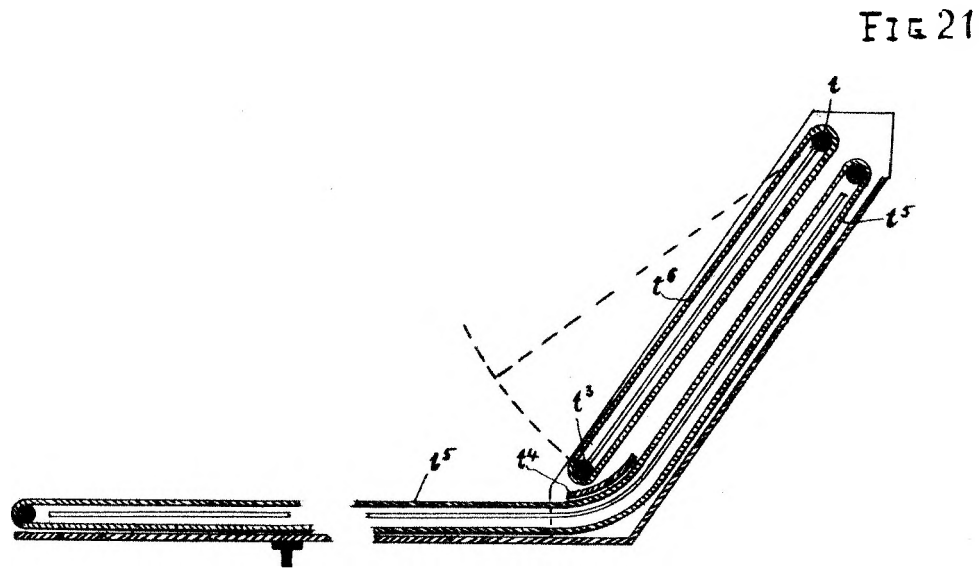


FIG. 21.

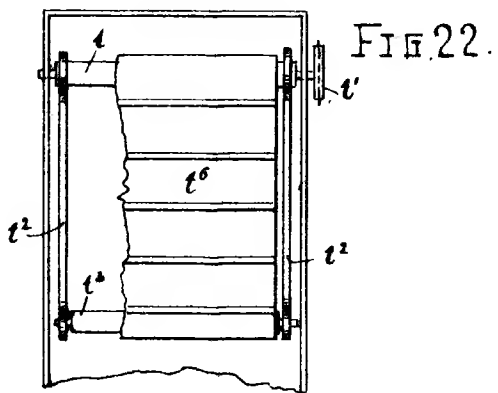


FIG. 22.

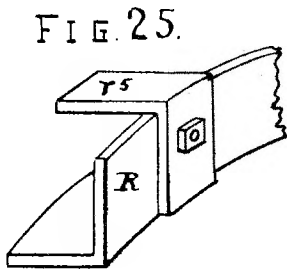


FIG. 25.

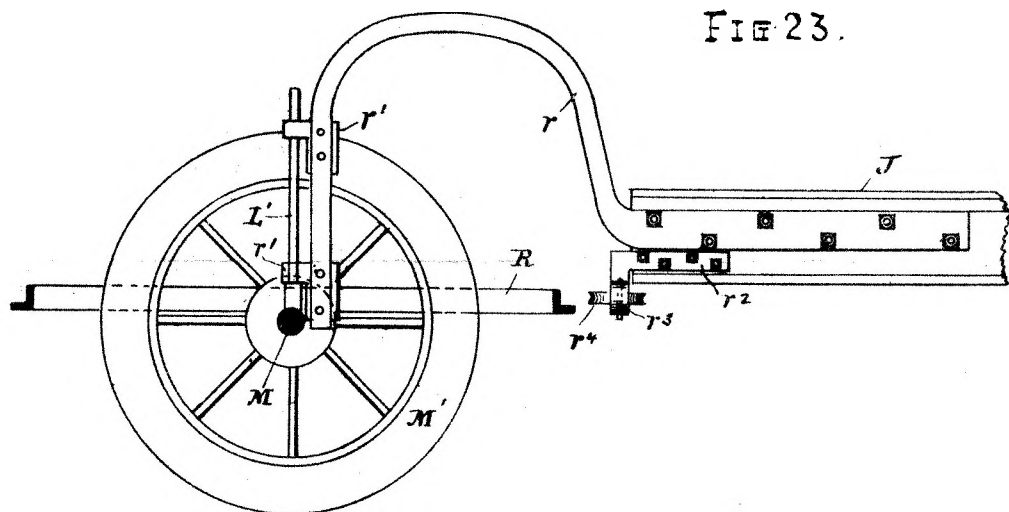


FIG. 23.

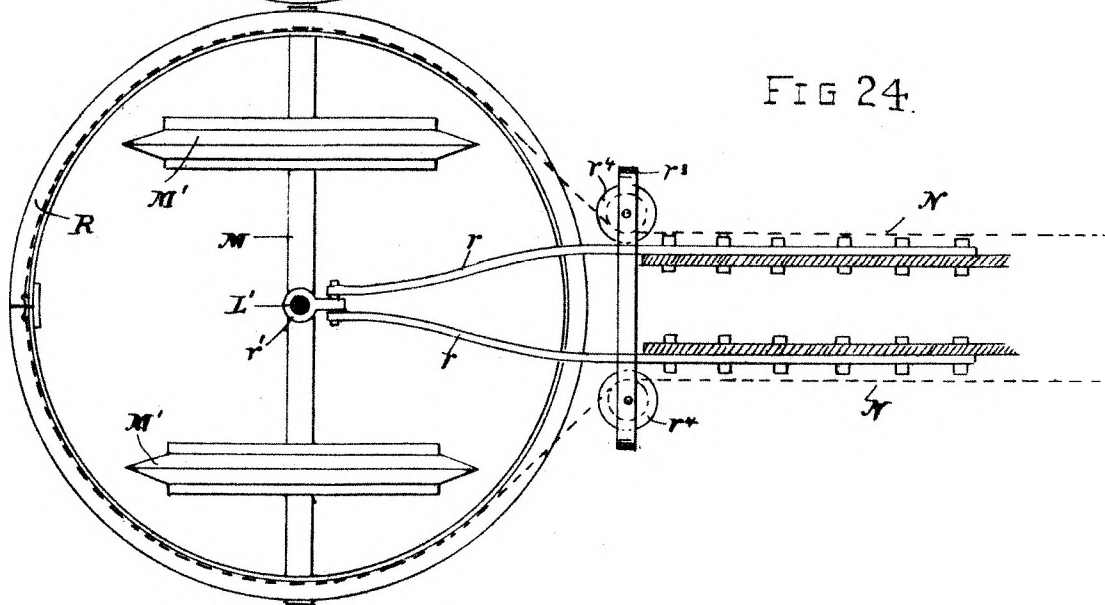


FIG. 24.

*This is the Sheet of Drawings marked E referred to in the annexed
Letters of Registration granted to Almerin Hubbell Lighthall this
twenty-sixth day of October, A.D. 1881.*

Augustus Loftus.

(Sig. 34.)



A.D. 1881, 26th October. No. 1006.

**INVENTION FOR PRICKING, CHANNELLING, NAILING, AND CHANNEL-SETTING
SOLES OF SEWN BOOTS AND SHOES.**

LETTERS OF REGISTRATION to George Blackeby, for an invention for pricking, channelling, nailing, and channel-setting soles of sewn boots and shoes.

[Registered on the 27th day of October, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS GEORGE BLACKEBY, of Rundle-street, Adelaide, in the Province of South Australia, boot and shoe manufacturer, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention for "Pricking, channelling, nailing, and channel-setting soles of sewn boots and shoes," which is more particularly described in the specification, marked A, and the three sheets of drawings, marked B, C, and D, respectively, which are hereunto annexed; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said George Blackeby, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said George Blackeby, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said George Blackeby shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this twenty-sixth day of October, in the year of our Lord one thousand eight hundred and eighty-one.

[L.s.]

AUGUSTUS LOFTUS.

An Invention for pricking, channelling, nailing,

A.
SPECIFICATION.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, GEORGE BLACKEBY, of Rundle-street, Adelaide, in the Province of South Australia, boot and shoe manufacturer, send greeting :

WHEREAS His Excellency the Right Honorable LORD AUGUSTUS LOFTUS, G.C.B., Governor and Commander-in-Chief of Her Majesty's Province of New South Wales, by Letters Patent bearing date the day of _____ in the year of our Lord one thousand eight hundred and eighty-one, did for himself, his heirs and successors, give and grant unto me, the said George Blackeby, my executors, administrators, and assigns, or such others as I, the said George Blackeby, my executors, administrators, or assigns, should at any time agree with, and no other, from time to time, and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend in the Province of New South Wales, certain improvements known as "an invention for pricking, channelling, nailing, and channel-setting soles of sewn boots and shoes," upon the condition, among others, that I, the said George Blackeby, by an instrument in writing under my hand and seal, should particularly describe and ascertain the nature of the said improvements and in what manner the same were to be performed, and cause the same to be filed in the Registry Office within six calendar months next and immediately after the date of the said Letters Patent : Now know ye that I, the said George Blackeby, do hereby declare the nature of my said improvements, and in what manner the same are to be performed, to be particularly described and ascertained in and by the following statement, that is to say :—" All machine-sewn boots and shoes known to me have the channel cut near to the edge of the sole before they are sewn on to the upper of the boot or shoe, and after it is sewn on the channel is rubbed down with some ordinary tool, and the bottom is made perfectly level by hammering it. If the boot or shoe is nailed this is done by hand-labour—that is, it is done by making the holes for the nails in the sole with a peg-awl and hammer, and then the nails are driven into the sole with an ordinary hammer. Now as all machine-sewn boots and shoes are sewn right through the soles, and not through a welt which projects out all round the sole, such as is the case in hand-sewn boots, one blow with the hammer near to a stitch is sure to damage it, and perhaps to burst it, and the boot or shoe is then almost sure to open or rip, especially if any nails are driven into the sole. This is no doubt the reason why many machine-sewn boots do rip. I have therefore invented a machine which will prick two rows of holes (or three rows where wanted) round the sole ; pierce at one time all the holes required in the centre of the sole ; cut a double channel all round the sole, and a third channel where wanted, and after the nails have been put into the holes prepared for them, to press them all in at one time, and after sewing the sole on to the upper, to set the channel and so complete the operation without using any hammer. In this way strong nailed double or treble machine-sewn boots and shoes made by my invention will be perfectly reliable, as they cannot possibly rip. The advantages of my invention will be :—First, to ensure great saving of labour in the manufacture of boots and shoes ; second, to secure the manufacture of boots and shoes which will not only be stronger and more durable than those hitherto made, but will also be cheaper than the ordinary riveted or pegged boots and shoes now in use ; third, to ensure greater ease and comfort to the wearer than can be secured by the ordinary pegged or riveted boots and shoes, as boots and shoes manufactured by my invention will not gall or wound the feet, or destroy the socks and stockings. The nature and principle of the invention and in what manner it is to be made, used, or performed, are particularly described and ascertained in and by this present instrument in writing, with the aid of the several drawings hereunto annexed, and in which said several drawings similar parts are marked and referred to by similar letters or figures as are marked and referred to in this specification. The drawings herewith are as follows :—

Drawing 1—Plan of whole machine, comprising figures 1, 2, 3, 4, and 5. Drawing 2—Front elevation of figures 1, 2, 3, and 4, with part section of figure 1. Drawing 3—Side elevation of machine, giving various parts *in situ*, and part section of figure 3.

My invention consists of a machine for a new and improved method of making and putting on the soles of all kinds of strong sewn boots and shoes, and is especially useful in the manufacture of strong nailed boots.

Drawing 1 shows a table to which is attached by bolts the various parts, figures 1 to 5. In drawing 2, figure 1 gives a sectional view of a portion of the prickers. This machine has a head-piece C carrying on its lower side three prickers, DD and D'. The head-piece receives motion from a toggle-jointed lever, EE, by an upward motion of the arm F. The lever EE is drawn to the position shown by the dotted lines GG, and on its return movement presses down the head-piece and prickers. The motion of the arm is continued to the other position shown by the dotted lines HH, when it is again raised. The third pricker is made to throw up or down by means of a lever, II, pressed by the knee of the operator, which causes a lever, J, to take the position shown in the drawing, and which forces forward the bar K (which has its end pointed or tapered), and presses the pricker D' down to the same level as the others. The spring L raises it up again, when the bar is allowed to go back as the pressure of the knee is removed. A roller, M, acts as a stop to regulate the depth to which the sole is to be pierced, and can be regulated in its height ; it also takes the upward pressure of the feed-wheel N. The sole is supported by the hollow feed-wheel N, which can be raised or lowered by a treadle, and which keeps the sole against the stop M. The inner edge of this wheel is slightly larger in diameter, and is roughed. It is supported by the brackets OO attached to a treadle, P, shown in drawing 3, by the rods qq, and slides in a guide. It receives a feed motion by means of the wheel Q' on the same shaft R', connected with jointed bars a' a'. The cam S, drawing 3, on the shaft 3, gives a short movement to the arm, and the catch B' carries the feed-wheel forward the distance wanted between the nails in the sole. The stop or guard Z, drawing 3, fig. 5, can be set out to regulate the distance of the holes from the edge of the sole. To fill the vacant space down the centre of the sole the press, fig. 2 in drawing 2, is used to prick at one time the word "PATENT," or any other word, pattern, shape, or device the applicant may wish on the sole. The press consists of two side-bars 1 1, working through the table and guides 3 3, having a cross-piece, 4, at the top through a boss in the centre of which is the screwed spindle 5, having a hand-wheel at its top by which to regulate the height of the press top 6, which is attached to its lower end and between the two side-bars 1 1. On the under-side of this top 6 are fastened the prickers in the form of the word "Patent," or any other word, pattern, shape, or device desired. The side-bars are connected by a distance piece, 7, under the table, and

can

and channel-setting soles of sewn boots and shoes.

can be drawn down by the levers B B, connected with the eccentric A on the shaft 2 by the rods B B. The stops 8 8 8 keep the sole from rising with the prickers, and also act as stops for placing the sole in the right position under the prickers. The channelling is performed by the machine shown in fig. 3, drawing 3, and consists of a frame, *a a* and *a'*, fastened to the table by bolts. Upon the part of the frame *a'* are the channellers supported by the stud B, and fastened by the screw *d* at its end. The third channeller *r* is raised up by the spring *e* on the top of the frame, and can be brought down to its place when wanted by the rod *f f* attached to the knee-piece *g*. Between these channellers are rollers, *h i j k*, which act as guards for the depth of cut. The inner roller K is connected by a train of wheels to the under supporting wheel *m*, and both receive motion from the wheels N O, and are driven by a belt on the speed-cone *p*. Knives, A (figure 3, drawing 2), are placed in front of each channeller, and the third knife is attached to its channeller *r*, and rises with it when not in use. The supporting-wheel *m* is raised by means of the rods *s s* working through the guides *t*, and connected to the treadle *u*. The stop or guide *v* regulates the distance of the channellers from the edge of the sole. The nails are placed in the holes in the sole by hand, and then the sole is put into the press (figure 4, drawing 2), consisting of a table, Z, which moves up and down. This works upon the guide-bolt Y, which supports a lower table, X X. Movement is given to the table Z by means of the toggle-levers W W W raised by the eccentric A on the shaft 2, which causes the table to rise and fall between the top *v* and bottom *x* portion of the press. The openings of the press are at T and V. The channel-setter (drawing 3, figure 5) consists of the arm *a* attached to the upright head B B, jointed on to the pin C, carrying at its outer end the wheel F, which connected with the wheel D causes the roller E to revolve with it. The end of the arm is slightly smaller in diameter than the roller E. To the wheel D on the outside of the arm is a chain-wheel, F, which is driven by a chain from the wheel G at the joint C, which receives motion by means of the belt H H passing over the guide-pulleys I I to the shaft 1. The weight M on the lever L gives pressure by means of the joints at K and J to the arm *a*, which causes it to come down to the dotted lines Z' Z', which brings the small roller E into the recess O O, in which a small gas-light, P, is left burning for the purpose of heating it. By means of the treadle Q and lever R R, the lever L and with it the arm A can be raised. The boot on the jack S' S' being placed under the foot is removed from the treadle, and the roller E presses upon the channel. The jack S S consists of a round spindle working in a ball-socket, T, in the foot-piece U U. On its upper-arm V is a sliding-fork, W, having the range of the slot X X. On the joint Y works the tightening-rod *a'*, being a round-topped lever on which drops the heel of the last, the toe being supported by the fork W. The end of this lever has a spring-catch, *b*, which catches on the rack *d* at the arm Z, and thereby keeps it in that position. C C are driving-wheels from the shaft or engine. D is a cog-wheel which works on E, and drives shaft 2, which shaft gives motion to both presses. F is a pulley to drive shaft 3, which shaft gives motion to the channellers. The channel-setter receives motion from a belt round shaft 1. G G is a belt from pulley F to pulley H on shaft 3. The belt I I drives the channellers. The mode of using my machine is as follows:—The soles being cut out and cross-channelled, are pasted together and dried in a press. The operator then commences at the waist of the sole, having with his knee put down the third pricker, and pressing the treadle down with his foot, which movement brings the feed-wheel up and presses the sole against the stop or guard. The machine will then prick three rows of holes, and carry the sole along under the prickers. On getting near to the toe the operator takes his knee from the knee-piece, which withdraws the third pricker from use. The two prickers then continue to go round the toe, the operator pressing the sole against the guide and turning it round. Continuing it to the other side he again presses his knee to the knee-piece, and puts the third pricker again in operation. Taking his foot off the treadle on arriving at the waist, the feed-wheel descends and releases the sole. He then puts the sole against the stops under the pricking press, and the press coming down pricks all the holes required in the centre of the sole, and thus completes the pricking operation. He then places the sole between the feed-wheel of the channeller, first pressing the knee-piece and bringing the third channeller into operation. Pressing down the treadle with his foot, the feed-wheels draw the sole under the channeller, he guiding it against the guard. On coming to the end of the waist he releases the knee-piece, and continues round the sole with the other two channellers until coming to the other side of the waist he presses the knee-piece again, and that brings down the third channeller, and again cuts three channels to the end of the waist. If necessary all three channels can be cut all round the sole. The nails are then put by hand in the holes pricked for them in the sole, which is then placed under the press, which crushes them all in at once, and the sole is now ready to be sewn on to the upper. After sewing, the boot is placed on the last upon the jack, and the treadle being pressed down raises the arm carrying the roller; and on putting the boot under it the treadle is released, which allows all the pressure of the weight to come upon the end of the arm, and the roller being turned by the wheel above connected with the driving-shaft will draw the boot under, pressing down the channel and covering the stitches, and at the same time smoothing the portion of the soles between the nails by the under-end of the arm. On coming to the end of the stitches the treadle is pressed, which raises the arm, and the boot and last are released from the jack by pushing in the tightening lever.

Having fully described and ascertained my invention and the manner in which I propose to work it, I claim—

First—The general construction and arrangement of the parts forming a machine for pricking, channelling, nailing, and channel-setting soles of sewn boots and shoes, substantially as described above, and as set forth in the drawings herewith.

Second—That I am able to make with my machine the very stongest kind of hob-nailed boots and shoes machine-sewn, instead of making them pegged and riveted as has hitherto been done.

In witness whereof, I have hereunto set my hand and seal, this _____ day of _____ in the year of our Lord one thousand eight hundred and eighty-one.

Witnesses—

JNO. FAIRFAX CONIGRAVE,
Waymouth-street, Adelaide.

E. CLARKE,
Adelaide.

GEORGE BLACKEBY,

Boot-manufacturer,
68, Rundle-street.

This

An Invention for pricking, channelling, nailing, &c., sewn boots and shoes.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to George Blackeby, this twenty-sixth day of October, A.D. 1881.

AUGUSTUS LOFTUS.

REPORTS.

Sir, Sydney, 26 August, 1881.
 We have the honor to return herewith the papers in the matter of the Petition of George Blackeby, for a patent for "an invention for pricking, channelling, nailing, and channel-setting soles of sewn boots and shoes," and to request that you will be good enough to cause all the letters referred to in the specification to be inserted in the plan, as many of them have been omitted.

We have, &c.,
 A. C. FRASER.
 THOS. RICHARDS.

The Under Secretary of Justice.

MEMO.—Papers returned herewith for further amendment. The following letters and numbers referred to in the specification are not marked on the plan, viz. :—Drawing 2, letter C; drawing 1, figure 1, letter Z; drawing 2, figure 2, numbers 7 and 8; drawing 2, figure S W; drawing 2, figure 4, A, B B, H, M, L, K, J, a, z, z, E, OO, P, Q, RR, and 4.

A. C. FRASER.
 THOS. RICHARDS.
 6/9/81.

The Under Secretary of Justice.

Sir, Sydney, 15 September, 1881.
 The application of Mr. George Blackeby for Letters of Registration for an invention for "pricking, channelling, nailing, and channel-setting of soles of sewn boots and shoes," having been referred to us, we have examined the specification and drawings accompanying the application, and have now the honor to report that we see no objection to the issue of Letters of Registration as applied for.

We have, &c.,
 A. C. FRASER.
 THOS. RICHARDS.

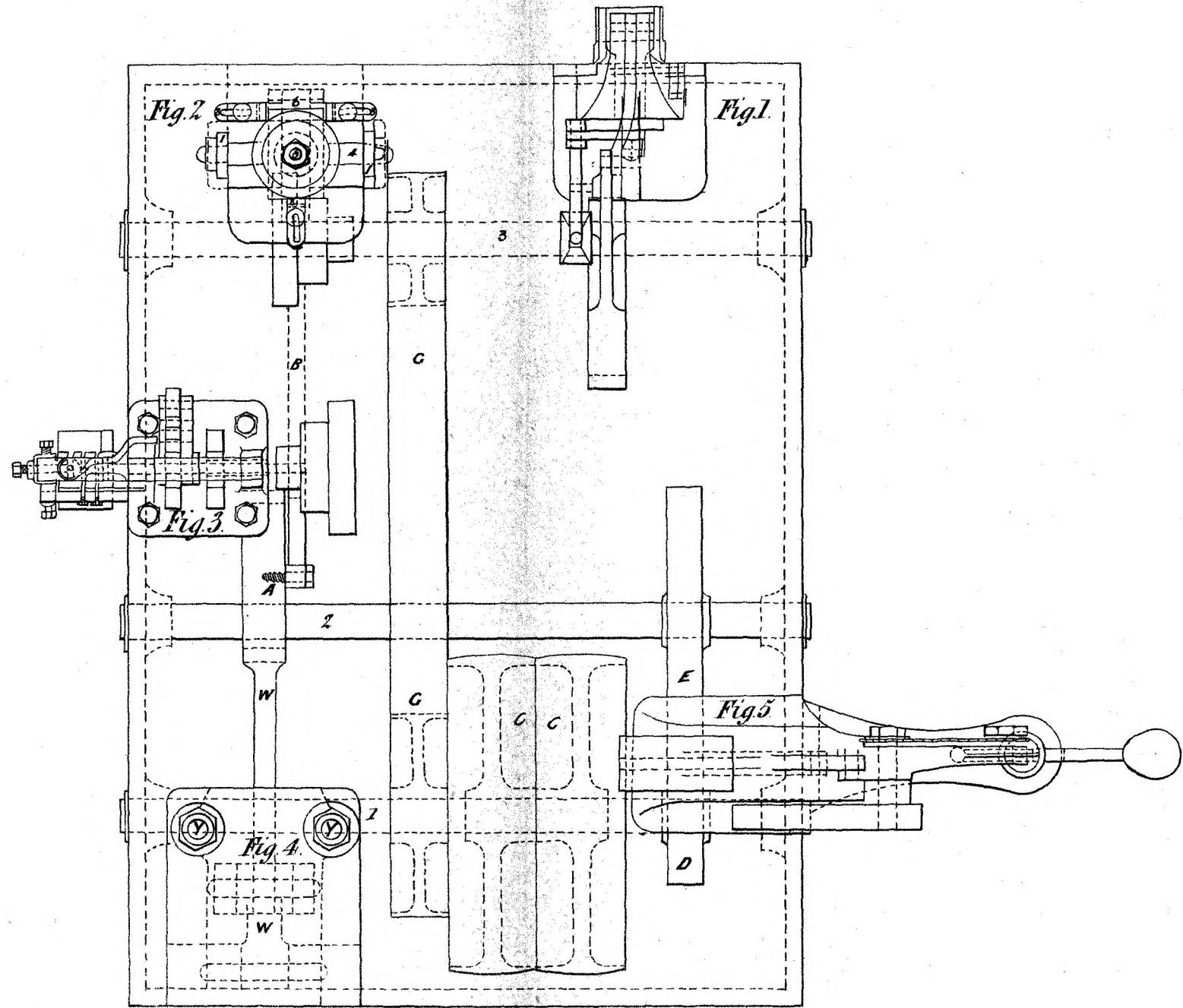
The Under Secretary of Justice.

[Drawings—three sheets.]

No. 1007.

[Assignment of No. 242A. See page 73 of Return of 21 June, 1872.]

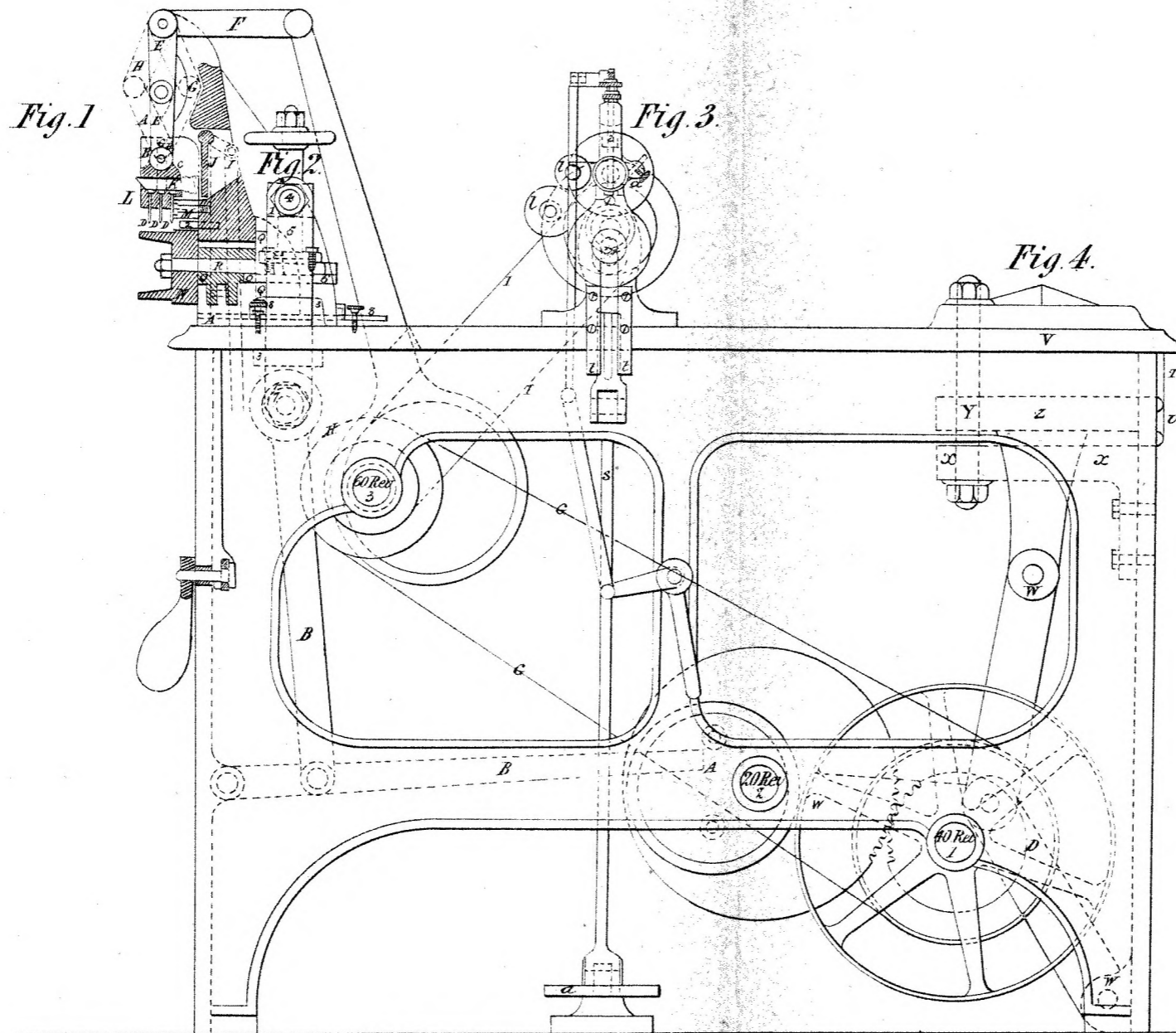
Drawing N°1.



This is the Sheet of Drawings marked B. referred to in the annexed Letters of Registration granted to George Blackebly, this twenty sixth day of October A.D. 1881.

Augustus Loftus.

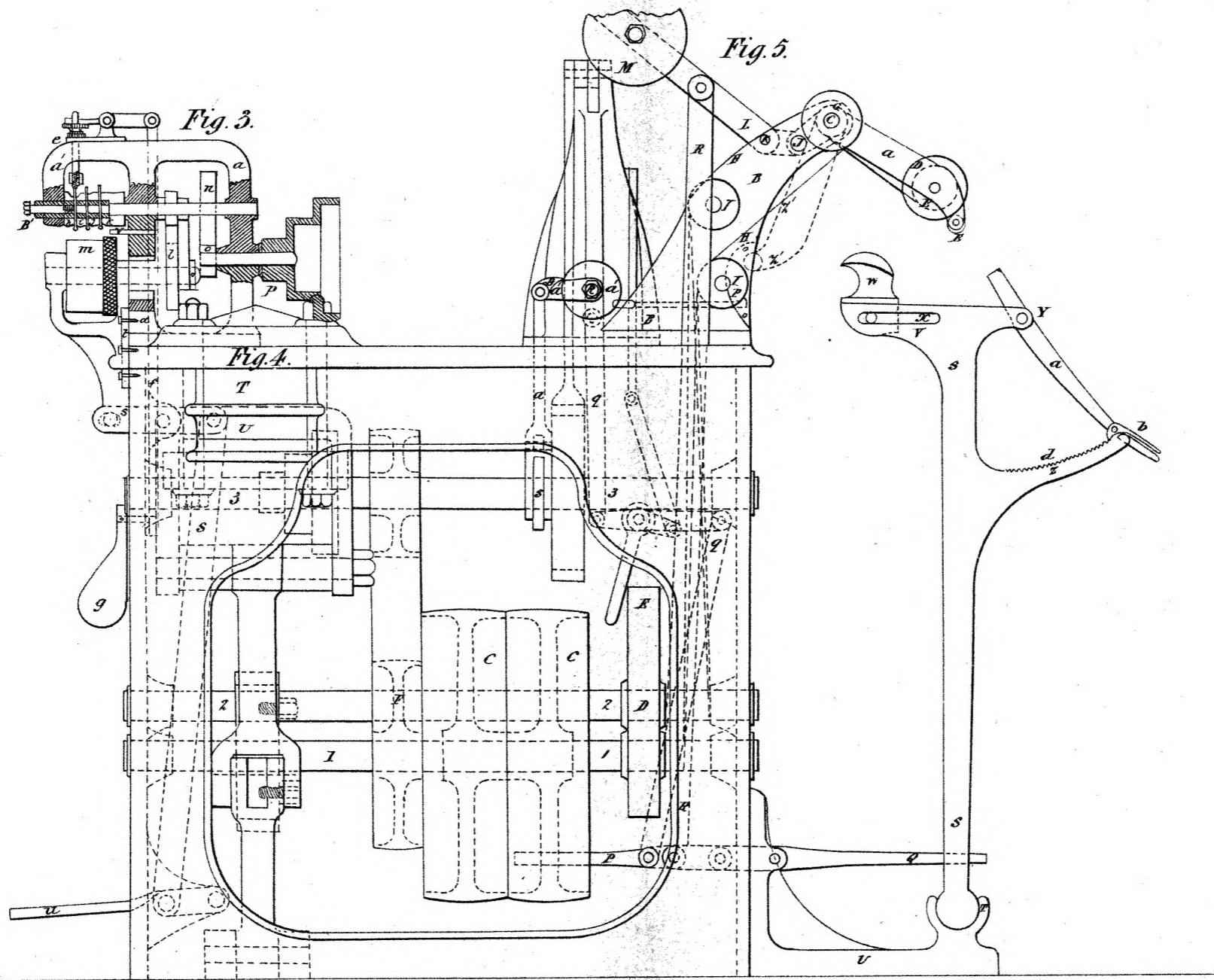
Drawing N^o 2.



*This is the Sheet of Drawings marked C. referred to in the annexed
 Letters of Registration granted to George Bluckebly, this twenty
 sixth day of October, A.D. 1881.*

Augustus Loftus.

Drawing N^o 3.



*This is the Sheet of Drawings marked D. referred to in the annexed
 Letters of Registration granted to George Blackeby, this twenty sixth
 day of October, 1881.*

Augustus Loftus.



A.D. 1881, 29th October. No. 1008.

IMPROVEMENTS IN THE MANUFACTURE OF BEER AND YEAST.

LETTERS OF REGISTRATION to John Thomas Toohey and James Toohey, for Improvements in the manufacture of Beer and Yeast by means of a cooling system.

[Registered on the 29th day of October, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS JOHN THOMAS TOOHEY and JAMES TOOHEY, of Sydney, in the Colony of New South Wales, brewers, have by their Petition humbly represented to me that they are the authors or designers of a certain invention or improvement in manufactures, that is to say, of an invention of "Improvements in the manufacture of Beer and Yeast by means of a cooling system," which is more particularly described in the specification and sheet of drawings which are hereunto annexed ; and that they, the said Petitioners, have deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four ; and have humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to them for a period of fourteen years : And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said John Thomas Toohey and James Toohey, their executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof ; to have, hold, and exercise unto the said John Thomas Toohey and James Toohey, their executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended : Provided always, that if the said John Thomas Toohey and James Toohey shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this twenty-ninth day of October, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in the manufacture of Beer and Yeast.

SPECIFICATION.

Improvements in the manufacture of Beer and Yeast by means of a cooling system.

THE cooling agent employed is water of a natural freshness, or water cooled in an ice-making machine, or water cooled by means of ice. Water reservoirs situated above the fermenting cellars feed the main-pipe A, from which a branch pipe goes to every cask. The flow to quantity of water is regulated by the tap B, passes the beer cooler C, figure 1 or 2, which are placed into the cask, enters underneath the metal bottom D of the yeast trough or yeast canal to finish the cooling operation, and runs by gravity to the waste-water reservoir in order to be cooled again or used for other purposes. The washing of the casks, the troughs, the coolers C, or the yeast-pipes with the coolers C, for the union cellar arrangement, requires a coupling off from the main pipe, on that account the branch joints are made of india-rubber hose. For the yeast troughs or canals is a zigzag road for the cooling water provided by fitting small lathes E into them, on which the metal bottom D rests. The whole arrangement is easily put into use in any kind of breweries system at present in existence.

Claims for novelty:—Improvements in the manufacture of beer and yeast by means of a cooling system as above described and shown by drawings annexed.

JOHN T. TOOHEY.
JAMES TOOHEY.

This is the specification referred to in the annexed Letters of Registration granted to John Thomas Toohey and James Toohey, this twenty-ninth day of October, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 24 September, 1881.

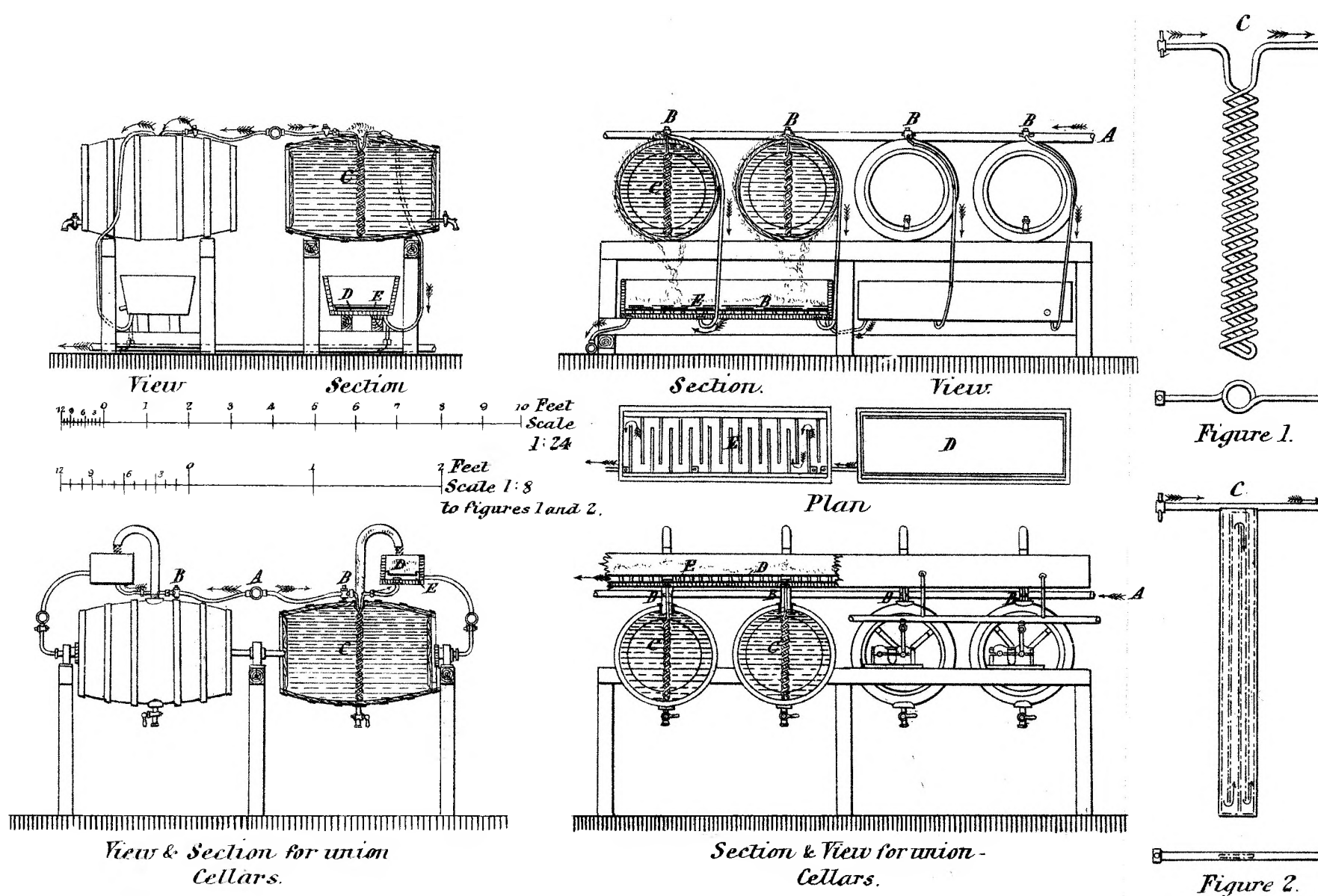
The application of Messrs. John Thomas and James Toohey for Letters of Registration for an invention of improvements in the manufacture of beer and yeast by means of a cooling system having been referred to us, we have examined the plans and specification accompanying the application, and have now the honor to report that we see no objection to the issue of Letters of Registration as applied for.

We have, &c.,
ARCH. C. FRASER.
THOS. RICHARDS.

he Under Secretary of Justice.

[Drawings—one sheet.]

IMPROVEMENT IN THE MANUFACTURE OF BEER AND YEAST BY
MEANS OF A COOLING SYSTEM



This is the Sheet of Drawings referred to in the annexed Letters of Registration granted to John Thomas Toohey, and James Toohey, this twenty ninth day of October, A.D. 1881.

Augustus Loftus.

*John T. Toohey
James Toohey.*



A.D. 1881, 29th October. No. 1009.

A MACHINE FOR POLISHING OR BURNISHING THE EDGES OF THE SOLES OF BOOTS AND SHOES.

LETTERS OF REGISTRATION to George Harrison, for a Machine for polishing or burnishing the edges of the soles of Boots and Shoes.

[Registered on the 29th day of October, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS GEORGE HARRISON, of London, at present residing at Sydney, in the Colony of New South Wales, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention of "A Machine for polishing or burnishing the edges of the soles of Boots and Shoes," which is more particularly described in the specification and sheet of drawings which are hereunto annexed ; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four ; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years : And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said George Harrison, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof ; to have, hold, and exercise unto the said George Harrison, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended : Provided always, that if the said George Harrison shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this twenty-ninth day of October, in the year of our Lord one thousand eight hundred and eighty-one

[L.S.]

AUGUSTUS LOFTUS.

A Machine for polishing or burnishing the edges of the soles of Boots and Shoes.

SPECIFICATION.

TO ALL TO WHOM THESE PRESENTS SHALL COME: I, GEORGE HARRISON, of London, now temporarily residing in New South Wales, send greeting:

WHEREAS I am the inventor of a machine for polishing or burnishing the edges of the soles of boots and shoes, and am desirous of obtaining Letters Patent for the same, I now declare the nature of my invention and the way in which its operations are performed.

Reference being made to the accompanying drawing and the figures and letters thereon, figure 1 is a general view of the machine, inside elevation; figure 2 is a partial section of figure 1 to a larger scale; figure 3 is a ground plan with some details removed to prevent confusion; figure 4 is a detail of the lever shown in figure 2; figures 5 and 6 are two views of the burnisher carrier drawn to working size; figure 7 is a section through A B on figures 5 and 6.

A is a column of cast-iron forming the framing or stand for the whole machine, and having a foot by which it may be secured to the floor of the workroom; B is a shaft running in bearings; C' C'' are the bearings to shaft B; D' D'' are fast and loose pulleys for the driving-belt of the machine; E is a belt pulley on shaft B; F is a smaller pulley receiving motion by a belt from pulley E; G is a crank-shaft driven at a high speed by the pulley F; H' H'' are the bearings in which shaft G revolves; I is a disc and crank-pin on shaft G; J is a lever working from a centre with a horizontal vibratory or oscillating motion; K is the centre from which the lever J vibrates or oscillates; L is a cap securing the lever in its place from rising, but allowing a horizontal motion; M is an accurately bored boss or cylinder on lever J, having a portion of one side removed; N is a brass bush working in cylinder M, and having an eye bored to fit the crank-pin I, which works through the opening where a portion of M is removed; O is a bracket or projection on J to receive a tool-carrier; P is a carrier for holding the burnishing tool in bracket O on lever J, and being capable of a slight vertical motion; Q is the burnishing tool having a rapid vibratory motion when the machine is at work; R is a projection to support and steady the work to be burnished; S is a gas-burner to keep tool Q heated; T is a flexible pipe supplying gas to burner S.

a is a centre-pin on which carrier works in bracket O; b is a pin on which carrier P rests; c is a spring to keep P down on pin b; d is a cylindrical projection or continuation of carrier P; e is a turned pin accurately fitting d and the back part of P; f is a spring to press e outwards; g is a boss or collar capable of revolving on d, and having two slots to take a clutch; h is a collar or nut fast on d to keep g in its place; i' i'' are pins on g to carry the burnishing tools Q; k' k'' are springs to catch in recesses in Q and keep them in their places; l is a clutch fast on pin e, and having projections to engage in the slots in g when kept out by spring f; m is a pin securing clutch l fast on pin e; n is a projection on which spring c bears to keep tool Q down on its work.

When the machine is to be set to work, tools Q' Q'', of such shapes as are required for the soles and heels of the boots to be burnished or other work to be performed, are slipped on the pins i' i''. Power is applied by means of a belt to pulley D, and thence by another belt to pulley F, and the crank-shaft G is set in motion several hundred times in a minute. By the revolution of the crank-shaft G the crank-pin I communicates motion to the cylindrical bush N, and the rotatory motion of the crank-pin is converted into a vertical reciprocating motion of the bush N in the cylinder M on lever J, and also into a horizontal motion of the cylinder itself, which, being a part of the lever J, causes such lever to vibrate from the centre K through a distance due to the eccentricity or throw of the crank-pin I.

This motion of the lever J causes the attached tools Q' Q'' to rub, with a short and rapid motion, any work which may be brought into contact with them by the operator's hand, and as they are kept hot by a jet of lit gas from burner S, the leather operated upon is caused to acquire a polish or burnish.

When the work is completed to which one tool Q is applicable, the knob on the end of pin e is pressed, the spring f is compressed, the clutch l is released from g, and then the collar g with the pins i' i'' and tools Q can be turned round and the clutch allowed to secure it fast, when the other tool Q can be brought to bear on the work.

Having now described my machine, I do not claim as original all the mechanical arrangements contained in it, neither do I confine myself to the exact arrangement and construction of parts as set forth, but what I do claim as novel and original is,—

First—The general arrangement of the machine to give to a burnishing tool a vibratory motion in the arc of a circle from the revolution of a driving shaft.

Secondly—The construction of the tool-carrier with a vertical motion, and a spring to keep it down upon its work, substantially as shown.

Thirdly—The construction of the tool-holder and clutch to enable a change to be rapidly made from one tool to another, substantially as shown on drawing.

G. HARRISON.

This is the specification referred to in the annexed Letters of Registration granted to George Harrison, this twenty-ninth day of October, A.D. 1881.

AUGUSTUS LOFTUS.

REPORTS.

A Machine for polishing or burnishing the edges of the soles of Boots and Shoes.

REPORTS.

Sir,

Sydney, 26 August, 1881.

We have the honor to return herewith the papers in the matter of the Petition of George Harrison for a Patent for an invention for burnishing the edges of soles of boots and shoes, and to request that you will be good enough to cause all the letters referred to in the specification to be inserted in the plan, as many of them have been omitted.

We have, &c.,

A. C. FRASER.
THOS. RICHARDS.

The Under Secretary of Justice.

Sir,

Sydney, 26 September, 1881.

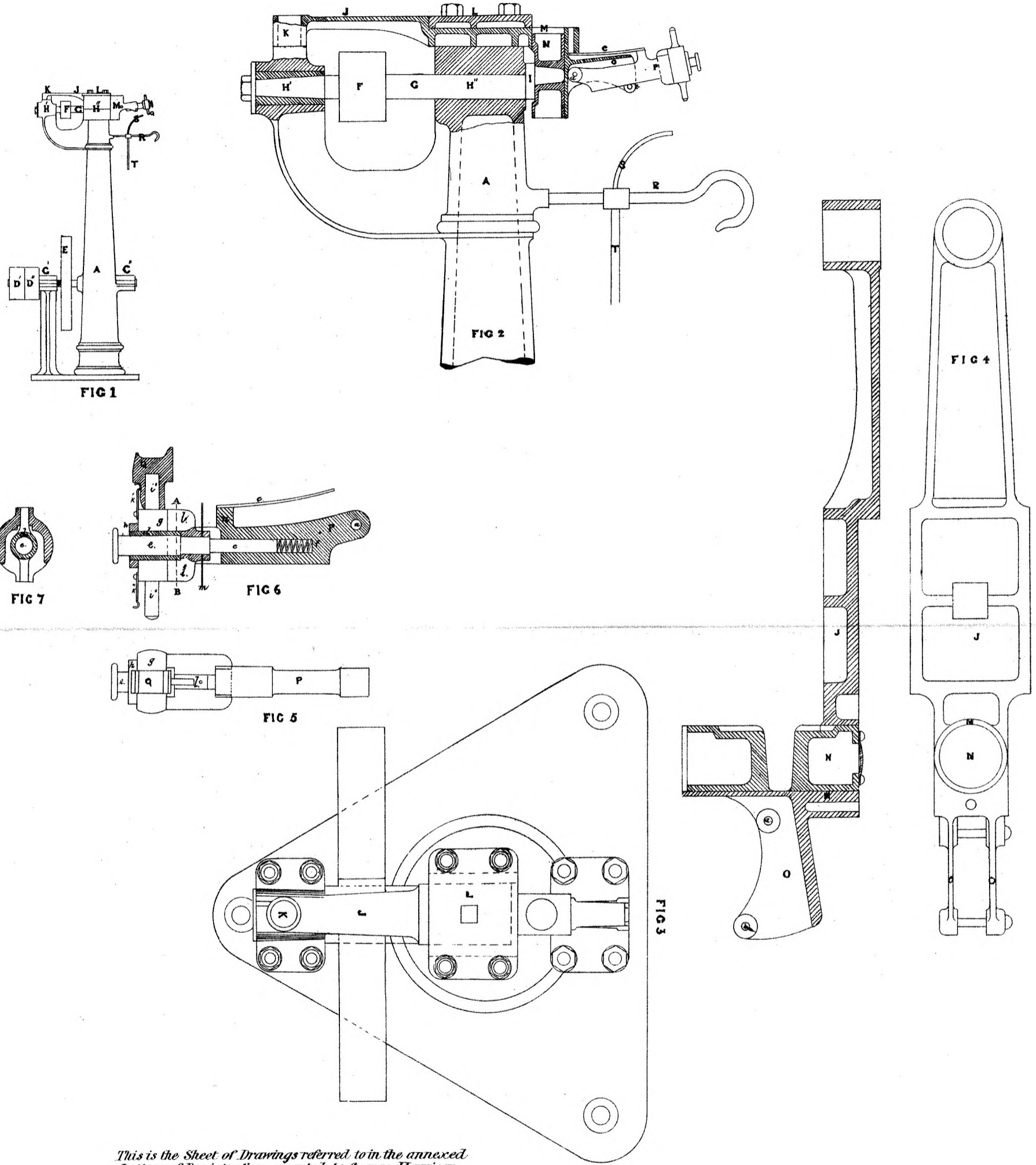
The application of Mr. George Harrison for Letters of Registration for an invention for burnishing the edges of soles of boots and shoes having been referred to us, we have examined the plans and specification accompanying the same, and have now the honor to state that we see no objection to Letters of Registration being granted as applied for.

We have, &c.,

A. C. FRASER.
THOS. RICHARDS.

The Under Secretary of Justice.

[Drawings—one sheet.]



This is the Sheet of Drawings referred to in the annexed
 Letters of Registration granted to George Harrison
 this twenty fifth day of October, A.D. 1881.
 Augustus Loftus.

Fig. 34.

PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE,
 SYDNEY, NEW SOUTH WALES.

*George Harrison
 per Norman Selfe*



A.D. 1881, 5th November. No. 1010.

IMPROVEMENTS IN HARVESTING AND SHEAF-BINDING MACHINERY OR APPARATUS.

LETTERS OF REGISTRATION to James Hornsby, John Innocent, and George Thomas Rutter, for Improvements in Harvesting and Sheaf-binding Machinery or Apparatus.

[Registered on the 5th day of November, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS JAMES HORNSBY, JOHN INNOCENT, and GEORGE THOMAS RUTTER, all of Grantham, in the Kingdom of England, have by their Petition humbly represented to me that they are the authors or designers of a certain invention or improvement in manufactures, that is to say, of an invention entitled, "Improvements in Harvesting and Sheaf-binding Machinery or Apparatus," which is more particularly described in the specification, marked A, and the two sheets of drawings, marked B and C respectively, which are hereunto annexed; and that they, the said Petitioners, have deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and have humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to them for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said James Hornsby, John Innocent, and George Thomas Rutter, their executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said James Hornsby, John Innocent, and George Thomas Rutter, their executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said James Hornsby, John Innocent, and George Thomas Rutter shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this fifth day of November, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Harvesting and Sheaf-binding Machinery.

A.

SPECIFICATION of JAMES HORNSBY, JOHN INNOCENT, and GEORGE THOMAS RUTTER, all of Grantham, in the county of Lincoln, in the Kingdom of England, for "Improvements in Harvesting and Sheaf-binding Machinery or Apparatus."

OUR said invention, relating to improvements in harvesting machinery, has reference chiefly to apparatus combined or connected therewith for the purposes of compacting and binding the cut and delivered crop into sheaves of uniform bulk and compactness. Our invention is adapted more particularly to that class of reaping machinery in which the corn or other similar crop is delivered on to a travelling endless band or apron, and is thence elevated or conducted to the binding apparatus, but our improvements are also partly applicable to harvesting or reaping machines of other descriptions.

One part of our said invention relates to improved apparatus for raising and lowering reaping or harvesting machines, in order to adapt or adjust its relative elevation to the corn or crop to be cut. For this purpose we fix upon the main framing of the machine quadrant-shaped or curved brackets having internal teeth, with which engage spur pinions, actuated by chain wheels, driven by a handle and worm gearing.

According to the second part of our said invention, which has reference to that class of sheaf-binding apparatus in which the packing spindle and discs with their claws are arranged to continuously revolve, we provide fixed cam paths or guiding surfaces controlled by slides or switches arranged in such a manner that the packing claws are caused to act intermittently upon the crop to be packed or formed into sheaves.

The packing and binding apparatus is automatic in its action, and so constructed and arranged that all the sheaves are of about the same size and compactness. For this purpose the crop is packed against a compressing lever, which when formed into a sheaf of sufficient and definite quantity thrusts the said lever back, and causes the packing apparatus to be thrown out of gear and the binding apparatus to be brought into operation, which is continuously repeated at definite intervals throughout the working of the machine. The sheaf having attained the requisite volume, compression is effected between the binder arm and a lever by a roller or tappet mounted on the intermittently revolving binding spindle travelling over the face of a thrust lever, which by its subsequent continued rotary course engages with the heel of a horizontal lever attached to the compressing lever, and thus raising the latter clear of the sheaf when ready to be ejected.

The knotting apparatus which we prefer to employ in connection with our binding apparatus is similar to that described in the specification to Letters Patent granted to Charles Denton Abel, dated twenty-first of June, one thousand eight hundred and eighty, No. 2,517, which we arrange so as to be operated by a cam-wheel intermittent and differential gearing, in order to effect the required and necessary rotary and longitudinal movements for the knotting, retaining, and cutting apparatus.

After a sheaf has been securely bound and the string or cord severed, it is immediately ejected by a lever, operated by a crank attached to a spindle passing through a sleeve or tubular shaft carrying the binder arm, and the path of the said ejector being suitably controlled by a radius rod, and its motion being imparted by a chain-wheel separate and independent of that of the binding arm.

The third part of our said invention relates to peculiar arrangements of apparatus for effectually clearing or raising the outer end of the finger-bar in mowing machines, by the intervention of a rocking lever, connected at one end to the main raising lever, and at the other end to the tilting lever, acting upon the slade carrying the finger-bar. According to a modified arrangement, a projection formed on the lower end of the main raising lever is caused to operate directly upon the tilting lever hinged to the slade.

And in order that our said invention may be fully understood, we shall now proceed more particularly to describe the same, and for that purpose shall refer to the several figures on the annexed sheets of drawings, the same letters of reference indicating corresponding parts in all the figures.

Figure 1 (sheet 1) of the accompanying drawings represents a back view of a complete harvesting machine, with our improvements applied thereto.

Figure 2 is a plan, and figure 3 an end view of the packing and binding apparatus, constructed, arranged, and operating according to our said invention.

Figures 4 and 5 represent detail views of the mechanism for raising and lowering the machine according to the height of the crop to be cut.

Figure 6 shows a part longitudinal section of the packing and binding apparatus to a larger scale, while figure 6A shows a detail of the thrust lever and shipping clutch.

Figure 7 represents a transverse section of the packing and binding apparatus taken on line X X of the preceding figure.

Figure 8 (sheet 2) shows a view of the inner side of a packer disc for carrying the packing claws, which claws are shown in detail at figure 8A.

Figures 9, 10, 10A, 11, and 12 represent detail views respectively of the stationary plates for carrying the cam paths or guiding surfaces, with the slides or switches controlling them, for causing the packing claws to act intermittently on the crop, as will hereinafter be referred to.

Figures 13, 14, 14A, and 15 illustrate detail views of the binding string, knotting, retaining, and cutting apparatus, with train of gearing and necessary parts for actuating the same, as hereinafter described.

Figures 16 and 17 represent a front elevation and end view respectively of the sheaf ejector, operated through the tubular shaft carrying the binder-arm, according to our invention.

Figures 18, 19, and 19A show a plan, transverse sectional elevation and detail view respectively, of a mowing machine, with our improved apparatus for raising or clearing the outer end of the finger-bar applied thereto; while figure 20 shows a transverse sectional elevation of a similar machine with a modified arrangement for raising or lifting the outer end of the finger-bar; and figures 21 and 22 illustrate respectively a side and front elevation of a knife-finger, attached or secured to the bar according to our improvements.

A

Improvements in Harvesting and Sheaf-binding Machinery.

A is the main road or travelling wheel fixed to the tubular boss a , which serves as the prime mover to the whole machine, and having fixed or formed on its face a spur-wheel, a^1 , into which gears a pinion, b , with an ordinary suitable train of intermediate gearing for imparting motion to the various elements of the machine through the intervention of conveniently arranged endless bands, chains, or equivalent devices. When the harvesting, reaping, or other similar machine is required to travel without imparting motion to the machine, the spur pinion b may be thrown out of gear with the spur-driving wheel a^1 by means of the lever b^1 actuating a driving-clutch or similar appliance in any known manner.

Through the centre of the main wheel tubular boss a passes a horizontal spindle, a^2 , which serves as the main axle and axis of rotation, and about which it revolves while travelling, the said spindle being therefore capable of receiving and transmitting independent motion. At the ends of this horizontal spindle or axle are fixed spur pinions, a^3 a^4 , gearing into internal teeth provided within segmental or curved-shaped brackets, B B¹, fixed to suitable transverse framing carried by the machine, as shown in figures 1, 4, and 5 of the accompanying drawings. A bearing, B², is fixed on the frame at a point corresponding with the centre of the prime motion pinion, which carries a worm wheel, b^2 , with a chain wheel, b^3 , formed or keyed to its face, and fixed in the same plane to another similar chain wheel, b^4 , secured on the horizontal spindle or axle a^2 , which receive corresponding motion by means of an endless pitch chain passing over them.

On one end of a spindle, C, is fixed a worm, C¹, which imparts motion by means of the crank handle c to the worm wheel b^2 , carrying the chain wheel previously mentioned.

Now, by turning the handle c in either direction, corresponding fractional or integral motion is imparted to the worm wheel b^2 and its chain wheel b^3 , which communicates its motion by means of the endless chain to the wheel b^4 , fixed on the main horizontal axle or spindle a^2 , thus causing similar reciprocating circular motion to be transmitted to the pinions a^3 a^4 fixed at its ends, which travelling in the internal teeth of the fixed curved brackets B B¹ cause the frame of the entire machine to be bodily raised or lowered according to the exigencies of the road and the height of the crop to be cut.

It is obvious that the curvature of the brackets and the pitch of the internal teeth must be determined and vary according to the distance at which the worm wheel or prime mover is placed, the centre of which always remains the radius of curvature.

The small pin c^1 inserted in the spindle c , and connected by means of a chain to the framing, is simply provided to prevent the handle and spindle turning while travelling, but any other suitable known means might be conveniently adopted if required.

The whole of the packing and binding apparatus is suitably arranged within a separate framing, D, mounted at the side (or in similar convenient position) of a harvesting or reaping machine, as represented at figure 1 of the accompanying drawings; but it is obvious that the said apparatus might be advantageously adapted to other similar classes or types of machines which cut and collect crops with the ultimate view of binding the same. The said separate or independent framing D forming a trough-shaped receptacle or enclosure, is mounted on rollers d , in horizontal guides d^1 , provided at the upper part of the framing, as shown, so that the entire framing and apparatus is capable of lateral adjustment, in order that the binding cord or string may always be passed round the sheaf at the proper definite position, independent of the varying nature, growth, or development of the crops to be bound.

This lateral or endwise motion is imparted by means of the handle a^2 , arranged within convenient reach of the operator, and actuating suitable chain wheels or other equivalent gearing in the well-known manner. The packing and binding apparatus is automatic in its action and functions, and so constructed and arranged that all the sheaves bound are of similar size and compactness, by the means and in the manner hereinafter described.

E is the main or principal shaft or spindle for driving the packing and binding apparatus at the required intervals, and which receives continuous rotary motion during these intermittent operations from the reaper or any suitably arranged prime mover. In a continuation of about the same horizontal plane is mounted another independent spindle or shaft, F, which actuates the binding, knotting, cutting, and ejecting apparatus at the required intervals by suitable gearing, and is necessarily intermittent in its action.

A third spindle or shaft, G, carrying the packing apparatus, is mounted in a parallel plane to the former mentioned spindles, or in other suitable relative position, and kept in communication or gear with the main spindle E by means of spur wheels e e^1 , so that the packing spindle G and its apparatus connected therewith receive corresponding continuous rotary motion during the operation of the machine.

This short packing spindle G passes through fixed segmental or curved brackets or plates, G¹ G², provided with cam-paths or guiding surfaces, g^1 g^2 , and having secured thereon packer discs, H H¹, carrying the packing claws h , which are maintained continuously revolving by the main spindle E during the action of the machine, but the latter rendered only intermittently operative by virtue of the controlling action of the cam-paths, as will presently be more fully described.

An ordinary driving clutch, e^2 , or equivalent device, is provided on the main spindle E, formed on the face of the spur wheel e keyed thereon, and a corresponding clutch, f^2 , carried on the inner end of the intermittent binding spindle F, which is thrown alternately into and out of gear with the clutch formed on the continuously running main spindle by a strong helical spring, f^1 , and a shipping lever, M, respectively, which intermittent driving action is suitably controlled by the requisite volume of the sheaf packed or accumulated ready for binding.

The first operation of packing or binding the grain or crop into sheaves is effected by two or more sets of rotating claws, h , carried round by the continuously revolving discs H, as already described, each of these claws being suitably pivoted to the same at h^1 , and consequently free to oscillate or vibrate for a certain distance, so as to sufficiently project beyond the periphery of the disc for the requirements of packing, or to conversely fall back within the course of the said discs when it is desired to cause them to run idle or maintain them inoperative during the process of binding. These oscillating packing claws h are provided with tail-pieces and projections, h^2 , which control their movements by engaging with the concentric cam-paths or guiding surfaces g^1 g^2 , formed on the fixed brackets or plates G¹ G² already mentioned,

Improvements in Harvesting and Sheaf-binding Machinery.

mentioned, so that while the packing discs and claws rotate continuously, the latter are only caused to intermittently project beyond the circumference of the same when it is desired to carry down the cut crop, and collect and compress it against a lever, I, to form a sheaf ready for binding.

The entrance to the inner concentric path or guiding surfaces g^1 , formed by suitably projecting curved ribs upon the stationary plates, are controlled by reciprocating slides or switches, g^3 , working in guides, g^4 , formed in the body of the plates, and which receive motion from a bell-cranked or bent lever or levers, g^5 , pivoted on the pin g^{10} , and connected with a roller or rollers, g^6 , actuated by a recess, f^3 , formed in the collar of the clutch f^2 , carried on the binding spindle F.

When the sheaf is being packed the entrance to the inner cam-paths g^1 are closed by the semicircular projections g^7 formed on the side of the slides, as shown in plan at figure 10A, thereby obstructing or covering the same, as indicated in figures 7 and 10 of the accompanying drawings, thus causing the tails and projections h^2 of the packing claws, which are continuously revolving at a fixed radius to come in contact with the said curved projections on the slides, and so interrupt and divert their course to the outer paths g^2 , which forces the claws h forward beyond the edge of the discs, so as to operate upon the crop to be packed during their passage along the guiding surfaces, when they are subsequently released, in order not to carry the crop beyond a certain distance.

This operation continues until sufficient to form a sheaf has been packed, when the slides g^3 , with their projections g^7 , are caused to uncover or open the inner guiding paths g^1 , and thus allow the projections h^2 formed on the tails of the packing claws to enter the same by the inward tilting action imparted to them by the blade spring g^8 fixed to the cam-plates, whereby the packing claws are caused to revolve inoperatively within the periphery of the discs, so that they have no further action upon the crop. This inoperative or idle running of the packing claws (by their tails being guided through the inner cam-paths) is continued while the sheaf is being bound, tied, cut, and ejected, which is effected during one complete revolution of the binding spindle F, when the roller g^6 , carried by the bell-crank lever g^5 actuating the slides, again falls or is pressed into the recess f^3 by the helical spring J, thereby causing the inner paths g^1 to be again closed by the projections g^7 formed on the slides, thus obliging the diverted tails of the packing claws to again traverse the outer paths g^2 , and force out the claws in opposition to the action of the springs g^8 , when they immediately commence to pack another sheaf.

When the packing claws are caused to revolve in their forward or operative attitude the ends of their projections h^2 rest on the outer cam-path, while the recesses h^3 formed on the inner surfaces of the packing discs H form an extreme end stop to prevent the claw going further forward until clear of the action of the cams or guiding surfaces, as represented at figure 8 of the accompanying drawings. As shown at figure 8A, h^2 is T-ended, one side of which forms a stop at either extremities; the other side trails in the said cam-paths.

The claws in their continued rotary course away from their work are afterwards caused to fall by their own weight within the periphery of the discs, and temporarily recline in the recesses h^4 until brought so far forward to be again required for work; or when the tails of the claws are allowed to traverse the inner cam-paths they remain reclining in the latter position by virtue of the springs g^8 and guiding projections, as indicated by the dotted positions at figures 8 and 10 of the drawings.

At figure 12 is illustrated a modification of the preceding arrangement for operating equivalent mechanism for controlling the passage of the tails of the packers to the inner or outer cam-paths, according to the intermittent operations required at proper and definite intervals.

According to this arrangement, we provide a short oscillating lever, g^3 , having a suitably curved head, for controlling the entrance to the inner guiding surface or cam-paths g^1 , in lieu of the reciprocating rectilinear slides or switches previously described with reference to the first arrangement. The said controlling lever G^3 receives its motion from a similar bell-crank lever, g^5 , actuated by the recess f^3 formed in the collar of the driving clutch, and attached to the former by means of the connecting rod g^9 . When the curved head of the lever closes the inner guiding paths g^1 it rests in an oblique plane against the face of the inner concentric ribs, which are prolonged for the purpose, as represented in figure 12 of the drawings, whereby the thrusting action of the packing claws upon the connecting rods and bell-crank levers g^5 is avoided. As under this arrangement the passage of the packing claws always tend by their own advancing action to keep the cam-paths closed, the use of the spring J is minimized, and may be conveniently placed in a horizontal plane between a projection or prolongation formed on the bell-crank lever and the framing, as shown in the drawing.

The lever or arm against which the crop is accumulated and packed for forming a sheaf, in the manner hereinbefore described, also serves at the proper time to compress the same against the raised binder arm, so that it may be tied and bound fairly tight and uniformly compact, at the same time temporarily removing any tensile strain upon the string or cord during the process of knotting.

For this purpose the lever I is hinged or pivoted at its upper extremity to another horizontal arm or lever, K, capable of oscillating about the centre k , provided in a bracket K^1 , fixed on the framing D above the binding spindle F, and in the same vertical plane as the tappet or roller f^5 fixed thereon. The lever I passes downwards through the rectangular or trough-shaped sleeve I', open in front to allow the former to project forward, and hinged at its top, i , to the longitudinal framing of the machine, so as to be capable of vibrating in a vertical plane to and from the binder spindle, as represented at figure 7 of the accompanying drawings. The bottom end of this sleeve I is attached to a pull or connecting rod I², arranged in nearly a horizontal position, and secured at its other extremity to the bottom of a thrust lever, L, hanging in nearly a vertical position from the horizontal fulcrum pin k , carried by the bracket K^1 .

The thrust lever L is provided with a curved projection, l , formed on its side near its fulcrum, and suitably arranged as to be capable of engaging with a corresponding stud or projection, m , formed on a shipping clutch or lever, M, pivoted on the same fulcrum pin k , but capable of independent motion, as represented in detail at figure 6A of the drawings. So that, as the crop is packed against the lever I the increasing volume gradually forces it backwards, thereby pulling the thrust lever L forwards until a definite accumulation to form a sheaf causes its projection l to engage with that of m , formed on the shipping clutch M, raising the same clear of the face of the collar f^4 formed on the clutch f^2 carried by the

Improvements in Harvesting and Sheaf-binding Machinery.

the binding spindle, whereby the latter is thrown into gear by the spring f^1 with the continuously revolving spindle E, which upon receiving corresponding motion causes the packing apparatus to be thrown out of operation by the roller g^6 leaving the recess f^3 in the said collar.

The shipping clutch or lever M may be of any known or desired construction, although shown in the drawings provided with a friction roller and a separate limb kept out by a helical spring to the extent required, so as always to maintain it in contact with the face of the driving clutch. On the inner face of the said collar f^4 of the driving clutch is formed a cam projection, f^6 , extending for about a quarter of its circumference and of gradually tapering section, so that immediately the shipping lever is raised clear of the driving clutch, the cam collar carried on the binding spindle commences to revolve with the same for the purpose of binding; meanwhile the helical spring N continually tends to force down the shipping lever towards the spindle, and thus the thin end of the tapering cam projection f^6 on the collar inserts itself against the head of the said lever, so that by the time the binding spindle has completed one revolution the cam by its advancing action has again thrown it out of gear, when the roller g^6 is again forced into the recess f^3 and the packing operation is recommenced, as before described.

For the purpose of operating the lever I for compressing the sheaf, as hereinbefore mentioned, we mount a roller or tappet, f^5 , upon the boss of the driving clutch carried on the binding spindle F, which consequently receives corresponding intermittent rotary motion. Therefore, immediately the binding spindle has motion imparted to it (after sufficient grain or crop has been packed) for the purpose of actuating the binding mechanism, the roller or tappet f^5 , in making its one complete revolution with the said spindle, is first caused to travel over the face of the thrust lever L, thereby forcing it backwards and pulling the sleeve I and the lever I forwards, whereby the sheaf is compressed between the latter and the binding arm now raised. By its continued progressive rotary course it engages with the heel of the horizontal lever K above the binder spindle attached to the top of the lever I, thus bodily raising the latter within the sleeve I clear of the sheaf now bound and tied ready to be ejected, all of which normal and moved positions are indicated in figure 7 of the accompanying drawings.

The binder arm R of any known or desired construction is carried on a sleeve or tubular shaft, r , mounted in suitable bearings, r^1 r^2 , conveniently provided beneath the table D¹, on which the sheaf is packed and bound, and receives intermittent reciprocating rotary motion by means of the intermittent toothed-wheel s^1 , fixed on the binder spindle F, gearing into a spur wheel, s^2 , actuating a crank, s^1 , and connecting rod, s^3 , attached to the crank arm s^4 , fixed to the tubular shaft or sleeve r of the binder arm; the arrangement of suitable intermittent gearing being so timed as to effect the required operations with proper durations, so that the binder arm R is brought up to encircle the sheaf at the necessary intervals, and maintained in that position until the sheaf is bound and the string severed, when it is caused to return to its normal position beneath the binding table or platform, as shown at figures 13, 16, and 17 of the accompanying drawings.

The intermittent wheel s gearing with the lock-spur wheel s^1 , having teeth formed only on a portion of its circumference, consequently during its one revolution with the binding spindle first raises the binder arm by means of the cranks and connections, and then locks it in this position for a certain portion of its course, when it afterwards again releases it and returns it to its normal position.

The knotting apparatus which we prefer to employ in connection with our binding apparatus is similar in construction and operation to that described in the specification to Letters Patent granted to Charles Denton Abel, dated the twenty-first day of June, one thousand eight hundred and eighty, No. 2,517, and consists of a rotating hook-eye T¹, into which the cord is laid, after which a knotter tube, t , is brought forward, which locks or secures the cord within the said hook. When the knotter has made one revolution it has passed the cord completely round the knotter tube t ; an internal hook, t^1 , is then projected from within the tube, and as the knotter continues to revolve the cord is laid under the said hook t^1 , when the string is cut and the ends drawn within the knotter tube. The knotter tube is also drawn within the main tube of the apparatus T, on the outer end of which is formed the hook-eye T¹, thus slipping, tightening, and completing the knot, all substantially as described in the specification to the said former Letters Patent. According to our invention, we arrange the knotting apparatus of the kind above referred to so as to operate it in the following manner, which will be readily understood by reference to figures 13, 14, and 15 of the accompanying drawings:—

The knotting apparatus is fixed to the framing D in a horizontal position above the sheaf, and is actuated by intermittent and differential gearing fixed on the binder and counter spindles, the teeth upon the said gearing being so arranged as to cause the knotting apparatus to receive rotary and longitudinal movements at the requisite times.

For this purpose a cam-wheel, P, is fixed on the intermittently operating binding spindle F, and provided with a suitable number of teeth, p , to impart just one revolution at the proper time to a spur pinion, p^1 , mounted on a spindle, p^2 , operating a crank, p^3 , connected to the cutting and retaining apparatus Q of known construction, so as to turn the same bodily towards the knotting apparatus, in order to provide sufficient slack of the string or cord during the process of knotting.

Fixed to the face of the spur pinion p^1 , or secured to the same spindle p^2 , is another spur wheel, p^4 , of larger dimensions, gearing into another pinion, t^2 , just half its size, and which is suitably secured to the rotating portion of the knotting apparatus T, so that as the pinion p^1 becomes intermittently driven at the proper intervals by the teeth p formed on the cam-wheel P (which rotates with the binding spindle), it performs one revolution to partially turn the cutting and retaining apparatus for the purpose before mentioned, while the larger pinion p^4 causes the pinion t^2 to revolve with the knotting apparatus twice, in order to effect the requisite turns or convolutions of the string on the knotting tube t .

On the end and inner face of the cam-wheel P are fixed three cam projections, P¹ P² P³, for operating the lever q^1 , and a recess, P⁴, provided in the circumference of the said wheel P, for actuating the lever q , the said levers carrying frictional rollers, and so fixed on sleeves, q^2 and q^3 , and loose on a rocking spindle, q^4 , respectively, as to be capable of imparting independent longitudinal or endwise motion to the spring spindles t^3 and q^1 of the knotting, cutting, and retaining apparatus respectively, through the intervention of corresponding levers or projections, q^2 q^3 , suitably located on the sleeves of the rocking spindle q^4 , for the purposes of projecting the internal hook t^1 and closing the knife and retainer.

The

Improvements in Harvesting and Sheaf-binding Machinery.

The lever q , with its roller for closing the cutting and retaining apparatus by the lever q^c , are fixed to and rock with the spindle q^d , as shown at figure 14A of the drawings, the other levers for protruding the internal knotting hook t^1 being free to oscillate thereon as an axis of motion.

The pressure of the levers being removed, the hook is withdrawn within the tube, and the knife and retainer opened by means of helical springs exerting their force at the proper relative periods in the known manner.

The normal position of the knotting tube and hook are within the body or framing of the apparatus, and that of the knife and retainer closed, or in its forward attitude, so that as the binder arm recedes it carries back the string over the bridge of the retainer, leaving it across the binding table or platform D^1 , so that the loose crop is packed or collected over it, and when the binder arm is again raised or brought forward the sheaf lies formed in the loop or bite of the spring; the string always resting over the cutting and retaining apparatus, immediately it opens the former falls into position to be cut and retained.

Now, assuming the binding spindle F to be revolving for the purposes of actuating the various elements of the packing and binding apparatus, the projection P^1 on the cam-wheel P at the proper interval comes in contact with lever q^1 , thereby forcing out the knotting tube t , so as to lock the cord or string within the hook-eye T^1 formed on the face of the apparatus. This being accomplished, the knotting apparatus T makes a little over one complete revolution through the intervention of the spur-wheel t^2 coming into gear with the intermittent teeth p , provided on the cam-wheel, when the second cam projection p^2 of greater elevation than the first is brought into action, whereby the pressing action upon the lever q^1 is continued and increased, so as to overcome the power of the helical spring and force out the internal hook t^2 to engage with the crossed ends of the string. No sooner is this effected than the lever q^1 becomes released from P^2 , and the spring draws in the knotted strands within the tube t ; at the same time the second lever q falls into the recess P^1 provided on the face of the cam-wheel P , whereby the knife and retainer is suddenly opened, into which the string beyond the knot falls, and is almost immediately closed by the continued rotary course of the cam-wheel, whereby the binding string is cut and the free end retained. The third projection P^3 of the greatest height now comes in contact with the temporarily released lever q^1 , and forces the tube t^1 and hook t^2 out, so as to expel the knotted ends, when the sheaf is ready to be ejected.

After the sheaf is bound in the manner hereinbefore described it is ejected by a lever, U , carried by a crank arm, u , attached to a spindle, u^1 , which passes through the sleeve or tubular shaft r , carrying the binder arm R , as represented at figures 16 and 17 of the drawings. This ejecting lever is pivoted at about the centre of its length to the aforesaid crank arm, the lower end of the former being likewise pivoted to a radius rod, u^2 , the opposite end of which is attached to a pin fixed to the binder frame, so that the lower end of the ejector lever can only move or work up and down about such radius, while by the rotation of the crank u the top end of the ejector is caused to travel in an elliptical path.

The whole apparatus is actuated and controlled by an intermittent internal toothed wheel, U^1 , fixed on the binder spindle F , which drives an intermittent or delay pinion, U^2 , and chain-wheel, U^3 , made fast to its face, and a pitch-chain by preference being used to transmit the motion from the intermittent or delay pinion U^2 to a chain-wheel, U^4 , fixed on the spindle u^1 , on which is the crank u that carries and works the ejector U , as shown in end view at figure 3 of the drawings.

Now, as soon as the sheaf is bound and the severed knot clear of the tube, the crank u , carrying the ejector U , commences to rotate, carrying the point of the said ejector behind the sheaf, and by its gradual forward motion pushes it off the binding table, when it falls totally disconnected to the ground, ready for shocking or removal at pleasure.

Then the crank with the ejector continues its forward movement, until it gradually recedes beneath the binding table, and remains in that position until it is required to eject another sheaf.

The combined successive actions or operations of the general arrangement of sheaf-packing and binding machine or apparatus are as follows:—

The cut crop may be delivered upon the binding table or platform D^1 in any convenient known manner, although for illustration we shall describe it with reference to figure 1 of the drawings as elevated thereto by endless aprons or bands worked in connection with a harvester or reaping machine.

The crop is cut by the ordinary arrangement of reciprocating or vibrating knives provided in the front of the machine, and beaten by the continuously revolving reel or blade wheel Z on to a horizontal travelling canvas apron, which carries it to the elevator, consisting of two common parallel endless running aprons, which deliver it on to the sloping binding table D^1 , provided at the bottom of the adjustable trough-shaped framing or receptacle. The main travelling wheel A , as a prime mover, may be conveniently arranged to drive all the moving parts of the machine, as shown. The chain-wheel 1 receives its motion from the said main wheel by the intervention of ordinary gearing, and the suitable transmission of motion is conveyed to the other driving-wheels by means of an endless chain band or equivalent means, the arrows in the drawing indicating the direction of the same.

The chain-wheel 2, through the medium of a spur-pin, y , drives the prime mover Y of the packing and binding apparatus, which is fixed on the main continuously revolving spindle E , and consists of a wheel provided with continuous internal teeth, into which the said pinion gears.

The endless chain then passes to the gearing 3 for driving the elevating aprons, and from thence to that of 4, actuating the horizontal feeding apron, and finally back to the prime moving chain-wheel 1 over an idle chain-pulley, 5, capable of adjustment for giving or taking up any slack in the endless driving-chain or band; 6 is a spur-wheel, which may take its motion from the spindle 1 for driving the knives, all of which driving appliances may be conveniently thrown in or out of gear, as desired, by the lever b^1 actuating the driving clutch, arranged within easy reach of the attendant or operator.

Now, assuming all the former-mentioned gearing to be in operation, and consequently the main spindle E and packing spindle G to be continuously revolving, the cut crop is fed on to the binding table, and the collecting and compacting effected by the revolving projecting packing claws h against the lever I , the crop being prevented from entering the moving parts of the machine by the guard-plate G^5 . When the uniform determined volume of the crop is sufficient to form a sheaf it forces back the said lever, pulling

Improvements in Harvesting and Sheaf-binding Machinery.

pulling forward the thrust lever L with its projection, which immediately causes the shipping lever M to be temporarily raised, whereby the driving clutch on the binder spindle F is brought into gear with that fixed on the continuously revolving spindle F by the spring f^1 , when the former receives similar rotary motion. As the binder spindle commences to revolve, the roller g^6 , connected with the bell-crank lever g^5 , leaves the recess f^3 in the collar f^4 , whereby the slides or switches g^3 are moved so as to cause the packing claws to run idle or inoperative.

At the same time the binder arm R commenced to rise above the table by virtue of the intermittent gearing S S¹ upon and actuated by the binding spindle F being brought into operation, and by the time the binder arm is up, so as to encircle the loose sheaf, the roller or tappet f^2 , fixed on the binder spindle, comes into contact and forces back the thrust lever L, connected with the lever I, through the intervention of the sleeve I¹, so as to compress the sheaf against the binder arm; then the binding and knotting operation immediately commences, and while the said operation is proceeding, the binder arm is maintained raised or in its forward position by the intermittent nature of its gearing.

The revolving cam-wheel P and rocking spindle q^4 with its levers now causes the knotting tube t to be protruded to lock the string or cord in the hook-eye of the apparatus, when it commences to bodily revolve by its intermittent differential gearing, p p^1 p^4 and t^2 , thus lapping the said string around the tube, and at the same time canting or turning the retainer to give the required slack. As soon as this is completed, during a little more than its one revolution, the lever q^1 comes in contact with a higher cam projection, P², on the wheel P, and effects the necessary projection of the internal hook t^2 , which seizes the crossed strands, and is almost immediately returned within the tube t by the action of the spring upon the withdrawal of the lever q^5 , as the lever q^1 clears the cam surface P², whereupon the second lever q falls into the recess P⁴ provided on the peripheral face of the cam-wheel, which temporarily withdrawing the pressure of the lever from the cutting and retaining apparatus, causes it to open by the action of its helical spring, and the continuous string from the binder arm to the bound sheaf immediately falls therein. No sooner has sufficient interval been allowed to accomplish this than the lever is again forced out of the recess P⁴ by continued revolution of the cam-wheel, whereby the cutting and retaining apparatus is reclosed, and the string reclining therein is severed, while the free end to the binder arm is held locked or retained therein.

The highest cam surface P³ now comes in contact with the lever q^1 , so as to suddenly protrude both the internal hook t^2 and the tube t of the knotting apparatus, whereby the knotted ends binding the sheaf are expelled.

By this time the roller f^5 has travelled so far as to engage with the heel of the horizontal lever K, connected to that of I, whereby the latter is raised clear of the sheaf ready to be ejected.

The intermittent gearing U¹ U² U³ and U⁴, connected with the binder spindle for actuating the ejector U, is now brought into action, so as to raise it above the table behind the bound sheaf, upon the commencement of which operation the binder arm begins to gradually recede below the table, carrying with it the held string over the bridge of the retainer.

All these before described operations are performed during one revolution of the binding spindle F, which now becomes again thrown out of gear by the action of the cam surface f^6 on the collar f^4 against the side of the shipping lever M, when the roller g^6 again falls into the recess f^3 on the collar of the clutch, and the packing claws are again protruded ready to collect another sheaf.

We may observe, in conclusion, that it is obvious that the elements or details of the hereinbefore described binding machine or apparatus might be equivalently modified without departing from the essence of our said invention.

The third part of our said invention, relating to finger-bars of mowing machines, has reference to improved apparatus for more effectually raising or clearing the outer ends thereof, and at the same time so arranging the mechanism and its connections that the said finger-bar is always to a certain extent left free to compensate or automatically adjust itself to any irregularities in the surface of the ground over which it is travelling.

The main frame W of the machine is free to rock or oscillate on the main axle W¹, and the slade W², to which the finger-bar V is attached, is as usual hinged to the side of the said frame, so that the finger-bar may be turned up for the purpose of travelling. A tilting lever, w , is fixed to the joint pin or hinge w^1 of the slade W², and extends away from the finger-bar V¹ to within the framing of the machine. The lifting chain w^2 , attached to a hook on a quadrant W⁴ formed on the lower end of the main rocking or lifting lever W³, which is suitably pivoted to the frame, is connected with one end of a rocking lever w^3 , pivoted to the framing, provided at its other extremity with an eye or collar through which the lever w passes. When the chain w^2 is lifted, the opposite end of the rocking lever w^3 is depressed, which similarly forces down the free end of the lever w , passing through the collar on the former, thus causing the outer end of the finger-bar V¹ to be radially raised in a vertical plane about the hinge-pin w^1 , as shown in figures 18 and 19 of the drawings. Or in lieu of employing a rocking lever, w^3 , a heel or projection, X, may be provided at the back of the lifting quadrant W⁴, so as to directly force down the aforesaid tilting lever w , hinged to the slade carrying the finger-bar, whereby a similar effect or result is obtained, as shown in the modified arrangement at figure 20 of the drawings.

In order to more effectually resist lateral strains brought upon the fingers V of mowing machines by impinging obstructions on the field, and to render them of more generally stronger construction, we prefer to form them with two projecting shoulders, v v^1 , which serve as continuous and uniform strengthening abutments when fixed to the finger-bar V¹, as shown at figures 21 and 22 of the accompanying drawings; and to further enhance their strength and security we form the said finger-bars with rabbets or rectangular notches, v^3 , into which the faces or ribs of the fingers V rest, and are rigidly bolted or riveted to form a substantial and durable joint.

Improvements in Harvesting and Sheaf-binding Machinery.

CLAIMS.

- First—The peculiar construction and arrangement of apparatus for raising and lowering the machine carrying the knives, so as to render it adjustable according to the height of the crop to be cut, substantially as hereinbefore described, and illustrated in figures 1, 4, and 5 of the accompanying drawings.
- Second—In sheaf-binding apparatus, in which the packing spindle discs with their claws are arranged to revolve continuously, the use of cam paths or guiding surfaces controlled by slides or switches, and arranged in such a manner that the heels of the packing claws or suitable projections provided thereon are caused to travel along one cam path or guiding surface, so that their claws act upon the crop when required for packing and along another cam path or guiding surface, so that their claws are held inoperative within the periphery of the packing discs during the binding operation, the packing claws being thus caused during the continuous revolution of the discs to act intermittently upon the crop, substantially as hereinbefore described, and illustrated in figures 6 to 12 inclusive of the drawings.
- Third—The combination with the subject matter of the second claiming clause of the peculiar automatic controlling mechanism by which the packing claws are held inoperative or caused to run idle when the sheaf has attained a certain volume, and are again brought into action when the sheaf has been bound, tied, and ejected, substantially as hereinbefore described, and illustrated in the accompanying drawings.
- Fourth—The combination of the compressing lever I, the thrust lever L, the horizontal levers I² and K, and the friction roller or tappet *f*^s, mounted on the binder spindle, the several parts being so arranged and combined together that the said friction roller or tappet first effects the compression of the sheaf for binding, and then by its continued rotary course raises the compressing lever clear of the sheaf to be ejected, substantially as hereinbefore described, and illustrated in figure 7 of the accompanying drawings.
- Fifth—The combination of the shipping clutch or lever M with the compressing and thrust levers, so constructed and arranged that by the direct action of the thrust lever upon the shipping clutch or lever the latter is raised and the binding apparatus is thrown into gear and the packing claws are thrown out of action, when a determined volume to form the sheaf is accumulated, substantially as hereinbefore described, and illustrated in figures 6, 6A, and 7 of the accompanying drawings.
- Sixth—The combination of the cam-wheel P on the intermittent binder spindle, the differential gearing operated intermittently by the said cam-wheel, levers also operated by the latter, and string-knotting, retaining, and cutting apparatus, the several parts being so arranged and combined together that the necessary rotary and longitudinal motions are imparted to the knotting, retaining, and cutting apparatus at the requisite times, substantially as and for the purposes hereinbefore described, and as illustrated in figures 13 to 15 inclusive of the drawings.
- Seventh—Operating the ejector U by a cranked spindle passing through the tubular shaft or sleeve carrying the binding arm, the path of the said ejector being controlled by a radius rod, and its motion being independent of that of the binding arm, substantially as and for the purposes hereinbefore described, and illustrated in figures 16 and 17 of the accompanying drawings.
- Eighth—The general construction, arrangement, and combination of parts constituting a sheaf-binding machine or apparatus, substantially as hereinbefore described, and illustrated in the accompanying drawings.
- Ninth—Clearing or raising the outer end of the finger-bar in mowing machines through the intervention of a rocking lever, *w*³, connected at one end to the main raising lever, and at the other end to the tilting lever acting upon the slade carrying the finger-bar, the said rocking lever being arranged and combined with the other parts so as to operate substantially as hereinbefore described, and illustrated in figures 18, 19, and 20 of the drawings.
- Tenth—Clearing or raising the outer end of the finger-bar in mowing machines by causing the main raising lever to operate directly upon the tilting lever, which acts upon the slade carrying the finger-bar, substantially as hereinbefore described, and illustrated in figure 21 of the drawings.

In witness whereof, we, the said James Hornsby, John Innocent, and George Thomas Rutter, have to this our specification set our hands and seals, this first day of August, one thousand eight hundred and eighty-one.

Signed and sealed by the above-named James
Hornsby, John Innocent, and George
Thomas Rutter, in the presence of—

JAMES HORNSBY.
JOHN INNOCENT.
GEORGE THOMAS RUTTER.

RICHARD ALLCOTT SMITHURST,
Grantham.

JOHN T. HARMSTON,
Grantham.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to James Hornsby, John Innocent, and George Thomas Rutter, this fifth day of November, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Improvements in Harvesting and Sheaf-binding Machinery.

REPORT.

Sir, We do ourselves the honor to state, in reply to your blank cover communication of the 24th ultimo, No. 9,225, transmitting the Petition of James Hornsby, John Innocent, and George Thomas Rutter, for the registration of "Improvements in Harvesting and Sheaf-binding Machinery or Apparatus," that we are of opinion the prayer of the petitioners may be granted, in accordance with their specification, drawings, and claim.

Sydney, 7 October, 1881.

We have, &c.,

EDMUND FOSBERY.
GOTHER K. MANN.

The Under Secretary of Justice.

[Drawings—two sheets.]

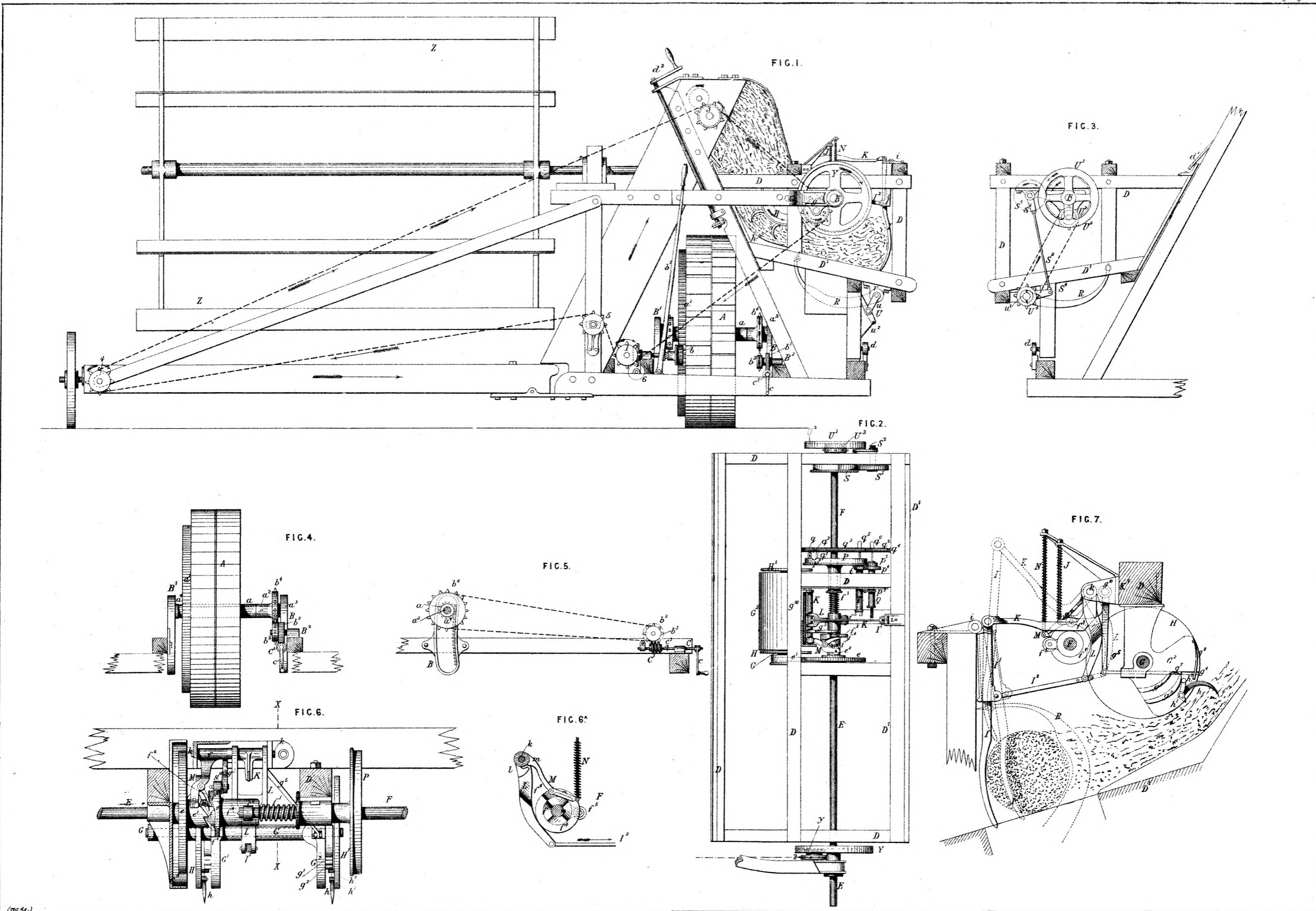
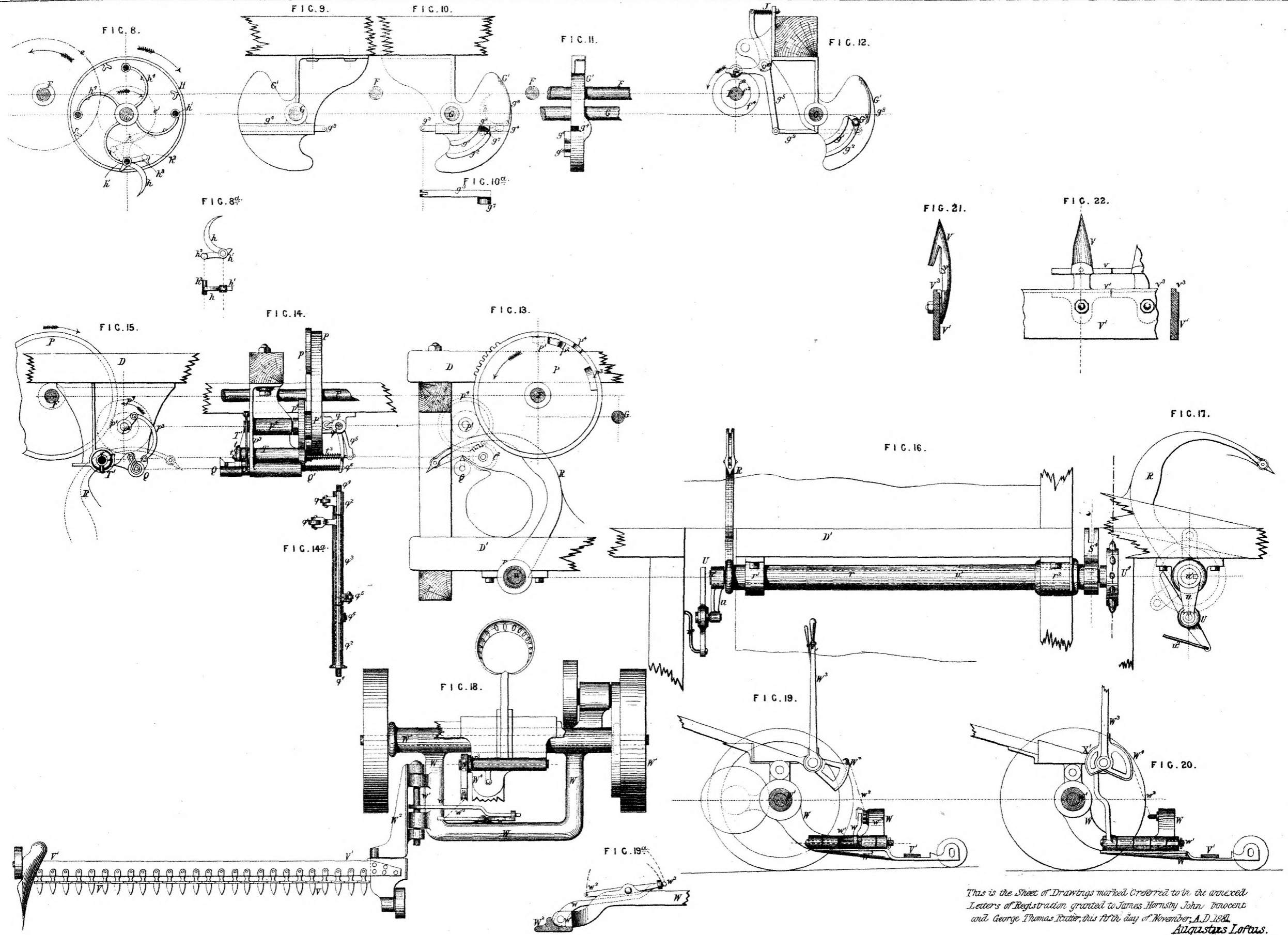


PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE, SYDNEY, NEW SOUTH WALES.

This is the Sheet of Drawings marked *B* referred to in the annexed Letters of Registration granted to James Horsley, John Innocent and George Thomas Reuter, this fifth day of November, A.D. 1881. Augustus Loftus.

C.



This is the Sheet of Drawings marked C referred to in the annexed Letters of Registration granted to James Hornsby John Innocent and George Thomas Baxter, this 17th day of November, A.D. 1882.
Augustus Loftus.



A.D. 1881, 5th November. No. 1011.

IMPROVEMENTS IN MAGNETO OR DYNAMO ELECTRIC MACHINES OR ELECTRIC ENGINES.

LETTERS OF REGISTRATION to Thomas Alva Edison, for Improvements in Magneto or Dynamo Electric Machines or Electric Engines.

[Registered on the 5th day of November, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS THOMAS ALVA EDISON, of Menlo Park, in the State of New Jersey, United States of America, electrician, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in Magneto or Dynamo Electric Machines or Electric Engines," which is more particularly described in the specification, marked A, and the two sheets of drawings, marked B and C respectively, which are hereunto annexed; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Thomas Alva Edison, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said Thomas Alva Edison, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said Thomas Alva Edison shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this fifth day of November, in the year of our Lord one thousand eight hundred and eighty-one.

[L.s.]

AUGUSTUS LOFTUS.

Improvements in Magneto or Dynamo Electric Machines or Electric Engines.

A.

SPECIFICATION.

TO ALL WHOM IT MAY CONCERN: Be it known that I, THOMAS ALVA EDISON, of Menlo Park, in the State of New Jersey, United States of America, have invented certain improvements in magneto or dynamo electric machines or electric engines, of which the following is a specification:—

THE object of the first part of my invention is to produce a dynamo or magneto electric machine in which the iron core of the armature will not be necessary and the loss of power caused by the heating of the same will be avoided, only the inductive portion of the armature being passed between the polar extensions of the exciting magnet or magnets, which polar extensions can consequently be brought close together so as to produce an intense magnetic field. And my object is further to construct a machine of this character, so that it will generate a continuous current of high electro-motive force in the same direction without the use of pole changers, all the inductive portions of the armature being constantly in circuit and the internal resistance of the machine being exceedingly small.

I accomplish this object by constructing the armature in the shape of a disc or plate like that used by Arago in his experiments, but divided into radial sections. These radial sections, which form the inductive portion of the armature, are preferably naked copper bars, joined edgewise by a non-conducting material, so that they form a rigid disc or plate, and attached rigidly to the driving shaft by means of an insulating hub. The radial bars are turned outwardly at their inner ends and connected thereby, or by rods, with circular plates surrounding the driving shaft or the hub of the armature, and insulated from each other. Each plate has a tongue, which is turned outwardly and secured in a groove of the insulating commutator cylinder. The bars nearest to diametrically opposite positions are in this manner connected together in pairs, and with a commutator bar midway between them. The radial bars revolve between the polar extensions of an electro-magnet or magnets (two electro-magnets being preferred for this purpose), and outside of such polar extensions the disc, formed of radial bars and insulating material, is surrounded by concentric metal rings (preferably of copper), which are insulated from each other and the radial bars, except as hereinafter explained.

The number of the exterior concentric rings, as well as of the plates of the hub, is one half that of the radial bars. The radial bars, at their outer ends, have arms, made integral therewith or secured to them, which extend to the proper rings and are insulated from all others. Each ring connects two radial bars, the terminal bar of one opposite pair being connected thereby with the initial bar of another pair so as to make a continually closed circuit through all the bars. The connections between the bars being all multiple arc connections, the internal resistance of the machine is reduced to the minimum. The plates and rings make the connections symmetrical at every point.

For illustration, I will suppose the disc to be composed of sixteen radial bars, which I will refer to by numbers as bars 1 to 16 inclusive. The disc would be surrounded by eight rings, which I will call rings 1 to 8 inclusive, ring 1 being the inner ring, and ring 8 the outside ring. Eight plates and commutator bars would also be used. Now, to ring 1 would be connected the outer ends of bars 1 and 11; to ring 2, bars 8 and 15; to ring 3, bars 6 and 13; to ring 4, bars 4 and 10; to ring 5, bars 3 and 9; to ring 6, bars 7 and 16; to ring 7, bars 5 and 14; and to ring 8, bars 2 and 12.

The bars would be connected together at their inner ends and to commutators midway between them, in pairs as follows:—Bars 1 and 8, 2 and 11, 3 and 10, 4 and 13, 5 and 12, 6 and 15, 7 and 14, 9 and 16.

This arrangement can be extended as may be desired, and armatures made with a large number of bars.

The current, commencing at the negative commutator brush or spring, is divided into two parts, each of which parts passes through one half of the radial bars, and combines with the other part at the positive commutator brush or spring.

In this manner all the bars are continually kept in circuit, and a current is generated having an electro-motive force due to one half the length of all the bars.

The concentric rings are arranged outside of the polar extensions of the exciting magnets, so that such extensions can be brought close up to the inductive bars while the rings are nearly outside the magnetic field and do not cut the lines of force at right angles, and consequently exert no counter effect upon the electro-motive force of the current.

The radial bars could be cut away or removed at three or more points to make room for metallic arms projecting from the hub, in order to strengthen the armature, without seriously detracting from the efficiency of the machine.

It is important that a disc armature of this kind should be made exceedingly stiff and strong, especially when the machine is connected up for use as an electric engine.

For this purpose I have designed two constructions, as follows:—

First—The polar extensions on one side of the armature can be set further back, leaving a space for the reception of a strengthening disc, to which the inductive bars will be secured. This disc will be formed by winding a thin strip of iron around the hub with a strip of paper, which will separate the spiral convolutions of the iron. Around this disc will be shrunk an iron ring, and radial bolts will be passed through holes in the disc and screwed into the hub. The copper rings will then be added, and then another iron ring may be shrunk on. This last ring may also be used with all or any one of the constructions herein described.

This strengthening disc, having its conducting portion in the shape of spiral convolutions, said conducting portion does not cut the lines of force, but becomes a detached portion of the magnet, which revolve with the armature.

Second—The radial bars of the first construction can be made forked or in two parallel parts connected at their inner ends, and between these parts can be interpolated a core made of spiral convolutions of iron and paper, as just described.

The

Improvements in Magneto or Dynamo Electric Machines or Electric Engines.

The inductive copper bars of the last two constructions are connected in the manner already described of the first construction.

Another part of my invention relates to the application of concentric rings for making the multiple arc connections of the copper bars in a dynamo or magneto electric machine or electric engine, having an armature of cylindrical form.

At each end of the cylindrical armature is arranged a series of insulated concentric copper rings, placed outside of the polar extensions of the exciting magnet. Each ring is provided with two projecting fingers on the outside edge, which are turned inwardly and connected with the ends of the proper longitudinal bars.

Midway between the connection of each ring with two bars at the commutator end of the machine, such ring is connected with a bar of the commutator cylinder. This is preferably done by means of an angular bar connected with the ring, and connected with or forming a bar of the commutator cylinder. In this machine the bars may be connected in opposite pairs and midway to commutators, in the same manner that the radial bars before described are connected at their inner ends, while at the opposite end of this last machine the bars may have their connections arranged like those at the outer ends of the radial bars before described.

The novel features of all these machines are equally well applicable to electric engines and motors, and this description is intended by me to be understood as covering the same.

For electric engines the disc armatures possess the advantage of great lateral compactness, permitting the use of the engine on a narrow railway car without having it project over the sides of the same, or in other locations where lateral space is limited.

The foregoing will be better understood by reference to the drawings, in which figure 1 is an elevation of the simplest form of disc armature with the commutator cylinder in section, the connections of the radial bars with the commutator bars being shown diagrammatically; figure 2, a central horizontal section; and figure 3, a perspective view of this machine; figure 4 is a horizontal section of the machine, having disc armature with strengthening core; figure 5, a vertical section of the armature of this machine; figure 6, a separate perspective view of one of the double inductive bars and its commutator connection; figure 7 is a perspective view of a cylindrical armature having the longitudinal bars connected by concentric rings; figure 8, a longitudinal section through this last armature, the commutator cylinder being shown in elevation; and figure 9, a separate view of one of the concentric rings.

With reference to figures 1, 2, and 3, A B are the electro-magnets, and A¹ A² B¹ B² the polar extensions of same. C is the driving shaft. The radial copper bars are numbered from 1 to 16 inclusive. D is the hub to which the radial bars are secured, the bars being insulated properly therefrom. Sixteen radial bars are shown for purpose of illustration, but the number might be more or less according to the size of the machine. E represents the circular insulated plates with which the radial bars are connected, and these plates have tongues, e, connected with the bars of commutator cylinder F. Two radial bars are connected with each plate, E, and by it with the nearest central commutator bar.

The concentric copper rings surrounding the radial bars are lettered from G¹ to G⁸ inclusive. They are connected with the radial bars by bands, straps, or rods, H, or the radial bars may be forked and inclose the rings partly, in which case H would be integral with such radial bars. The neutral line extends vertically through the centre of the armature, while the commutator brushes or springs P N make contact with the sides of the commutator cylinder at the ends of the horizontal diameter, the bars next to the neutral line being connected with the central side commutator bars as shown. On the left-hand side of the neutral line the currents in the radial bars, as shown in figure 1, all run inwardly, while those on the right-hand side flow outwardly. In the position shown, one portion of the current would pass from the negative to the positive commutator brush *via* 1 G¹ 11, 2 G² 12, 5 G⁷ 14, 7 G⁶ and 16, and the other portion *via* 8 G³ 15, 6 G³ 13, 4 G⁴ 10, 3 G⁵ and 9, the proper plates E and straps H being included in the circuits.

The first means set forth in the general description for strengthening the disk armature (by using an extra disc on one side of the radial bars) is not shown in the drawings, the general description being sufficiently full to enable those skilled in the art to understand that construction.

The second construction for that purpose is illustrated in figures 4, 5, and 6.

In those figures A is the shaft, B the hub, C the double naked copper bars, D the copper disc connected by extensions *a* with C and by rods or strips *b* with bars of commutator cylinder E. F is the core of the armature. H represents the concentric copper rings connected with C by the offset arms *d*.

I K are the electro-magnets, of which N S are polar extensions.

The application of the concentric rings to the cylindrical armature is shown in figures 7, 8, and 9.

A is the core of the armature, built up of discs or rings of iron separated by paper. B represents the longitudinal naked copper bars. C C¹ are the two series of concentric copper rings at the ends of the armature. Each ring has two fingers, e, for making connection with the inductive bars. D is the commutator cylinder, the bars of which are connected with the concentric rings at one end of the armature by angular bars *d*.

What I claim is—

First—A dynamo or magneto electric machine or electric engine having an armature provided with radial inductive bars revolving in the magnetic field, substantially as set forth.

Second—The armature of a dynamo or magneto electric machine or electric engine, constructed in the form of a metal disc, divided into radial sections connected together and insulated from each other so as to produce a rigid disc, substantially as set forth.

Third—In a dynamo or magneto electric machine or electric engine, the armature formed of radial bars symmetrically connected together and with commutator bars, so that all the radial bars will be kept continually in contact, substantially as set forth.

Fourth—

Improvements in Magneto or Dynamo Electric Machines or Electric Engines.

Fourth—A magneto or dynamo electric machine or electric engine, having in combination the armature constructed of radial bars connected in pairs at their inner ends with the commutator bars and suitable connections of different pairs at the outer ends of the radial bars, whereby the radial bars will all be kept continually in circuit, substantially as set forth.

Fifth—In a dynamo or magneto electric machine or electric engine, the concentric rings for connecting the armature bars, substantially as set forth.

Sixth—In a dynamo or magneto electric machine or electric engine, the combination with the armature of the concentric rings for connecting the armature bars, revolving outside of the polar extensions of the magnet or magnets, substantially as set forth.

Seventh—The method or means for strengthening a disc armature, consisting in attaching a core or disc to one side of the same, substantially as described.

Eighth—The method or means for strengthening a disc armature, consisting in providing the same with a central core, substantially as described.

Ninth—A strengthening core or disc for disc armatures, made of spirally wound iron and an insulating material, substantially as described.

Tenth—The combination with the cylindrical armature of the concentric rings for connecting the inductive bars, substantially as set forth.

Signed by me, this 27th day of July, A.D. 1881,—

THOMAS ALVA EDISON.

Witnesses—

CHAS. H. SMITH.
GEO. T. PINCKNEY.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to Thomas Alva Edison, this fifth day of November, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 4 October, 1881.

We do ourselves the honor to report, in reply to your blank cover communication of the 24th ultimo, No. 9,226, transmitting Mr. Thomas Alva Edison's Petition for the registration of an invention entitled "Improvements in Magneto or Dynamo Electric Machines or Electric Engines," that we are of opinion the prayer of Mr. Edison's Petition may be granted, in terms of his specification, drawings, and claim.

We have, &c.,

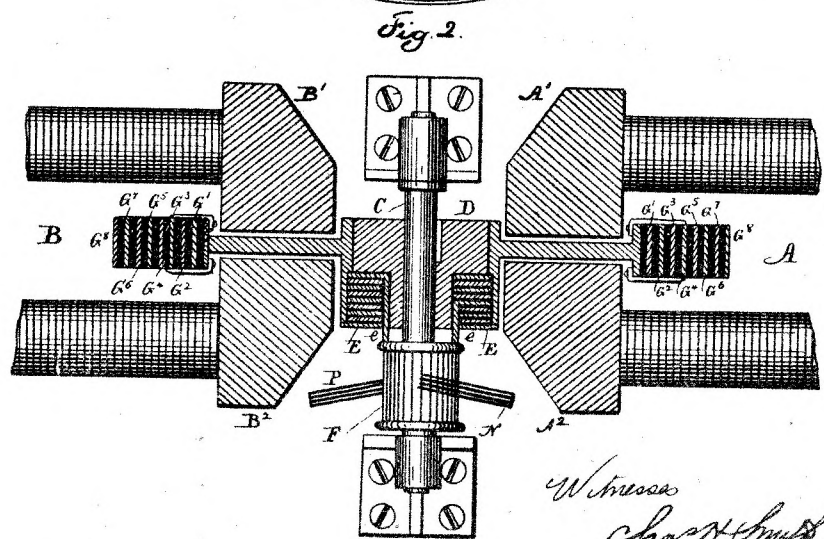
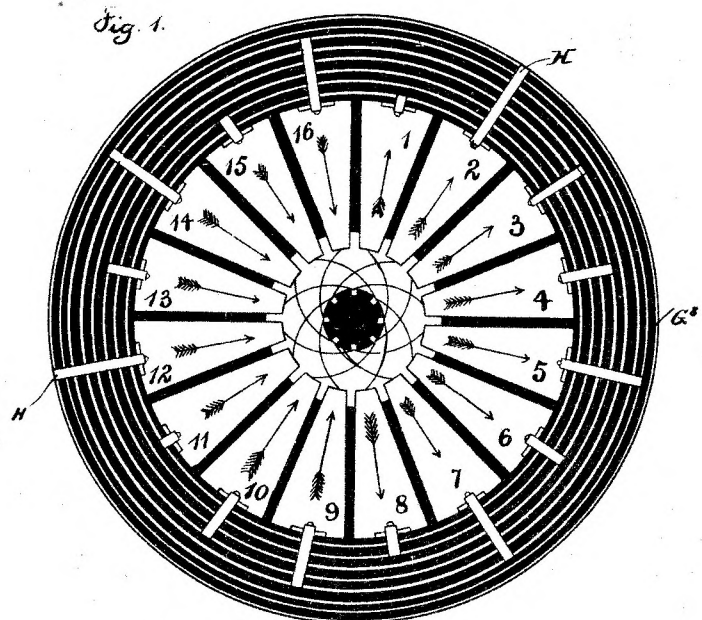
E. C. CRACKNELL.
GOTHER K. MANN.

The Under Secretary of Justice.

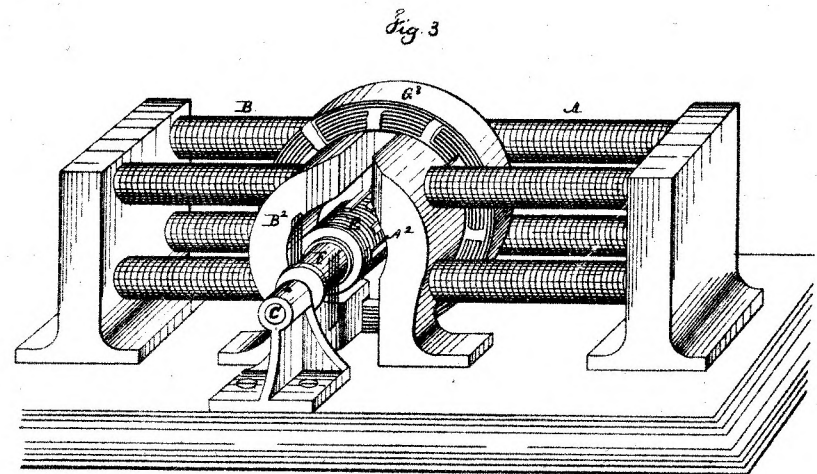
[Drawings—two sheets.]

B.

1011



Witness
Chas. H. Smith
Geo. T. Combs



Thomas Alva Edison

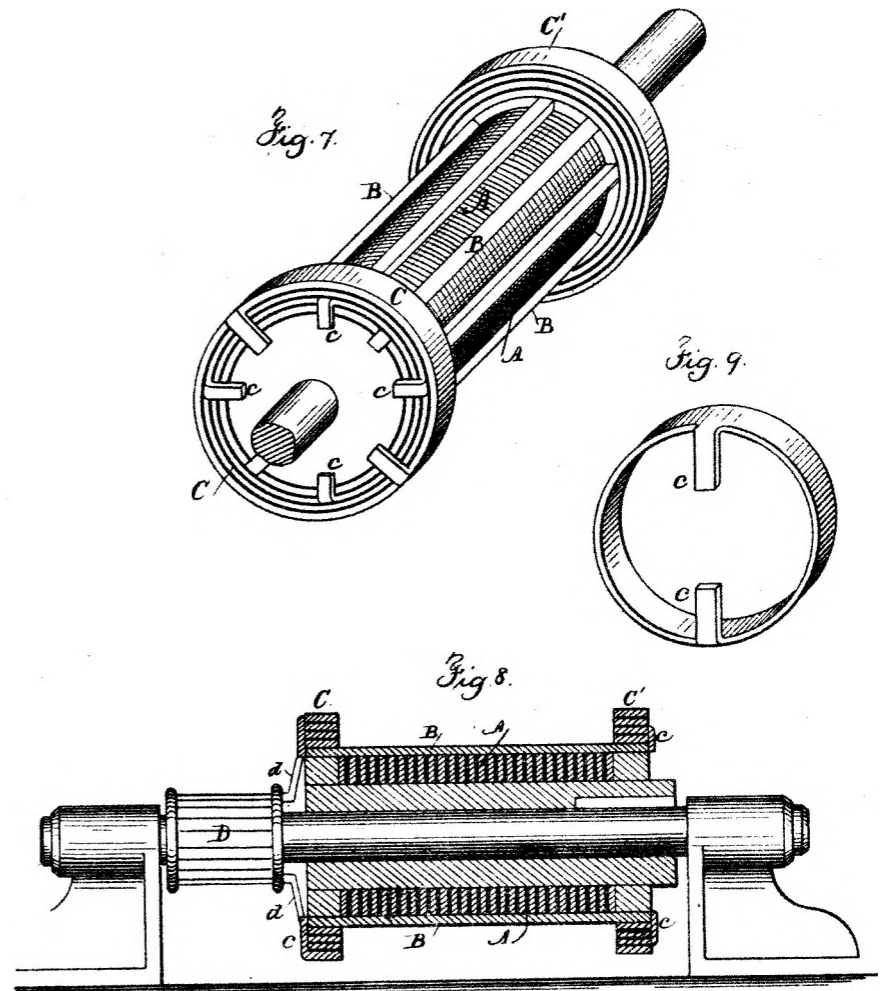
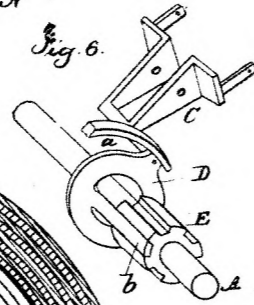
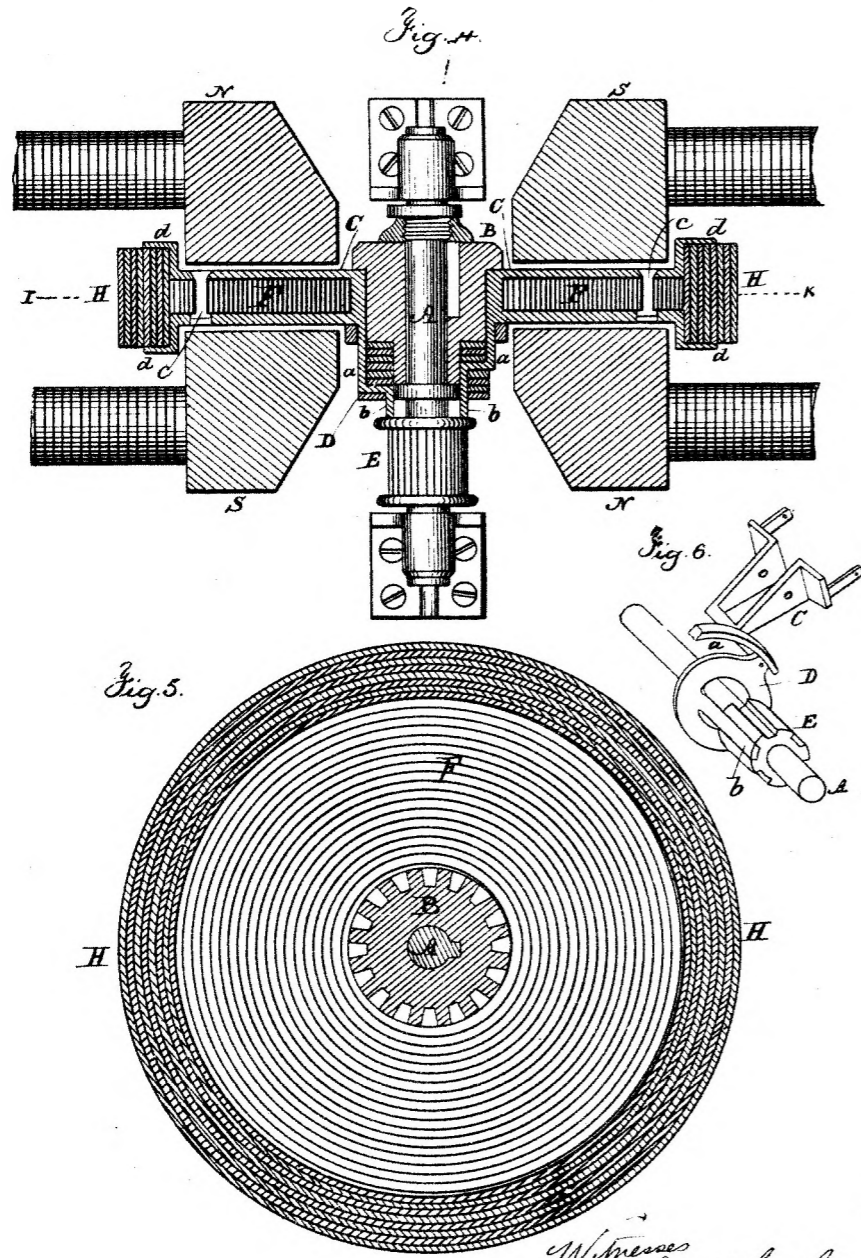
This is the Sheet of Drawings marked B referred to in the annexed Letters of Registration, granted to Thomas Alva Edison, this fifth day of November, A.D. 1881.

Augustus Loftus.

PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE,
 SYDNEY, NEW SOUTH WALES.

Fig. 34-

C.



Thomas Alva Edison

Witnesses
Chas. Smith
Geo. J. Mackay

This is the Sheet of Drawings marked C referred to in the annexed Letters of Registration, granted to Thomas Alva Edison this fifth day of November, A.D. 1881.
Augustus Loftus.

PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE, SYDNEY, NEW SOUTH WALES.

Fig. 34-



A.D. 1881, 5th November. No. 1012.

IMPROVEMENTS IN THE METHOD OF ACTUATING RAILWAY BRAKES.

LETTERS OF REGISTRATION to Edward D. Barker for Improvements in the method of actuating Railway Brakes, part of which is applicable generally as a steam pump.

[Registered on the 5th day of November, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS EDWARD D. BARKER, of Bedford Row, London, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention of "Improvements in the method of actuating Railway Brakes, part of which is applicable generally as a steam pump," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed ; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four ; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years : And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Edward D. Barker, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof ; to have, hold, and exercise unto the said Edward D. Barker, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended : Provided always, that if the said Edward D. Barker shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this fifth day of November, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in the method of actuating Railway Brakes.

SPECIFICATION lodged by EDWARD D. BARKER, with his Petition for registration of his invention of improvements in railway brake apparatus, part of which is applicable generally as a steam pump.

THIS invention has for its object improvements in railway brake apparatus, part of which is applicable generally as a steam pump.

The brakes are actuated by means of a continuous line of piping connected with an hydraulic accumulator, in which water is stored under pressure. The water is forced along this line of piping into hydraulic rams fastened underneath the carriages. One ram is made to actuate either four or two brake-blocks. In order to actuate four blocks, the blocks are connected on the opposite sides of the carriage by cross-bars, a cylinder and piston or their equivalents are applied to the centre of these cross-bars, in such a manner that when fluid, under pressure or exhaust, is admitted to them the cross-bars are forcibly drawn together, and the brake-blocks at their ends pressed against the peripheries of the wheels on opposite sides.

By this means all strain on the axles is avoided, and the highest pressure may be instantaneously applied without fear of accident. This arrangement may be modified either to actuate one brake-block on each of the four wheels of a carriage or one pair of blocks on the two wheels on one side; but as both these plans cause a strain on the axles and axle-box guides, the author prefers the arrangement shown by the drawing. A self-acting arrangement prevents the brake-blocks from receding too far from the wheels, adjusting them as they wear out to a uniform distance from the tires of the wheels. In order that when a continuous hydraulic brake apparatus (or other apparatus where the brakes are applied by fluid under pressure) is used the brake may be applied automatically to any carriage in case of its becoming detached from the train, in addition to mounting the ordinary brake apparatus upon the carriage the author also mounts upon it a small cylinder, to one end of which fluid under pressure is permanently admitted from the accumulator.

If communication with the accumulator is broken, a coiled spring, acting on the piston in the cylinder, forces the brakes on to the wheel. This plan will be more particularly described below.

As protection is not sought for any particular form of accumulator, that part of the machinery will not be described. The author, merely premising that he prefers using the steam from the boiler as the motive force to drive the water through the pipes, will now proceed to describe the steam pump, by means of which the accumulator is kept charged with water and ready for immediate use. The pump used is direct-acting, and is worked by steam from the boiler. The steam cylinder and pump cylinder are in a line with one another, and a piston rod connecting the two pistons passes through stuffing-boxes in the ordinary manner.

The peculiarity which the author claims generally for this pump is that it has no dead point, *i.e.*, it is always able to start at any point of the stroke. In order that the invention may be better understood, the author will now describe the different parts by reference to the accompanying drawings.

Figure 1 of the drawings hereunto annexed shows a side view, partly in section, of the steam pump. Figure 2 is a plan view of the same. A is the pump cylinder; B, the steam cylinder; C, the piston rod uniting the pistons of the two cylinders; D, is a cross-head on the piston rod; D¹, an arm extending from the cross-head and embracing the valve rod E; FF are coiled springs surrounding the valve rod, one on either side of the arm D¹. These springs at their opposite ends abut against collars upon the valve rod. Upon one of these collars is a projection, G, which, at the centre of each stroke, comes against one or other side of a stop, H, on a lever arm, H¹. This arm turns upon a pivot at one end, and is drawn downwards at its opposite end by coiled springs I. J is a roller upon the cross-head D. At the end of each stroke this roller comes against one or other of the inclines H² on the lever H¹, and moves the lever upward until the stop H has been moved clear of the projection upon the valve rod; the valve rod is then shifted endwise by whichever of the coiled springs is in compression, as before explained. The piston then travels back, and the stop H comes into position to again control the movement of the valve. The valve may be adjusted so that at the middle of the stroke it cuts off partly or entirely the admission of steam to the cylinder.

K is a fixed stop, which controls the amount of movement given to the valve at the end of each stroke. LL are two collars upon the valve rod, one on either side of the stop K¹. L¹L¹ are discs of vulcanized india-rubber, carried by these collars, to avoid shock. MM are the two pistons or discs forming the valve; they are at a distance apart upon the valve rod. Each piston serves alternately to admit and cut off steam from the parts NN leading to the two opposite ends of the steam cylinder. Steam is admitted constantly to the central space O between the discs, and the exhaust is led from its two ends. PP are small branch ports from the ports NN to the extreme ends of the steam cylinder. When the piston travels past and covers one or other of the ports N, the steam enclosed in the space between the piston and cylinder end forms a cushion to arrest the movement of the piston, as the steam can only escape through the small port P in the same way. After the valve has been shifted over, steam is first admitted slowly to the cylinder end through the small branch port until the piston has begun to move back and has travelled past the end of the port N, steam then enters the cylinder freely through this port. The arrangement of pump valves and connections may be of the ordinary kind. The author claims, as respects this part of his invention—

First—The combined arrangement of direct-acting steam pump substantially as described.

Second—The combined arrangement for giving motion to the rod of the valve employed for controlling the admission of steam to the steam cylinder at the times required, substantially as described.

Third—The combined arrangement by which the piston of the steam cylinder is gradually brought to rest at the end of each stroke and again gradually started back again, substantially as described.

In some cases the pumps are provided with india-rubber lip valves, formed as to their interior surfaces of hard rubber, and as to exterior surfaces of soft rubber. When so made, the valves are less liable to fail under high pressure than when made, as heretofore, entirely of soft rubber.

Figure

Improvements in the method of actuating Railway Brakes.

Figure 3 shows a section of a pump-valve, L-formed. a is the outer valve casing; b , an inner cylinder, with holes, b' , in its sides; cc are rings of india-rubber made as shown, with lips abutting against one another.

The lips are pressed together by screwing in the cover a^1 of the valve case. The cylinder b is closed at the top, and has a flange at the lower end, between which and the bottom of the valve case a tight joint is obtained by a ring of vulcanized rubber, d' , interposed between them. The lip valves c are constructed of an inner ring of hard rubber, c^1 , and an outer ring of soft rubber, c^2 , which form the lips as shown. By this construction the soft rubber lips are prevented from being forced under high pressure into the holes of the cylinder c , and thereby destroyed.

The author claims, as respects this part of his invention, the construction of lip valves partly of hard rubber and partly of soft rubber, substantially as described.

Figures 4, 5, and 6 represent the arrangement by which the brakes are applied in the guard's van. This is effected in such a manner that it can be worked by hand in the ordinary way as well as by liquid under pressure from the continuous pipe of the hydraulic apparatus that is carried under the train. Figure 4 shows a side view, figure 5 a vertical section, and figure 6 a horizontal section of this arrangement. aa are the links which rise up from the ordinary brake gear fitted below a guard's van. These links are not simply jointed to a nut which can be raised by turning a screw working in it, but to a cap, b , from the underside of which descends a hollow tubular plunger, c , which works in an hydraulic cylinder, d , and is closed at the bottom as shown; e is the screw passing freely through the cap at the top of the plunger, and f is the nut below the cap, into which the screw e enters. The nut is prevented from turning by grooves in its sides fitting over projecting ribs c^1 formed down the interior of the plunger c as shown at figure 6. By this arrangement the guard can apply the brakes by hand, or fluid under pressure can be admitted to the cylinder d and the plunger c so raised and the brakes applied. The above arrangement can be used not only with water under pressure but with steam or other fluid.

The author claims, as regards this part of the invention, the combined arrangement, substantially as described, for enabling brakes in a guard's van to be applied, not only by the guard working the ordinary hand gear, but also by means of fluid under pressure used for applying continuous brakes.

Figure 7 shows a side view, and figure 8 a plan view of the apparatus to be fixed to each carriage for the purpose of applying the brakes automatically in case of a separation occurring in the train.

Figure 9 shows a plan view, figure 10 a side view, and figure 11 an end view, on a smaller scale, of the apparatus fixed to a railway carriage.

In these figures a is an hydraulic cylinder, with a hollow plunger, b , working in it; c is a cup leather to form a tight joint between the plunger and the top of the cylinder a . The top of the plunger has extending from it a rod, d , around which is a coiled spring, e . This spring is, as shown, enclosed by a tube, f , fixed by arms to the cylinder a , and the spring at its end bears against the outer closed end of the tube. Water or other fluid under pressure is admitted continuously from an accumulator or reservoir in the guard's van or engine by a small pipe, g , to the end of the cylinder a . The pressure exerted by the spring e upon the plunger b is somewhat less than that exerted upon it by the fluid, and consequently the spring is maintained in a state of compression; h is a valve by which the inlet of fluid under pressure to the cylinder a can be closed and the fluid in the cylinder be prevented from escaping by the inlet. The valve h has a rod, h^1 , passing from it and through a ring, k , carried by arms at the inner end of the plunger b . On the end of the rod h^1 is a knob, h^2 . When the plunger is pressed outwards from the cylinder to the extreme of its traverse, the ring comes against the knob and holds the valve h at a short distance from its seat, as shown at figure 8. Should, however, any of the couplings which connect the small pipe g on one carriage to the same pipe on the next carriage be broken, an outlet is thereby made for the fluid under pressure in the cylinder a on all the carriages; the plungers b will then be forced inwards by their springs e until the valves h come to their seats, no more of the fluid under pressure in the cylinders a can then escape by the orifice by which the fluid originally passed into the cylinder; h^3 is a spring to ensure the closing of the valve h . From the end of the cylinder a is a small passage, not shown in the drawing, communicating with a small valve chamber, l , in which is an exit valve, l^1 , ordinarily kept closed by the pressure of the fluid and the spring l^2 . When the exit valve is opened it admits the fluid under pressure to a passage, m , in which conducts to the hydraulic cylinder n , by which the brake blocks are applied to the wheel of the carriage. From the passage m is also an opening into a small cylinder, o , which is in connection with the continuous pipe p , which passes from end to end of the train. When the brakes are to be applied in the ordinary manner, the fluid in the continuous pipe p is put under pressure by the guard or engine-driver, and passing through a passage, m , goes to the hydraulic brake cylinder and puts on the brakes; q is a valve in the small cylinder o , by which the opening from it into the passage m can be closed. This valve is ordinarily held open by an arm, l^1 , on a rod, r , as shown at figure 8. The rod r passes out through a stuffing-box, s , and has upon it a collar, n^2 , against which presses a spiral spring, t , and tends to force the collar up to a hinged stop, u , held in the position shown at figure 8, by the springs w^1 . When, however, the plunger b is allowed to move inwards by the escape of fluid from the cylinder a , an arm, b , projecting from the plunger acts upon an incline on the stop, and moves it away from the collar n^2 ; the rod r is then moved endwise by the spring t , the arm r^1 is thereby moved away from the valve q , so allowing this valve to be closed by the spring q^1 , at the same time the arm r comes against the valve l^1 and opens it, so allowing the fluid under pressure to pass from the cylinder a to the brake cylinder to apply the brakes. Thus all the brakes will be applied automatically in case of a separation occurring between any of the carriages of a train. The author prefers that the small pipe g by which the water under pressure is supplied continuously to the cylinders a should be carried along below the centre of each carriage, and at the end of each carriage have a branch g^1 passing to either side of the carriage. At the end of each branch is a valve, by which it can be closed. I also provide small flexible coupling pipes, g , by which the ends of the branch pipes on two adjoining carriages may be coupled together at either side of a train, as shown at figures 9 and 10. In order to put out of action when necessary the automatic arrangement, the end of the rod r is coupled to a small bell-crank lever, w , by a link, v , a pin at the end of this link entering a slot in the lever. The lever w is by other links and bell-cranks coupled to a weighted lever, x . By turning this lever into the position shown at figure 10, the rod r can be drawn back and be prevented from moving forward even should the stop u be raised by the moving inwards of the

Improvements in the method of actuating Railway Brakes.

the ram *b*; thus the valve *g* will always be held open and the hydraulic brake apparatus can be worked by fluid under pressure supplied to the brake cylinders by the main pipe *p* as before explained. By throwing over the weighted arm of the lever *x* into the other position, the small crank lever *w* is shifted into the position shown at figure 7. The slot in this lever will then be in a line with the link *v*, leaving this link and the rod *r* free to be moved forward by the spring *t* whenever the catch *a* is raised.

The author claims, as respects this part of his invention, the combined arrangement of apparatus substantially as described, for enabling the brake blocks of a continuous brake apparatus worked by fluid pressure to be applied automatically in case of any of the carriages breaking off from the remainder of a train.

Figure 12 shows the end of a flexible coupling tube used to join the continuous pipe that is carried throughout the train; *a* is the metallic nozzle; it is inserted, as shown, into the end of the flexible pipe *b* on the nozzle *a*, and beyond the end of the flexible pipe is a grooved flange, *c*, around which is a wire, to which are attached other wires, *d*; these are laid longitudinally along the end of the flexible tube. Wire is then bound round the end of the tube, binding in the wires *d*; the ends of the wires are then turned over as shown.

The metal nozzles are provided with vulcanized india-rubber rings suitably formed to make a tight joint when butted together. The two nozzles of a coupling are held together by a doubled lever hinged on to studs on the upper nozzle, and embracing corresponding studs on the lower nozzle.

Figures 13 and 14 show a coupling. Each nozzle has two studs, *a a*, projecting from it. On the studs of one nozzle the weighted lever *b* is carried, made double so that the two parts come on the opposite sides of the other nozzle. In each part is a curved slot, *c*, which draws the two nozzles together when the weighted lever is allowed to fall down. Each nozzle carries a flexible washer, *d*, shown at figure 12; these meeting together form a tight joint.

The author claims fastening metallic nozzles to the ends of flexible tubes and the coupling by means of a weighted arm or lever, also the combined arrangement of coupling, substantially as described.

Figure 15 shows a side elevation of a carriage wheel, showing the arrangement of cylinder, piston, and cross-bars; also the arrangement for hanging the brake blocks, and for preventing them from receding to an inconvenient distance from the wheels. *a* is the frame of the carriage, *b* the wheel, *c c* the brake blocks; they are jointed at *c'c'* to the hangers *d'd'* with the frame *a*, and at their lower ends they are coupled together by the cross-bars *e e*. For additional security the cross-bars are also suspended from the frame by light rods, having at their ends india-rubber blocks to check rattling and vibration. *h* is a cylinder containing a piston, and it is attached by a forked rod, *i*, to one of the cross-bars *e*. The piston rod *h'* is pin-jointed to the other cross-bar *e*. They are thus held suspended by their connection with the cross-bars. There is a spring which tends to retain the piston at the further end of the cylinder, and then the brake blocks are held off the wheels, but when water is forced into the cylinder the spring is compressed, and the cross-bars *e e* are drawn together and the brake blocks applied to the wheels. *k* is a flexible pipe communicating with the supply pipe *l*. At the ends of the carriages the pipes *l* are coupled throughout the train by means of the metallic nozzles and flexible tubes previously described. The pipes are constantly kept full of water from the accumulator, so that the brakes are constantly ready for use. *m* is a link having an elongated eye, *m'*, and a fixed pin, *n*, passes through it, so that the link is free to play to the extent only of the eye *m'*. At its further end the link has ratchet teeth, *m''*, and it passes through a guide loop, *n*, attached to the hanger *d*. This guide loop carries a pawl which takes into the ratchet teeth. These are held in a frame which nips them together. By this means the brake block cannot recede further from the wheel than the length of the eye *m'*; as the block wears it will be pushed gradually up the link. The brake block, in addition to being pin-jointed to the hanger *d*, is controlled as to its upper end by a self-adjusting forked link, *t*. This is a self-acting arrangement, similar in some respects to that at the end of the link *m*, and prevents the top of the brake block from hanging on the wheel.

The author claims the combination of a cylinder and piston or their equivalent, actuating cross-bars armed with brake blocks operating substantially as described; also the mechanism used for preventing the blocks from receding too far from the wheels, and compensating for the wear of the brake blocks, substantially as described.

The author also claims the general arrangement of the machinery for actuating a continuous, direct, and automatic hydraulic apparatus substantially as described.

Signed in behalf of the said Edward D. Barker, by his agent, Herbert Harris, this twenty-first day of September, 1881.

EDWARD D. BARKER,
per HERBERT HARRIS.

This is the specification referred to in the annexed Letters of Registration granted to Edward D. Barker, this fifth day of November, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 4 October, 1881.

We do ourselves the honor to report, in reply to your blank cover communication of the 22nd ultimo, No. 9,215, transmitting the Petition of Mr. Edward D. Barker for the registration of "certain improvements in the method of actuating Railway Brakes," that we are of opinion the prayer of the Petitioner may be granted, in accordance with his specification, drawings, and claim.

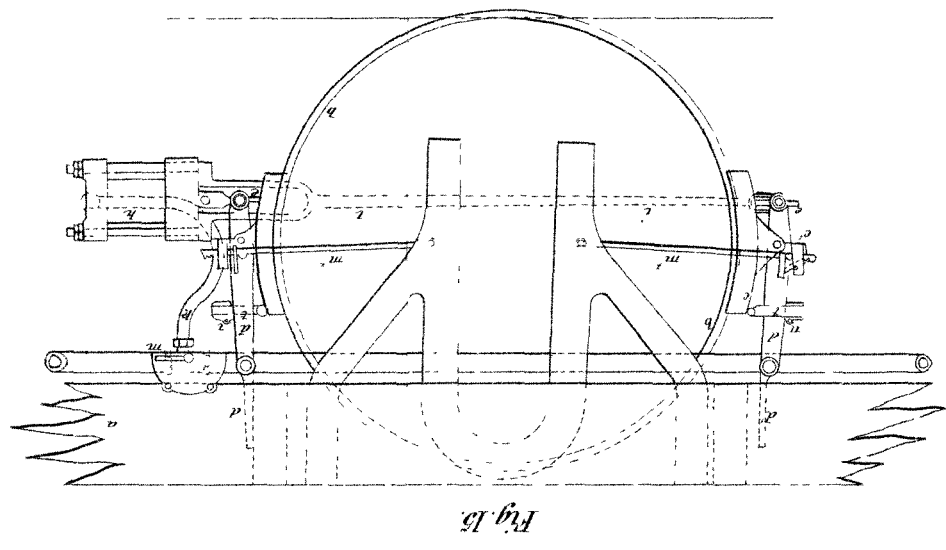
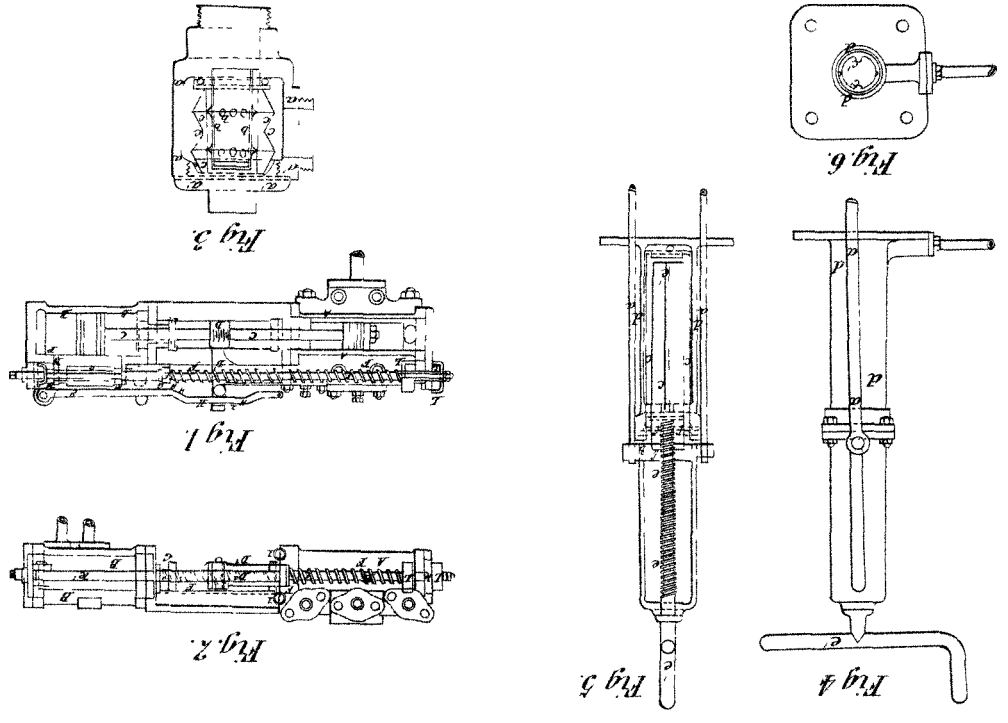
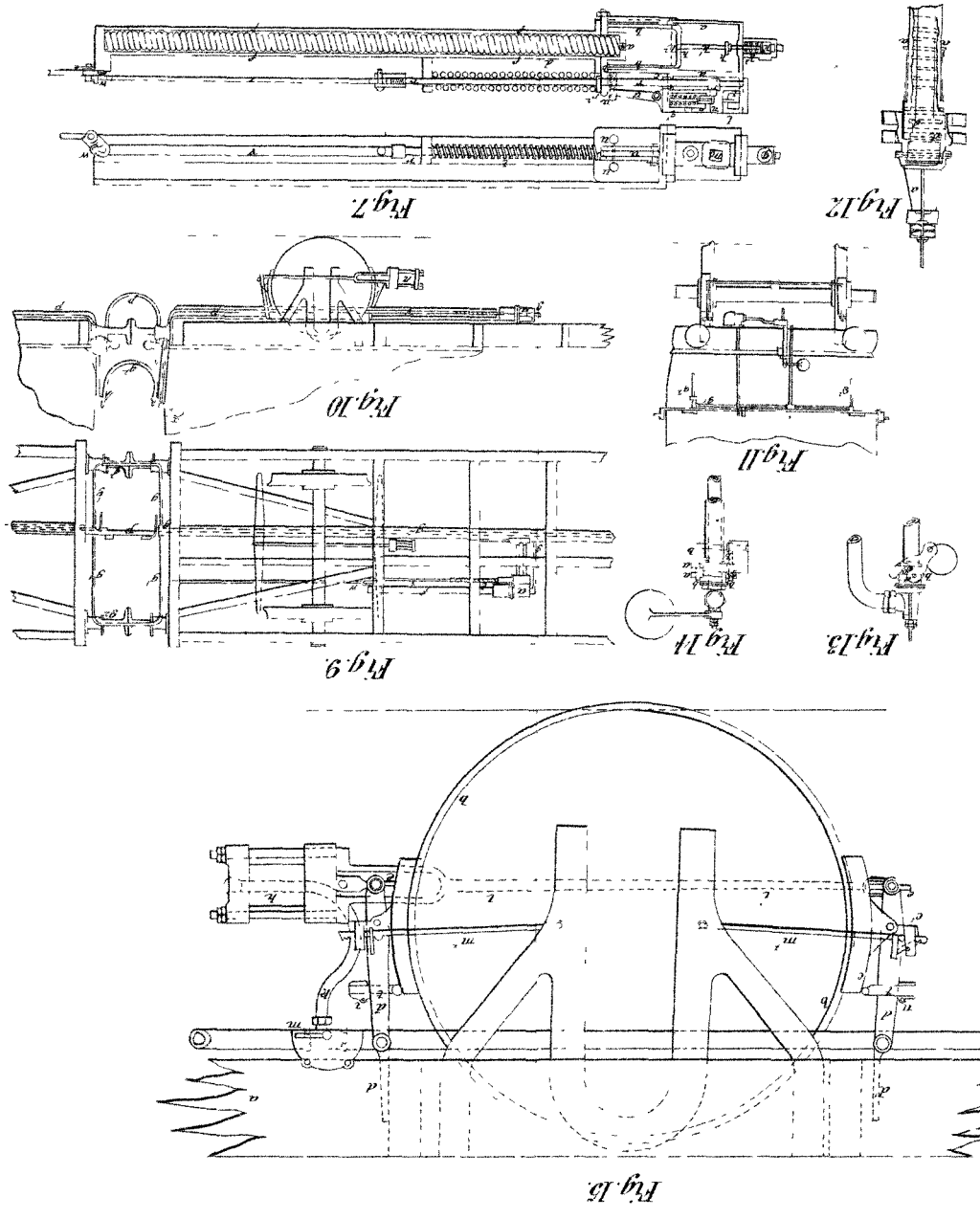
We have, &c.,
JOHN WHITTON,
GOTHER K. MANN.

The Under Secretary of Justice.

This is the Sheet of Drawings referred to in the annexed Letters of Registration, granted to *Karvra D. Barker*, this fifth day of November, A. D. 1881.

Barker's Hydraulic Brake

Specification.





A.D. 1881, 5th November. No. 1013.

IMPROVEMENTS IN ELECTRIC LAMPS.

LETTERS OF REGISTRATION to Thomas Alva Edison, for Improvements in Electric Lamps and the manufacture thereof, and in systems thereof. '

[Registered on the 5th day of November, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS THOMAS ALVA EDISON, of Menlo Park, in the State of New Jersey, United States of America, electrician, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in Electric Lamps and the manufacture thereof, and in systems thereof," which is more particularly described in the specification, marked A, and the two sheets of drawings, marked B and C respectively, which are hereunto annexed; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Thomas Alva Edison, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said Thomas Alva Edison, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said Thomas Alva Edison shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this fifth day of November, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

*Improvements in Electric Lamps.*A.
SPECIFICATION.

TO ALL WHOM IT MAY CONCERN: Be it known that I, THOMAS ALVA EDISON, of Menlo Park, in the State of New Jersey, United States of America, electrician, have invented certain "Improvements in Electric Lamps and the manufacture thereof, and in systems thereof," of which the following is a specification:—

My electric lamp consists essentially, as shown in patents hitherto granted me, of an incandescing conductor of high resistance, hermetically sealed in a glass vacuum chamber.

Great difficulty had always been experienced in attempting to so seal a glass vacuum chamber that danger of separation or opening of the parts should be avoided, and a stable vacuum maintained; in fact the maintenance of a stable vacuum had been pronounced impossible by many scientists.

In a prior patent I have shown and described a process of manufacture by which this end may be attained. The same end is the object of one portion of this invention, this embodying changes which result in increased economy of cost of manufacture.

Hitherto it has been usual to blow the glass enclosing chamber or bulb of the lamp from glass tubing, requiring that the glass first be made into a tube, the tube divided into proper lengths, and the bulbs then blown, an expensive and wasteful process. In this instance the bulb or chamber is to be blown directly from the pot glass. The blower takes upon his blowing rod a sufficient quantity and blows the same into a bulb, giving it just sufficient motion to cause the bulb to elongate, so that its outer extremity shall be or about be semicircular, from which the sides taper gradually and in straight or approximately straight or slightly curved lines, to the end of the blowing rod.

The bulb so formed is then broken away at the tapered end sufficiently to leave an aperture large enough for the introduction into the globe of the carbon and its supports.

Upon the semicircular end of the globe a small opening is made, and a small tube formed thereon, either by drawing out the material at that end, or by attaching thereto a separate piece of tubing to form the exhaust tube of the completed lamp, for attachment to the exhaust apparatus.

A small piece of tubing is taken, and an enlargement is blown therein, of a diameter about equal to the aperture referred to as being made in the tapering or conical end of the globe or bulb.

The leading-in wires, *i.e.*, the wires which pass into the lamp, and are to connect with the carbons, are then laid in this tube, one end is then brought to a welding or nearly melting heat, and clamped down by suitable means upon the wires, hermetically and firmly sealing them in the glass of the tube.

Another portion of my invention has for its object to furnish means for clamping these leading-in wires to the incandescing conductors, more cheaply and readily than by the platinum clamps heretofore used.

The wires which preferably are used are each in three sections, a central bit of platinum for sealing into the mass of the glass, with copper extremities, one leading away from the lamp, one leading into the lamp, for receiving and supporting the carbon.

This latter section may be cut from flat or sheet copper with an enlarged end, or it may be formed of a bit of wire, one of whose ends is flattened out. This enlarged flattened portion is wrapped around the enlarged ends of the carbon, securing it and making electrical contact therewith. This union may, if desired, be electro-plated, as shown in a prior patent.

The carbon being secured to the leading-in wires, and they sealed in the small tube referred to, the carbon is introduced into the globe, and the edge of the opening in the globe and the enlargement of the tube sealed together at a welding heat. The lamp is then attached to the exhaust or vacuum apparatus by the exhaust tube referred to, and the air exhausted therefrom.

When the proper degree of exhaustion has been attained, the lamp is sealed by a fusion and welding of the exhaust tube, near to the body of the lamp or globe.

This may be better understood perhaps by reference to the drawings, in which figure 1 shows the globe as blown and attached to the blowing rod; figure 2, the globe with its end blown off and the exhaust tube attached; figure 3, the supporting tube; figure 4, the lamp completed and sealed; figure 5, the lamp provided with means of attachment to a fixture; figure 6, a wire or blank for supporting the carbon.

The blowing rod B, indicated in broken lines, is dipped into the molten or pot glass, and a sufficient quantity taken up thereon, which is then blown into the shape shown in figure 1. This shape is semicircular at its outer end, from whence the sides taper in straight or nearly straight lines to the smaller end, and this shape distinguishes the lamp thus made from any heretofore made.

The part a^1 is then cut or broken from the body A, leaving an aperture at a .

A is then heated at b , and a tube, b^2 , formed thereon, either by drawing out the material at b or by attaching thereto a separate piece of tubing.

A piece of tubing, D, is taken, and an enlargement, d , formed thereon of about the diameter or of a slightly larger diameter than a . In this tube are laid the leading-in wires, 1, 2. These wires are each formed of three sections, a central one, p , of platinum, which is the portion to be in contact with the glass, with outer sections, e , of copper. The end i of the tube is then brought to a welding heat, and squeezed firmly together, sealing the parts p p of 1 2 firmly and hermetically therein. The carbon C is then attached to the wires e e .

One of these wires is shown in figure 6. They may be cut of the shape there shown from flat copper, but I prefer to take a piece of wire, e , and flatten its end to form the enlargement e^1 , which enlargement is folded upon or wrapped around the enlarged end of the carbon, making a firm and secure contact therewith and support therefor. If desired this union may then be plated.

If desired, the neck or tube D may be made as has previously been described by me in other patents, and the wires and clamps therein shown used, but for economy I prefer the means and methods herein shown.

The tube and carbon being arranged in relation to each other, as shown in figure 3, the carbon is introduced within the body of A, and the edges a and d brought together, at which point they are then sealed by a welding or fusing of the glass itself.

The lamp is then attached by the exhaust tube b^2 to the vacuum apparatus, and when the proper degree of vacuum has been reached it is sealed off at b^1 , the result being the lamp shown in figure 4.

Means

Improvements in Electric Lamps.

Means S for attaching the lamp to its support or fixture are then secured thereto, and the lamp is ready for the market.

Another part of this invention relates to the carbons used as the incandescing conductors in lamps for giving light by electrical incandescence, and its object is to render more stable these carbon filaments, to the end that the life of the lamps may on the average be prolonged.

When carbon filaments are used for lighting by incandescence, a phenomenon is found, to which may be applied the term "electrical carrying." This is an absolute carrying or moving of the carbon itself from the negative to the positive end of the carbon.

The amount of such carrying depends upon the resistance of the filaments, the degree of incandescence, the electro-motive force between the clamping electrodes, and the state of the vacuum.

While its amount may vary with varying conditions of these elements, it is the great cause of the ultimate destruction of the carbons used in high vacua, and if its degree and amount can be reduced, a proportionate increase in the life of the carbons is assured.

To this end this portion of my invention consists, generally, first in arranging the carbons in the lamps so that the strongest portion thereof, or the portion having the least resistance, shall be at the negative clamp; and secondly, in constructing a carbon having a greater mass of matter and less resistance at one terminal than at the other, the matter gradually decreasing, and the resistance gradually increasing from one to the other pole.

In constructing such a carbon, it is made of its fullest width at the negative end, whence it gradually tapers to the positive end. This construction gives a lower resistance and a lower incandescence at the negative end, so that the carrying from such negative end by electrical action is materially reduced, while the total resistance, candle power and economy of the carbon may remain the same, its duration or useful period being lengthened proportionately to the reduction of carrying. In practice such carbons should be made so that the unit of incandescence at the negative pole will be about eleven or twelve candle power, rising gradually to eighteen at the positive pole, the average of the carbon or its total lighting effect being about sixteen candle power, under normal conditions.

It is evident that instead of carbons being made tapering from one pole to the other as described, the same result may be produced by taking ordinary carbons, uniform in size throughout their length, and increasing the mass of matter and conductivity of one side by a deposit of carbon thereon, or soaking certain parts in a carbonizable solution, drying, and then re-carbonizing.

It often happens that carbons intended to be of uniform size throughout their length are found to be defective upon one side, that spots or weak places there appear. Such may be utilized by placing them in a lamp, so that the defective side becomes the positive end of the loop, the other or perfect side having less resistance, being made the negative side. By so using such carbons their life or duration will not be materially shortened, as the inevitable carrying then proceeds from the perfect to the imperfect side.

These points are illustrated in figures 7 and 8 of the drawings. Figure 7 represents a carbon made especially to carry out this invention; and figure 8 the same embodied in a lamp. In this case the end N intended for the negative end of the loop is made wide, and tapers gradually to the positive end P.

By the above described processes, and others employed by me in the manufacture of carbon conductors for the incandescent electric lamps used in my system, and in the production and retention of vacua in the enclosing globes thereof, I am enabled to make both the carbons and the vacua so nearly perfect that the carbons will withstand the heat of incandescence without being consumed thereby, for a very long period. In the present state of the art, however, it is impossible to manufacture a carbon which will not eventually be destroyed. When a carbon is destroyed the substitution of a new lamp is an exceedingly simple and easy matter, where the lamp is used in an accessible position. Sometimes, however, they may be used in comparatively inaccessible positions, or in positions where it would be difficult or inconvenient to substitute a new lamp for one burnt out, when the latter event happens.

Therefore some means seem desirable by which, when a lamp gives out and the current ceases to pass through it, the circuit will be instantly and automatically completed through another lamp, so that the extinguishment of the light will be only momentary. To accomplish this is the object of this part of my invention.

Generally speaking my arrangement is as follows: A small electro-magnet is placed in the circuit of the lamp, being magnetized by the current passing through its helix. The magnet is provided with an armature, which, as long as current passes, is held closely to it, but if the lamp from any cause is extinguished and the current ceases to pass, is withdrawn by a spring or weight, and makes contact at other points, closing the circuit of a second lamp and lighting it instantly.

Means may of course be provided so that three or any desired number of lamps may be placed together and lighted, and used successively.

Figure 9 of the accompanying drawings is a diagram showing the connections of two lamps properly arranged; while figures 10 and 11 show different methods of placing three lamps in circuit.

A B (figure 9) represent lamps, the lamp A being now in operation. It is placed in a derived circuit, 7 8, from the main conductors 1 2, its current passing from the main conductor 1 to the wire 7, through the coils of the magnet M to the lamp, and thence by wires 9 8, back to the main conductor 2. But if from the giving out of the carbon, or from any other cause, current ceases to pass through the circuit 7 8 to the lamp A, the core of M becomes demagnetized, and the armature lever N, which works on a pivot, is withdrawn by means of the spring *a*, and closes circuit through the contacts *c c'*, changing the direction of the current through 7 8, which now passes through the armature N and wire 5 to the lamp B, and thence back to the main conductor by wires 6 8. Instead of using the spring *a*, the end of the armature lever may be weighted, so that the action of gravity will withdraw it from the magnet when the current ceases to pass therein.

The arrangement of the lamps C D is somewhat different. In this case each lamp has a separate return wire to the main circuit. The current normally passes through the wire 4 and magnet M¹, to the lamp C, thence through the wire 3 back to the main circuit. But if current ceases to pass through the magnet the armature N¹ is withdrawn by means of the spring *a'*, making contact at the point *d*, and closing a circuit, 4 10, through the lamp D.

In

Improvements in Electric Lamps.

In figure 10 the lamp C¹ is in the derived circuit 11 12, in which is included the electro-magnet G, which is provided with the armature H, having the spring S. When current ceases to pass to C¹, the armature H is withdrawn from the magnet G touching the contact *f*, and causing current to pass through the wire K, armature H, and contact point *f*, to the magnet G¹ and lamp A¹, the armature H¹ (which has previously been held down by the end of the armature H now being attracted by the magnet G); thence by wire 13 to the main conductor 2, so that the lamp C¹ will be replaced by A¹. Should this in turn give out, the lamp B¹ is thrown into circuit by the withdrawal of the armature H¹ from the magnet G¹ and its consequent contact with *f*¹, so that a circuit, 12 14, is completed through the lamp B¹.

Another form of my invention may be seen in figure 11. Here a derived circuit, 15 16, passes through the magnet O and lamp C², and if the current through this should cease, the circuit 15 17, including the magnet P and lamp B², is formed by the contact of the armature S with *o*. R is a metal strip rigidly secured at one end, and normally passing half way between the magnets P P¹, but when the magnet P is in circuit it is drawn toward P and held against it; but should the current cease to pass through the circuit 15 17, and the magnet P lose its attractive force, the spring R will fly back, making contact at *h*, completing the circuit 15 18 through the lamp A², and energizing the magnet P¹ so that R will be held against the magnet and therefore against the contact *h*.

It is evident that by these arrangements or modification thereof any desired number of lamps might be so placed that each could be instantaneously replaced when necessary by another.

If a number of incandescent electric lamps be arranged as a series on one circuit, the interruption of the circuit at any one lamp by breakage of the incandescing portion or from other cause, results in the extinguishment of all the lamps upon that circuit.

An arrangement which would obviate this and preserve automatically, when one is injured, the circuit to all the other lamps, seems desirable. To accomplish this, a number of lamps are placed in shunts to the main circuit, each being provided with a magnetically operated switch, so arranged that if current ceases to flow through a lamp the circuit will be completed around it to the others, and on the lamp being replaced current will again flow through it.

These switches are made as armature levers, limited in their play on one side by back-stops, and on the other side connected to the main conductor through a small resistance.

A small branch circuit passes around the lever without including it, and contains a small electro-magnet.

If no current is on, the armature rests on its back-stop and is not attracted by the magnet, but when current passes, the resistance causes a fraction thereof to pass through the magnet, which then attracts the armature lever, breaks the main circuit, and allows current to pass through the shunt circuit of the lamp. But if the lamps breaks and the current ceases to pass, the magnet releases the armature lever, which falls and completes the main circuit as before, while upon remedy of the injury the circuit is again automatically restored.

These arrangements are shown in figure 12 of the drawings, in which G is a generator, here shown as a single machine of the dynamic type, but which may be of any desired type, and of which any necessary number may be used. From it leads the main or consumption circuit 1 2, while a circuit, 3, therefrom leads around its field of force magnets. In this field circuit 3 are included a resistance, R, and switch, S, which may be operated automatically or by hand to vary the strength of the field circuit, and so regulate the generative force of G.

In a derived circuit, 4, is an electro-dynamometer, I, for indicating the pressure or electro-motive force of the current.

5, 6, 7, 8, 9, 10 are branch circuits, each starting from and returning to one of the main or supply conductors.

In 5, 7, 8, and 10, switches *s s* are shown interposed in the main conductors between the points of departure and return of the branch circuits, and forming when in use the main circuit between those points, so that, as shown in 8, when closed the lamp is short-circuited, the main circuit being complete around it, while when open as in 5, 7, and 10, the main circuit is thrown through the lamps.

At 6 and 9 are shown the means for preserving the circuit complete to the remaining lamps, notwithstanding any injury to one.

In such case the switch is made as an armature lever, *l*, limited in its play in one direction by a back-stop, *a*, in the main circuit. Upon the other side the lever is connected to the main conductor through a small resistance, *r*.

From a main conductor, and upon the side where is the back-stop *a*, a branch, *o*, leads, in which is included a magnet, *m*, of low resistance, acting upon the armature lever *l*.

Supposing now that no current be on, or that the circuit be broken, the position of the parts will be as in 6, with *l* resting on its back stop. If now the line be closed or current sent therethrough, the resistance *r* will cause a fraction thereof to be deflected through *o* and *m*, whereupon *m* is charged and attracts *l*, lifting it from its back stop, breaking the shunt *l r* around the lamp and causing all the current to pass through the lamp circuit as in 9. If now a lamp breaks, so as to interrupt its circuit, the magnet *m* releases *l*, which dropping, completes the circuit *l r* around the lamp, as in 6, while upon remedy of the injury the circuit through the lamp is again automatically restored.

In these lamps it may sometimes happen that the enclosing globes are blackened to some extent by the deposition of carbon carried there by the phenomenon known as electric carrying.

A further object of this invention is to obviate any ill effects from this cause, to which end it consists in attaching to each lamp a short magnet presenting such a polarity to the positive side of the carbon filament that it will attract the highly electrified carbon vapour downwardly to the clamps instead of permitting it to be deposited upon the glass, as would be the case under ordinary circumstances, especially in high vacua.

Figure 13 of the drawings is a view of a lamp with a magnet attached.

G is a lamp consisting of an hermetically-sealed exhausted glass globe, in which the filament *c* is secured in clamps, *a b*. Upon its side in a suitable support is fixed the magnet N S, the upper end of which reaches to about the height of the clamps. It is placed upon the positive side of the carbon.

This magnet may be a very weak one, as a very weak magnet will deflect a stream of electrified carbon vapour. The effect of this magnet is to attract the vapour to the clamps, so preventing its deposition upon

Improvements in Electric Lamps.

upon the glass. In place of the magnet, a coil of wire with a current passing through it may be used, as its effect would be to deflect or attract the vapour in the same way.

In my electric lamps, it is best that the leading-in conductors above mentioned be of very small mass in section, possess a co-efficient of expansion under heat influence as near that of the glass as possible, and be able to stand the degree of heat requisite to fuse the glass around them. Platinum possesses these qualities in a marked degree, hence I have used it as the conductor passing through and sealed into the glass of the enclosing globe, and thence leading to the carbon or incandescent material. It, however, is one of the most expensive elements used in the construction of the lamp, and any arrangement which tends to economy in its use seems very desirable.

The object of a further portion of my invention therefore is to furnish an arrangement by which a minimum of platinum only is used in the leading-in conductors, the remainder being of cheaper material. To accomplish this, each leading-in conductor is made of three pieces, a central one consisting of a bit of platinum as long as, or a mere trifle longer than, is to be the length of the contact of the enclosing glass with the leading-in conductor; an inner terminal which is to rise from the platinum bit within the globe to the height at which it is desired to support the carbon; and an outer terminal, which may be of any desired or convenient length, the terminals being of copper or any suitable low resistance conductor, and fastened to the central platinum by soldering, or in any other efficient method.

This is illustrated in figures 14, 15, 16, and 17 of the drawings, of which figures 14 and 15 show such a leading-in conductor, and figures 16 and 17 supporting necks, each with two such conductors properly sealed in.

A piece of platinum, *b*, is taken, and to it are secured copper terminals, *a c*.

Hitherto I have shown two ways of sealing in the wires—one represented in figure 16, wherein the wires are laid in the tube which is to form the support for the carbon and globe, the glass heated and pressed together as at *e*. In the other case, in figure 17, a small bulb, *i*, is blown, and the wires pass through the top and the glass sealed therearound. In figure 16 the wires are in contact with the glass for a greater distance than in figure 17. The length of the platinum *b* should be proportioned to this length of contact, being just about equal or slightly greater in length than the contact. For instance, in figure 14 the platinum *b* is slightly larger than the length of the sealing portion *e* of figure 16, while in figure 15 it is much shorter, but bears the same relation to the sealing length as in the other case.

Of the copper wires *c* is the inner terminal, and receives upon its free end the carbon, which is fastened thereto by clamps, by plating or by wiring. *a* is the outer terminal, and may be of any desired length. By this construction the advantages of platinum as a leading-in conductor are preserved, while a minimum of the expensive material is used.

What I claim is :—

First—~~The enclosing globe of an incandescent lamp, blown directly from molten or pot glass, substantially as set forth.~~ T. A. E., by his Attorney, E.W.

Second—The method of manufacturing electric lamps, substantially as set forth, consisting in ~~forming the inclosing globe or chamber directly from molten or pot glass, forming separately the supporting tube or neck for the incandescent conductor, sealing the leading-in wires therein, and attaching the carbon or incandescent conductor to the leading-in wires, and then hermetically uniting the parts, prior to the exhaustion of the lamp, substantially as herein described.~~ T. A. E., by his Attorney, E.W.

Third—A clamp for receiving and supporting an end of an incandescent conductor, consisting of a body of metal with flattened end adapted to be folded upon or wrapped around the end of the conductor, substantially as set forth.

Fourth—A leading-in wire composed of a central platinum section for sealing into the glass, an outer section and an inner section, the latter having a clamping device integral therewith, substantially as set forth.

Fifth—The improved method of arranging incandescing carbon conductors in electric lamps, consisting in so arranging them that the mass of matter shall be greater and the resistance shall be less at one end than at the other, substantially as set forth.

Sixth—A carbon for an incandescing conductor for an electric lamp, having one of its ends or portions of less resistance and greater mass of matter than the other, substantially as set forth.

Seventh—A carbon for an incandescing conductor for an electric lamp, tapering from one end to the other.

Eighth—The method of utilizing defective or spotty carbons for incandescing conductors in electric lamps, consisting in arranging them in the lamps so that the more perfect side is the negative portion, substantially as set forth.

Ninth—In an electric lighting system the combination with two or more multiple arc circuits, each containing an incandescent lamp, of means for automatically transferring the current from one circuit upon its breakage to another, substantially as set forth.

Tenth—The combination with a multiple arc or derived circuit containing an electric lamp, of means for closing automatically upon the breakage of the above noted circuit, another multiple arc or derived circuit containing a lamp, substantially as set forth.

Eleventh—The combination with a multiple arc circuit containing a magnet, of a second multiple arc circuit controlled by the armature lever of the magnet, so that the current is automatically transferred from the first circuit upon its breakage, to the second circuit, substantially as set forth.

Twelfth—The combination with two electro-magnets of a spring armature passing between them, and so arranged that upon the demagnetization of one magnet the armature will fly back and complete a circuit through the other magnet, and be held thereby, substantially as set forth.

Thirteenth—The combination of a main circuit containing incandescent electric lamps, and a magnetically operated switch at each lamp, automatically closing or breaking the shunt circuit, so as to cut in or out of circuit the lamp, substantially as set forth.

Improvements in Electric Lamps.

Fourteenth—The combination with one main circuit of a series of incandescent electric lamps and automatically operated magnetic switches, controlling the circuit through the lamps, substantially as set forth.

Fifteenth—The combination with an incandescent electric lamp, of means as described for preventing the deposition of carbon upon the globe, substantially as set forth.

Sixteenth—A leading-in conductor formed of a central platinum piece with terminals of other metal, substantially as set forth.

Seventeenth—The combination of a piece of platinum sealed into the glass and terminals of other metal secured thereto, substantially as set forth.

Signed by me, this 15th day of June, A.D. 1881.

THOMAS ALVA EDISON.

Witnesses—

CHAS. H. SMITH.

GEO. T. PINCKNEY.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to Thomas Alva Edison, this fifth day of November, A.D. 1881.

AUGUSTUS LOFTUS.

REPORTS.

Sir,

Sydney, 19 September, 1881.

We do ourselves the honor to report, in reply to your blank cover communication of the 12th instant, No. 8,877, transmitting Mr. Thomas Alva Edison's Petition for the registration of "Improvements in Electric Lamps and the manufacture thereof, and in systems thereof," that we are of opinion the prayer of Mr. Edison's Petition may be granted, excepting his first claim, and so much of his second claim attached to his specification as relates to the manufacture of globes directly from molten or pot glass.

We have, &c.,

E. C. CRACKNELL.
GOTHER K. MANN.

The Under Secretary of Justice.

Sir,

Sydney, 4 October, 1881.

We do ourselves the honor to report, in reply to your blank cover communication of the 28th ultimo, No. 9,363, that we are of opinion the prayer of Mr. T. A. Edison's Petition may now be granted, in accordance with his revised specification, drawings, and claim.

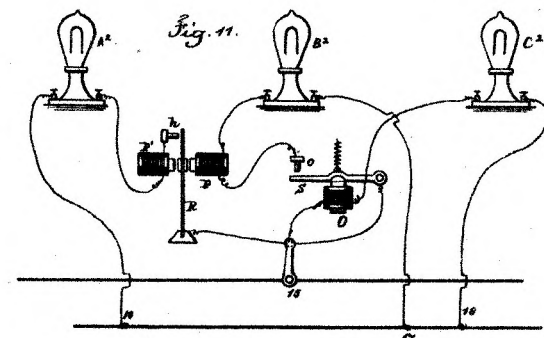
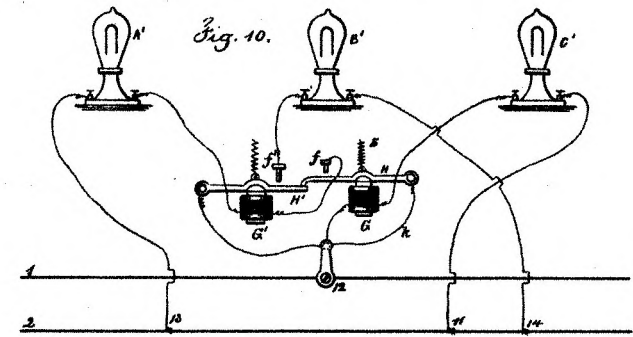
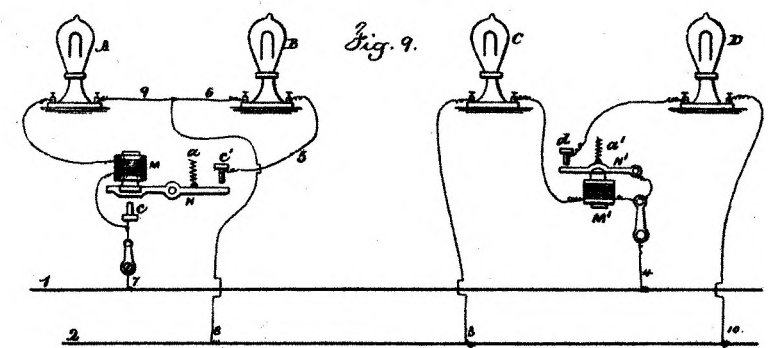
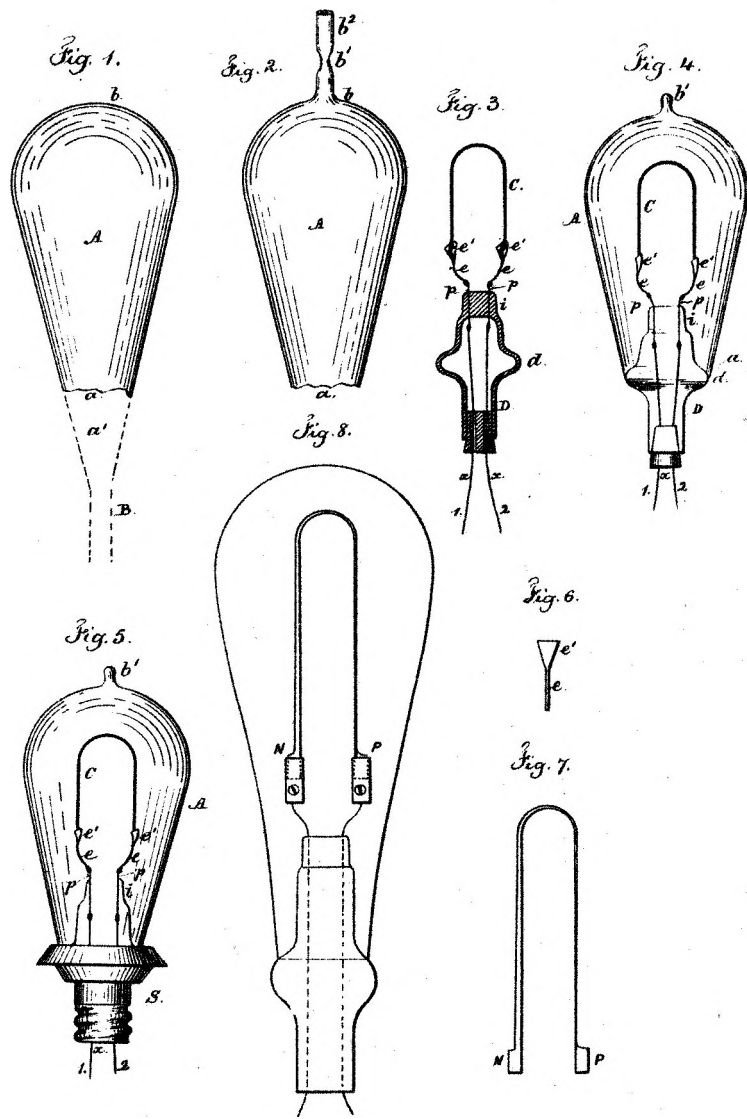
We have, &c.,

E. C. CRACKNELL.
GOTHER K. MANN.

The Under Secretary of Justice.

[Drawings—two sheets.]

B.



Thomas Alva Edison

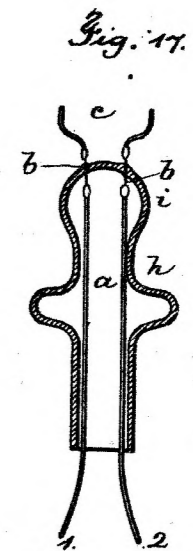
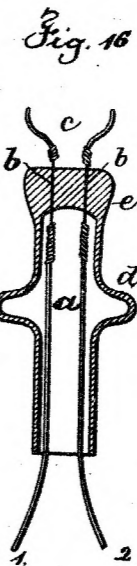
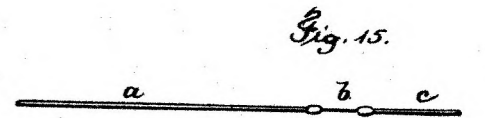
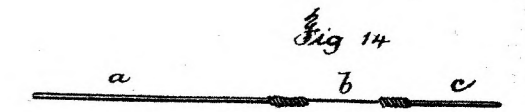
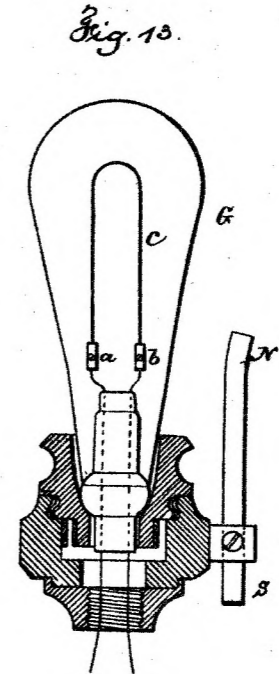
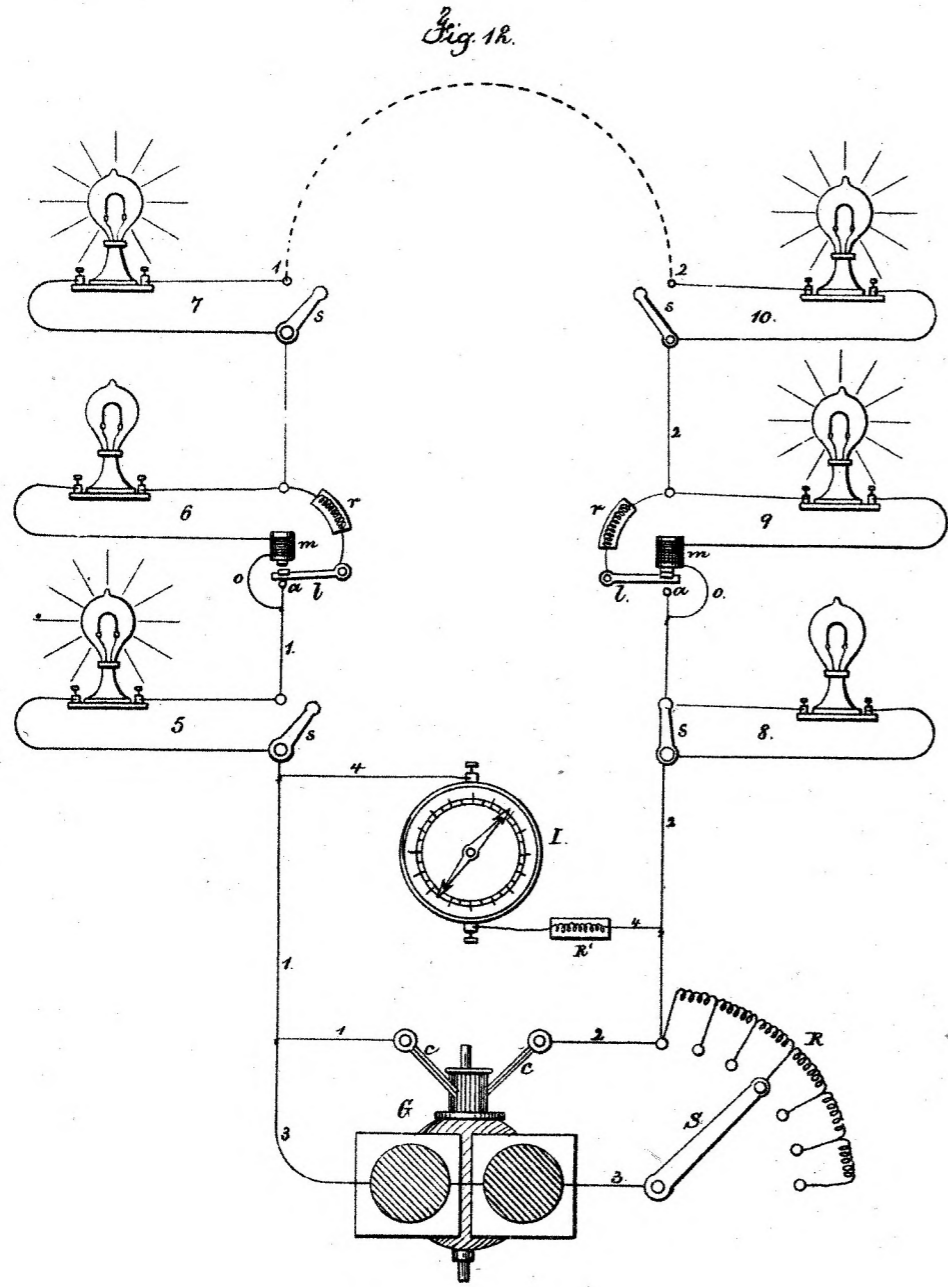
Witness
Chas. H. Smith
J. Stark

This is the Sheet of Drawings marked B referred to in the annexed Letters of Registration, granted to Thomas Alva Edison this fifth day of November, A.D. 1881.

Augustus L. oftus.

(Sig. 34.)

PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE, SYDNEY, NEW SOUTH WALES.



Thomas Alva Edison

Witnesses
Chas H. Smith
J. Hall

This is the Sheet of Drawings marked C referred to in the annexed Letters of Registration, granted to Thomas Alva Edison this fifth day of November, A.D. 1881.

Augustus Loftus.



A.D. 1881, 16th November. No. 1014.

AN IMPROVED TABLE, CONVERTIBLE INTO EITHER A BILLIARD OR A
DINING TABLE.

LETTERS OF REGISTRATION to Henry Upton Alcock, for an improved Table,
convertible into either a Billiard or a Dining Table.

[Registered on the 16th day of November, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS
(commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of
the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-
Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting:

WHEREAS HENRY UPTON ALCOCK, of Russell-street, Melbourne, in the Colony of Victoria, timber merchant, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "An improved Table, convertible into either a Billiard or a Dining Table," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Henry Upton Alcock, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof: to have, hold, and exercise unto the said Henry Upton Alcock, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said Henry Upton Alcock shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of
Registration to be sealed with the seal of the said Colony of New South Wales, at Govern-
ment House, Sydney, in New South Wales, this sixteenth day of November, in the year o
our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

An improved Table, convertible into either a Billiard or a Dining Table.

SPECIFICATION of HENRY UPTON ALCOCK, of Russell-street, Melbourne, in the Colony of Victoria, timber merchant, for an invention entitled "An improved Table, convertible into either a Billiard or a Dining Table."

THIS invention consists of a certain improved construction of table by which it may be converted from a billiard-table to a dining-table, and *vice versa*.

According to this invention the billiard-table is not reversible, as in other tables intended to be thus convertible, but is lowered from its position face upward by means of eccentrics or cams, or other mechanical equivalent, so as to be on a level with or a little below the level of the surrounding framing which supports it, and when lowered to this position the leaves forming a dining-table are placed over it. This framing is set at such a height as to make a comfortable dining-table.

In addition to the above I also provide for a sliding extension at one or both ends of such table, so that it may be lengthened in either direction, and covered with leaves as before, the sliding frame being of such a height as that when the leaves are placed upon it the whole surface of the table proper and its extension or extensions will be on a level.

On referring to my drawings, it will be seen that I have illustrated two methods of constructing my improved table, in neither of which is there any extension, but in which are shown two out of many methods of raising and lowering the billiard-table into position. I also show my method of making such tables extensible. In each case similar letters indicate similar parts wherever they occur.

Figure 1 shows plan of the first form of my improved table in position as a billiard-table; figure 2, longitudinal section thereof; whilst figure 2a shows a similar view as it appears ready for the reception of the leaves or top of the dining-table, which are fastened in position by means of slips of wood on their underside, fitting either inside the cushion or outside the billiard-table, and held together by the usual catches. Figure 3 is an end view, partly in section, of figure 2; and figure 4 is a view of the bottom of the billiard-table proper. A is the billiard-table, provided with wings or guides, A¹, which are just inside the main frame B, on legs, B¹. The right and left handed screw C works in thrust bearing C¹, fixed on the billiard-table and bearings at either end thereof. On this screw are right and left handed nuts, D¹, pivoted in lifters, D¹, at their upper edge. These lifters consist simply of a piece of wood planed and smoothed, and swivelling on their journals at D²; D³ are pivot pieces fastened to the legs B¹, and main frame B, carrying the journals D² of the lifters D. D⁴ are rest pieces at opposite corners on the frame.

It will be seen that if the screw be turned in one direction by a handle at the end, that the nuts D¹ will gradually come together, lowering the lifters D until they rest upon the pieces D⁴, and the table appears as shown in figure 2a. By turning the handle in the other direction the lifters will raise the table until it appears as shown in figure 2. In this form the screw travels up and down with the billiard-table.

Figure 5 shows plan of the second form of my improved table, in which the screw does not travel up and down with the billiard-table but remains permanently attached to the framing. Figure 6 is longitudinal section of same, as it appears with the billiard-table lowered down, and ready for the leaves or top of the dining-table to be placed upon it. Figure 6a similar view, as it appears with the billiard-table raised into position; and figure 7 end view, partly in section of figure 6. It will be seen that in this case the construction is substantially the same as in figures 1 to 4, the difference being that the thrust bearing C¹ is fastened not to the table but to a cross piece, B², of the frame, which also carries the ends of it. In this case the nuts D¹ are embraced by a forked connecting rod, D², to the upper edge of the lifters D.

The raising and lowering of the billiard-table is attained as in the first illustration by turning a handle on the end of the screw C, so as to lower the billiard-table from the position shown in figure 6a to that shown in figure 6, where it is ready for the leaves of the dining-table to be placed on top of it, or *vice versa*. An extra leg might be placed in the centre under cross piece B², if so preferred.

Figure 8 shows side elevation partly in section of a third form of my improved table, which is made exactly the same as in figures 5 to 7, with the addition of sliding extensions at either end. Figure 9 shows end view also partly in section of the same table. In this case the raising and lowering of the billiard-table is identical in principle and construction to that last before described, but the extension at either end is additional, and is made outside of the main frame B, and inside of a second frame, B³, by means of a sliding frame, E, on legs, E¹, as clearly shown in figure 9. In this form I have shown the extra leg in the centre, spoken of before.

My method of putting a third lifter under the billiard-table with or without the centre leg is shown in figure 10, which is an elevation of the frame with one side removed. It is on the same principle as those before described, the motion of the centre lifter D⁶ being taken by means of connecting links, D⁷, at either end from one of the other lifters, D.

In every case the leaves of the table which form the dining-table are placed over the billiard-table, and are kept in position by means of slips of wood on their underside, which fit either inside the cushion or outside the billiard-table, such leaves being held together by the usual catches. In every case these leaves have to be lifted off before the billiard-table can be used.

Having thus described the nature of my invention and the manner of performing same, I would have it understood that I do not claim broadly the construction of tables which are convertible at will into a billiard or dining table, because I am aware that this has been accomplished in the construction of what are known as reversible billiard and dining room tables; but my invention relates to the construction of such tables which are raised and lowered and are not reversible. I do not therefore confine myself to any precise method of raising and lowering such tables, although I have shown and described what I believe to be the best, but I claim—

First—The construction of tables which are capable of being converted into either a billiard or dining table at pleasure, by simply raising and lowering the billiard-table proper, and when required for a dining-table simply covering the billiard-table proper with leaves, substantially as herein described.

Second—

An improved Table, convertible into either a Billiard or a Dining Table.

Second—The construction of such tables with sliding extensions, as illustrated in figures 8 and 9.

Third—The two methods of raising and lowering the billiard-table proper in such convertible table, as shown in figures 1 to 4 and 5 to 7.

In witness whereof, I, the said Henry Upton Alcock, have hereto set my hand and seal, this twenty-third day of September, one thousand eight hundred and eighty-one.

H. U. ALCOCK.

Witness—W. S. BAYSTON,
Clerk to Edward Waters,
Patent Agent, Melbourne.

This is the specification referred to in the annexed Letters of Registration granted to Henry Upton Alcock, this sixteenth day of November, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

The application of Mr. Henry Upton Alcock for Letters of Registration for an invention entitled "An improved Table, convertible into either a Billiard or a Dining Table," having been referred to us, we have examined the plan and specifications accompanying the same, and have now the honor to state that we see no objection to the granting of Letters of Registration as applied for.

Sydney, 10 October, 1881.

We have, &c.,
ARCH. C. FRASER.
THOS. RICHARDS.

The Under Secretary of Justice.

[Drawings—one sheet.]

No. 1015.

[Assignment of No. 978. See page 287.]

No. 1016.

[Assignment of Patent-rights in Elevated Tramways.]

H. U. ALCOCK'S PATENT

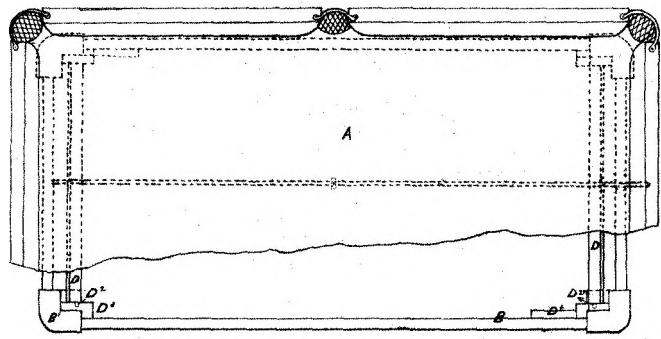


Fig. 1

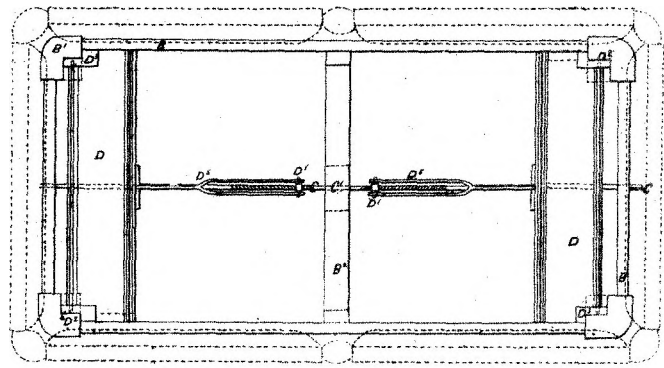


Fig. 5

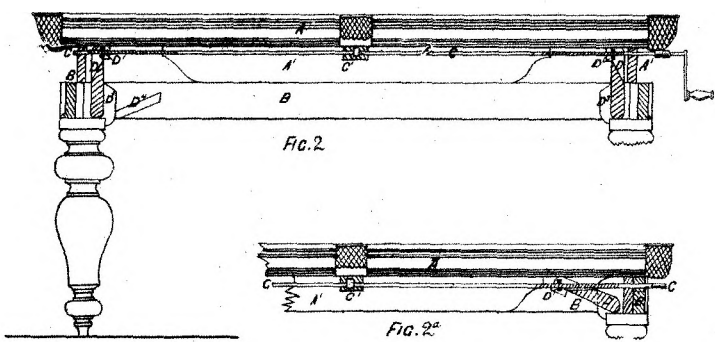


Fig. 2

Fig. 2^a

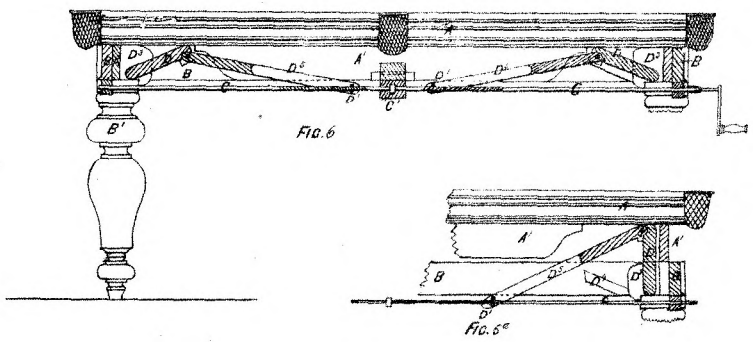


Fig. 6

Fig. 6^a

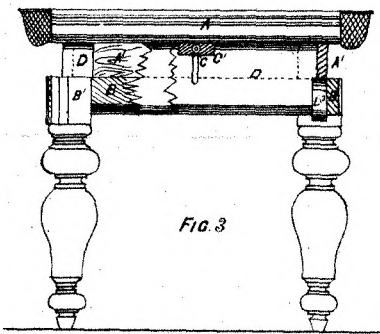


Fig. 3

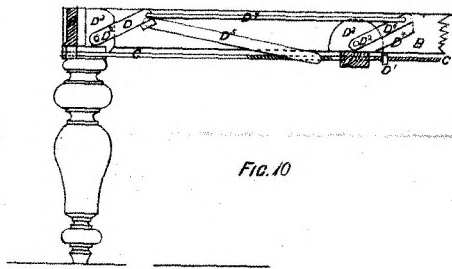


Fig. 10

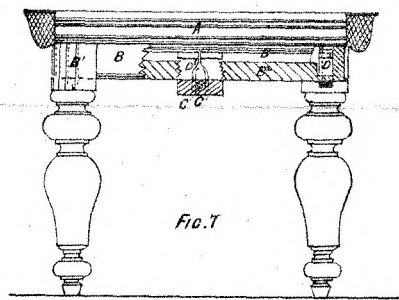


Fig. 7

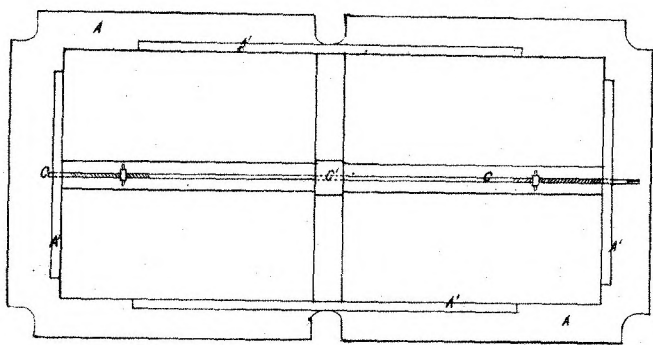


Fig. 4

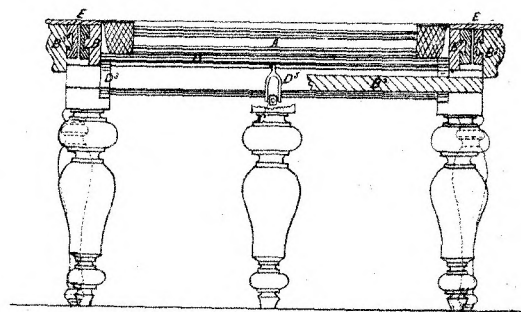


Fig. 9

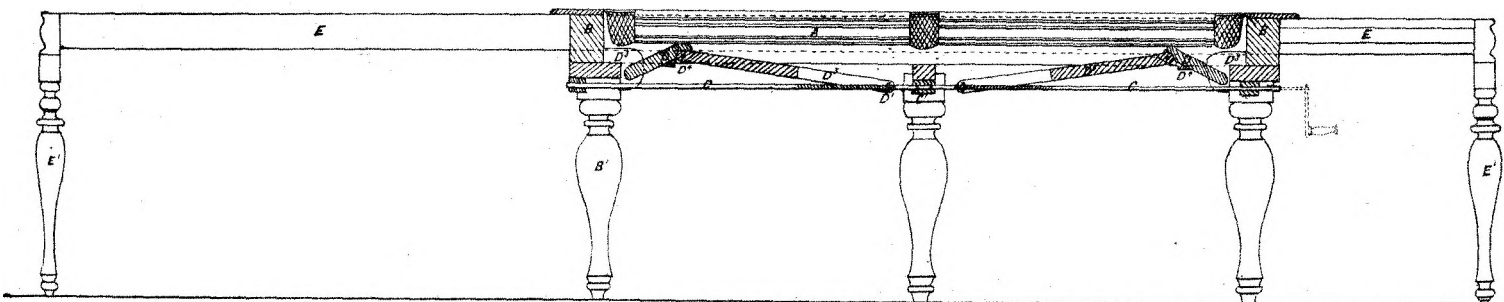


Fig. 8

This is the Sheet of Drawings referred to in the annexed Letters of Registration granted to Henry Upton Alcock, this sixteenth day of November, A. D. 1881. Augustus Loftus.

PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE, SYDNEY, NEW SOUTH WALES.



A.D. 1881, 25th November. No. 1017.

A MACHINE FOR SPLITTING WOOD.

LETTERS OF REGISTRATION to David Barnes, for a Machine for splitting Wood.

[Registered on the 25th day of November, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS DAVID BARNES, of Sydney, engineer, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "A Machine for splitting Wood," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed ; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four ; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years : And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said David Barnes, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof ; to have, hold, and exercise unto the said David Barnes, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended : Provided always, that if the said David Barnes shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this twenty-fifth day of November, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

A Machine for splitting Wood.

PROVISIONAL SPECIFICATION for wood-splitting machine.

A is a suitable frame with guides for sliding block B, containing one or more knives, deriving motion through crank or eccentric C. D is an endless chain conveying wood to and from knives, chain deriving motion from rod E to bell-crank F; thence by swinging bar and pawl G to ratchet H, secured by suitable means to carriers P. J, a movable plate for clearing the knives at each stroke.

To regulate wood to be split, adjust at G or H, in one case diminishing or increasing diameter of ratchet, or other means employed, such as toothless wheel, or in other case by having pin in swinging bar further or near from centre of P.

DAVID BARNES,
G.P.O., Sydney.

This is the specification referred to in the annexed Letters of Registration granted to David Barnes, this twenty-fifth day of November, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 28 September, 1881.

Having examined the plans and specifications accompanying the application from Mr. David Barnes for Letters of Registration for an Invention for splitting Wood, we are of opinion that there is no objection to the Petition being granted, so far as the arrangement described in the plan and specification now marked by us No. 1.

The plan referred to in Mr. Barnes' specification as No. 2 being for a distinct and different arrangement to No. 1, it could not be included in the same Letters of Registration.

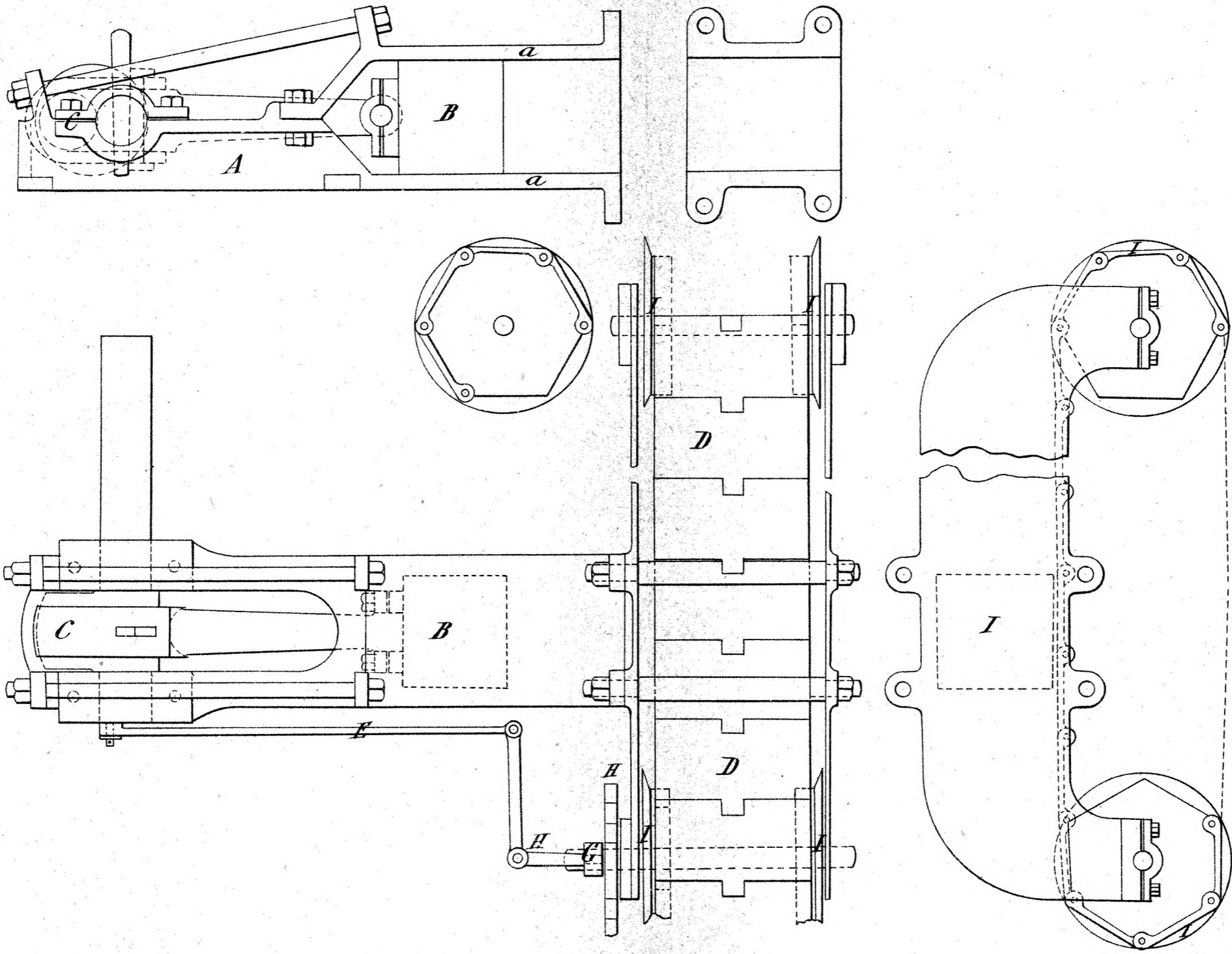
We have, &c.,

EDMUND FOSBERY.
JAMES BARNET.

The Under Secretary of Justice.

NOTE.—The applicant having accepted the suggestion of the Board, Letters of Registration were issued to him accordingly.

[Drawings—one sheet.]



*This is the Sheet of Drawings referred to in the annexed
Letters of Registration granted to David Barnes, this
twenty fifth day of November A.D. 1881.*

Augustus Loftus.

David Barnes.

Sig. 34.



A.D. 1881, 29th November. No. 1018.

IMPROVEMENTS IN COMMUTATORS FOR DYNAMO OR MAGNETO ELECTRIC MACHINES OR ELECTRO MOTORS.

LETTERS OF REGISTRATION to Thomas Alva Edison, for Improvements in Commutators for Dynamo or Magneto Electric Machines or Electro Motors.

[Registered on the 29th day of November, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS THOMAS ALVA EDISON, of Menlo Park, in the State of New Jersey, United States of America, electrician, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in Commutators for Dynamo or Magneto Electric Machines or Electro Motors," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Thomas Alva Edison, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said Thomas Alva Edison, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said Thomas Alva Edison shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this twenty-ninth day of November, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Commutators for Dynamo or

SPECIFICATION.

TO ALL WHOM IT MAY CONCERN: Be it known that I, THOMAS ALVA EDISON, of Menlo Park, in the State of New Jersey, United States of America, electrician, have invented certain improvements in Commutators for Dynamo or Magneto Electric Machines or Electro Motors, of which the following is a specification.

In the operation of magneto or dynamo electric machines, a spark is produced at each set of commutator brushes as they pass from one bar of the commutator cylinder to another. This spark is caused, first, by the breaking of a strong local circuit, produced by the brushes bridging the insulation between two bars; and, second, by breaking a portion of the main current at the same time.

Since it is extremely difficult, if not impossible, to adjust the brushes so that they will leave a commutator bar exactly together, this spark at each set of brushes is usually taken principally by one brush until that is reduced in length by the heat of the spark, when it is taken by another brush. In large and powerful dynamo or magneto electric machines, the sparks produced in this manner are exceedingly large, the result being a considerable waste of energy, which is converted into heat and injures the face of the commutator and the brushes that bear thereon.

The object therefore of my invention is to produce means for reducing the sparks at the commutators of these machines to the minimum.

In carrying out my invention, I widen the insulation and narrow the conducting bars at one end of the commutator cylinder, and I arrange to bear upon this portion of said cylinder, on each side thereof, a single commutator brush, whose bearing end is noticeably behind the ends of the main brushes beside which it is placed—that is to say, the end of this brush bears upon the commutator cylinder at a point which has already passed the main brushes. This brush, which I term for purpose of distinction the “isolated brush,” is not connected with the main brushes directly, but is connected with a series of breaking points resting on a “breaking cylinder,” which breaking cylinder has conducting bars and insulating spaces corresponding with those upon which the isolated brush bears.

This cylinder may be a separate cylinder mounted on the end of the shaft of the machine, or it can be a continuation of the commutator cylinder, its conducting bars being insulated from those of the commutator cylinder.

There may be two, or four, or any other desired number of these breaking points connected with the isolated brush on each side of the machine, the first point of each series being connected with the isolated brush, and the last point with the main wire.

In the working of the machine, the local circuit and a portion of the main circuit are continued through each isolated brush after the main brushes have left each commutator bar, so that no spark is produced at the point of the main brushes. When each isolated brush leaves a commutator bar, the current passing through it is also broken at a number of points on the breaking cylinder simultaneously with the breaking of the current on the commutator cylinder by the isolated brush.

In this manner the spark is divided up and the total spark greatly reduced, it being a discovery of mine that the spark at each point is reduced about as the square of the number of points at which the circuit is broken. Hence, if two breaking points are connected with each isolated brush, the spark at each point will be about one-ninth of what the entire spark would ordinarily be.

It is evident that this same arrangement could be used for the commutators of electro motors, and for other machines where the bad effect of a large spark is to be obviated.

In the annexed drawing, figure 1 represents a commutator in which a separate breaking cylinder is used; figure 2, one in which only one cylinder is used; and figure 3 shows the manner of connecting a large number of breaking points.

In figures 1 and 3, A is the commutator cylinder, $a a^1 a^2$ being insulating, and $b b^1 b^2$ conducting bars of its surface. The conducting bars are narrowed and the insulating spaces widened at the outer end of the cylinder. B is the breaking cylinder, whose conducting bars $c c^1$ correspond to those at the outer end of the commutator cylinder.

$d d$ are the main commutator brushes which take off the current and convey it to the wire 1; e is the isolated brush connected by the wire 2 to the brushes $h h^1$ (figure 1) on the breaking cylinder.

The conducting bars of the breaking cylinder are of such width that the brushes $h h^1$ break circuit simultaneously with the brush e .

In figure 3 four brushes $m m n n$, are used, all making and breaking circuit simultaneously with e , the last brush m being connected by wire 3 to the first brush n , and the last brush n to the main wire 1.

In figure 2 only one cylinder, C is used, divided by an insulating section, f , into two parts, one part forming the commutator cylinder, and the other the breaking cylinder. The arrangement and connection of the brushes are similar to the construction shown in figure 1.

In all these cases, similar brushes or sets of brushes are of course placed at the opposite side of the commutator, to correspond with the other pole of the machine.

What I claim is—

First—The method of reducing the spark at the commutators of dynamo or magneto electric machines, which consists in breaking the circuit at a number of points simultaneously, substantially as set forth.

Second—A series of commutator brushes, one of which is set noticeably behind the others, substantially as and for the purposes described.

Third—The combination with the commutator brush or brushes of a magneto or dynamo electric machine, of two or more circuit-breaking points arranged in series, and breaking circuit simultaneously with the breaking of the circuit at the commutator, substantially as set forth.

Fourth—A commutator cylinder, at one end of which the conducting spaces are narrowed and the insulating spaces widened, substantially as and for the purposes described.

Fifth—

Magneto Electric Machines or Electro Motors.

Fifth—The combination with the commutator cylinder and its brushes of a breaking cylinder mounted on the same shaft, and provided with means for breaking the circuit at several points, simultaneously with the breaking of the circuit at the commutator, substantially as set forth.

Sixth—The breaking cylinder whose surface is composed of alternate metal and insulation, provided with a number of brushes which make and break circuit simultaneously during the revolution of the cylinder, substantially as set forth.

Seventh—The combination with the isolated brush of the commutator of two or more brushes on the breaking cylinder, which break circuit simultaneously with the isolated brush, substantially as set forth.

Signed by me, this eighth day of August, A.D. 1881.

THOMAS ALVA EDISON.

Witnesses—

CHAS. H. SMITH.

GEO. T. PINCKNEY.

This is the specification referred to in the annexed Letters of Registration granted to Thomas Alva Edison, this twenty-ninth day of November, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

In reply to your B.C. minute of the 7th instant (No. 81-9,619), we beg to state that we have examined Mr. Thomas Alva Edison's application for Letters of Registration for Improvements in Commutators for Dynamo or Magneto Electric Machines or Electro Motors, and we see no objection to his Petition being granted.

Sydney, 25 October, 1881.

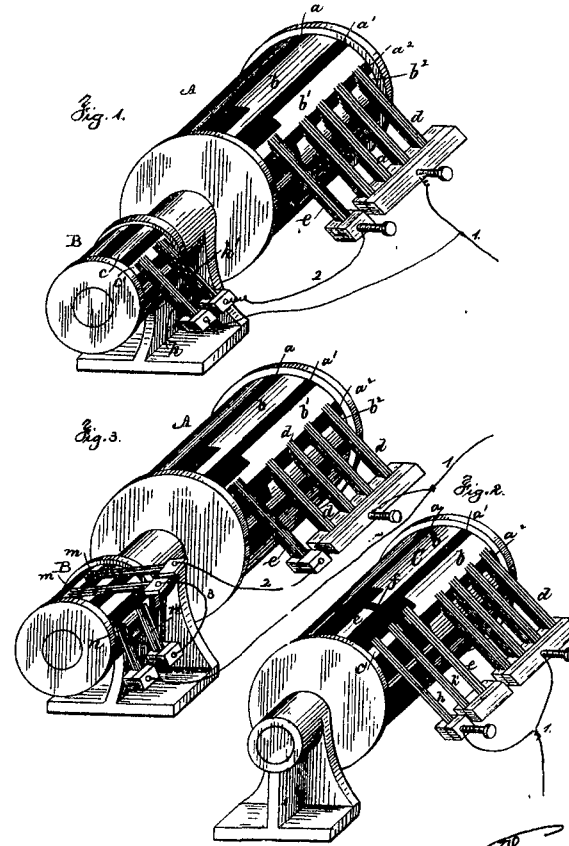
We have, &c.,

E. O. MORIARTY.

E. C. CRACKNELL.

The Under Secretary of Justice.

[Drawings—one sheet.]



Thomas alva Edison.

Witnesses
Charles Smith
Geo. J. Pinckney

This is the sheet of Drawings referred to in the annexed Letter
of Registration granted to Thomas Alva Edison this twenty
ninth day of November A.D. 1881

Augustus Loftus



A.D. 1881, 29th November. No. 1019.

IMPROVEMENTS IN ROCK-DRILLS.

LETTERS OF REGISTRATION to John Naylor and Robert Thornton, for
Improvements in Rock-drills.

[Registered on the 29th day of November, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS JOHN NAYLOR and ROBERT THORNTON, both of Stawell, in the Colony of Victoria, engineers, have by their Petition humbly represented to me that they are the authors or designers of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in Rock-drills," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed ; and that they, the said Petitioners, have deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four ; and have humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to them for a period of fourteen years : And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said John Naylor and Robert Thornton, their executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof ; to have, hold, and exercise unto the said John Naylor and Robert Thornton, their executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended : Provided always, that if the said John Naylor and Robert Thornton shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this twenty-ninth day of November, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Rock-drills.

SPECIFICATION of JOHN NAYLOR and ROBERT THORNTON, both of Stawell, in the Colony of Victoria, engineers, for an invention entitled "Improvements in Rock-drills."

OUR invention relates to the contrivances which we employ for regulating the supply and exhaust of the air or steam which gives the necessary motion to rock-drills. These contrivances are simple in construction, effective in operation, easily removable (for repair), and produce a machine which warrants us in calling ours a noiseless machine. They consist of certain peculiarities in the construction and arrangement of an equilibrium reversing valve fitted by preference above the centre of the drill cylinder. This valve is enclosed in a cylindrical case, and is made in the form of a hollow double-ended piston rod, on which are two hollow pistons with holes in a groove on their periphery. At the top of the case and near each end are small exhaust holes, and at the bottom are ports at either end leading to the cylinder of the drill, and at each end two valve supply passages leading from the cylinder. The operation is this: that at each stroke of the drill the piston thereof opens the valve supply passages, and the air in its cylinder is conducted to the cylinder containing the equilibrium reversing valve, forcing it to the opposite end, and thereby opening the exhaust, and also opening the supply at the other end for the return stroke. In order, however, that our invention may be clearly understood, we will now refer to the drawings hereto attached, in which the same letters indicate the same parts wherever they occur. Figure 1 represents a longitudinal sectional elevation of a rock-drill constructed according to our invention, and figure 2, a similar view of that part of the machine which constitutes our invention, this figure being shown full size, while the others are only shown half size; figure 3 is plan of the whole machine; figure 4, transverse sectional elevation on the line *aa* in figure 1; and figure 5, half sectional elevation on the line *bb* in figure 3. And we would here state that we have shown the whole of a rock-drill, in order the better to explain how our invention is to be applied, and not that there is anything new or of our invention in it beyond what is shown in figure 2, and not that our invention is not applicable to any other construction of drill, but to show one which we have found workable. A is the cylinder of the drill, and B the piston working therein; C and C' are the alternate supply and exhaust passages, and D and D' (shown in dotted lines) the passages which alternately conduct the compressed air or steam from the cylinder to actuate the reversing valve; E is the cylinder or casing of our sliding reversing valve, the hollow pistons of which are marked F and F' and the hollow double-ended piston rod G; H H' are the two sets of escape holes in the casing; I is the space between the hollow pistons, and is for conducting the supply to the passages C and C' alternately; J is the supply opening from the air reservoir or steam boiler.

It will be seen that in the position shown in the drawings the piston B has finished its instroke, and the compressed air or steam which has been giving it this stroke is exhausting through C' into hollow piston F', and from thence through hollow rod G to the atmosphere, a small portion of such exhaust having passed through passage D', and acted against the face of piston F', has reversed the equilibrium sliding valve, forcing it to the other end of its cylinder or casing E, thereby opening the port to supply passage C for the return stroke of the drill, the holes H' allowing the escape of the air or steam which has entered the valve cylinder, leaving only sufficient to form a cushion on its return stroke.

Having thus described the nature of our invention and the manner of performing same, we would have it understood that our improvements in rock-drills for which we are desirous of securing Letters Patent are—

First—The construction of such drills with hollow reversing valves having, by preference, two hollow pistons and a hollow double-ended piston rod, and with holes in the groove on the periphery of such hollow pistons.

Second—Combining such hollow reversing valves with the cylinders of rock-drills by means of passages, such as and for the purpose of those marked C and C' and D and D' in our drawings.

In witness whereof, we, the said John Naylor and Robert Thornton, have hereto set our hands and seals, this seventh day of October, one thousand eight hundred and eighty-one.

Witness—

GEO. C. GRANT, quartz-miner, Stawell.

JNO. NAYLOR.
ROBT. THORNTON.

This is the specification, referred to in the annexed Letters of Registration granted to John Naylor and Robert Thornton, this twenty-ninth day of November, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

We do ourselves the honor to report, in reply to your blank cover communication of the 12th instant, No. 9,886, that we are of opinion the prayer of Messrs. John Naylor and Robert Thornton's Petition, for the registration of an invention entitled "Improvements in Rock-drills," may be granted, in accordance with their specification, drawings, and claim.

Sydney, 26 October, 1881.

We have, &c.,
JAMES BARNET.
GOTHEK K. MANN.

The Under Secretary of Justice.

NAYLOR & THORNTON'S PATENT

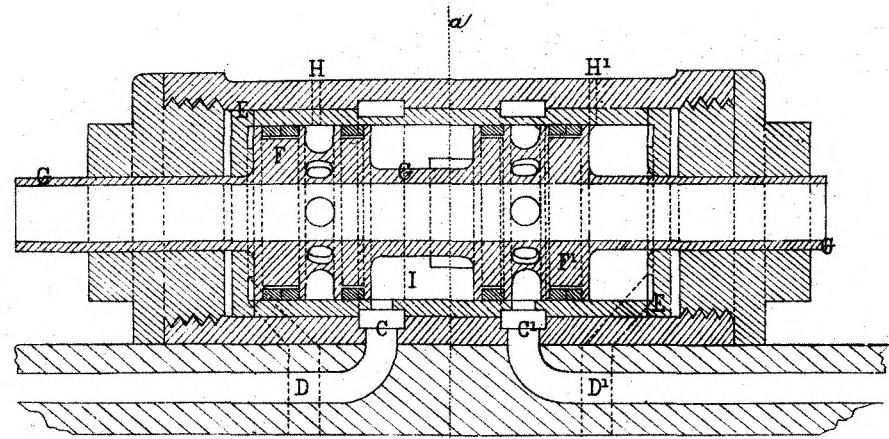


Fig 2

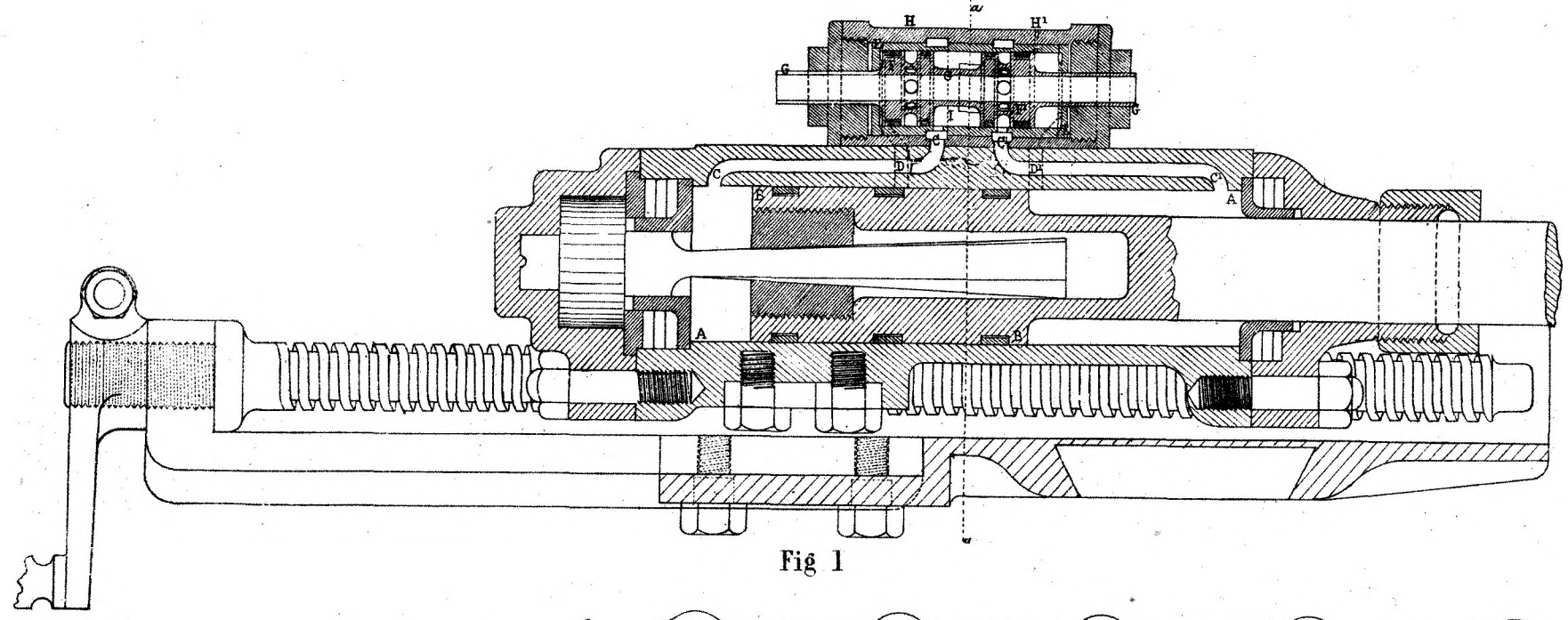


Fig 1

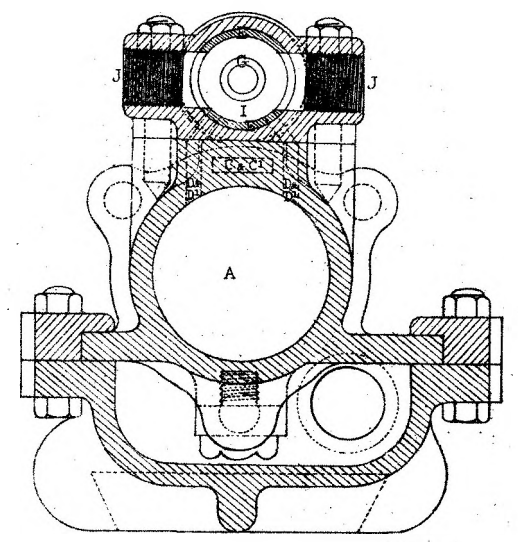


Fig 4

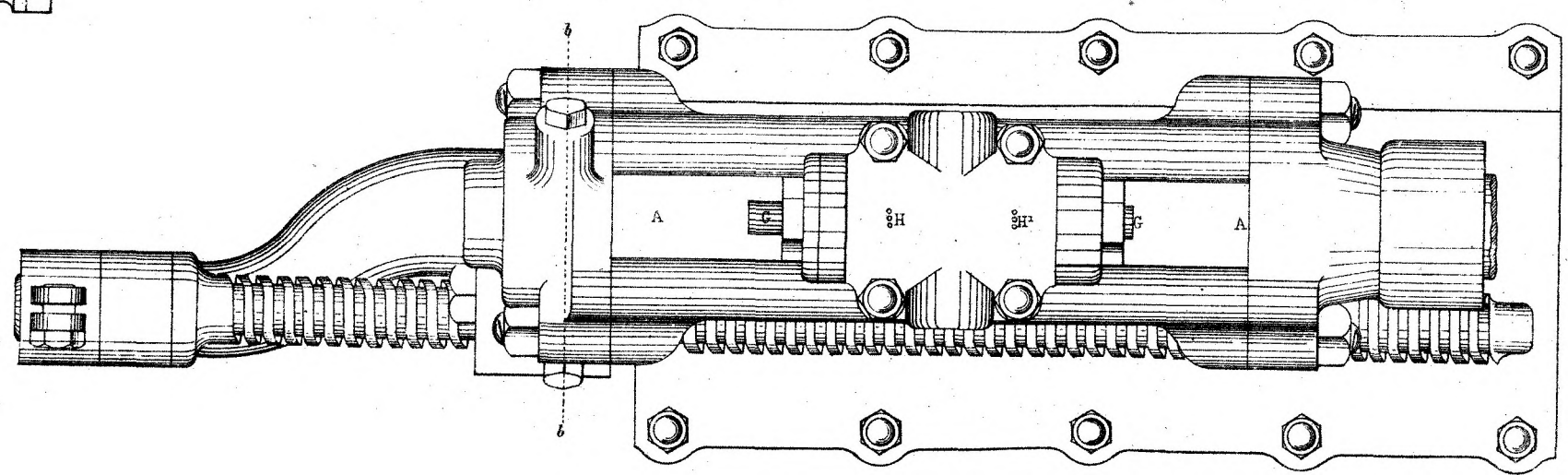


Fig 3

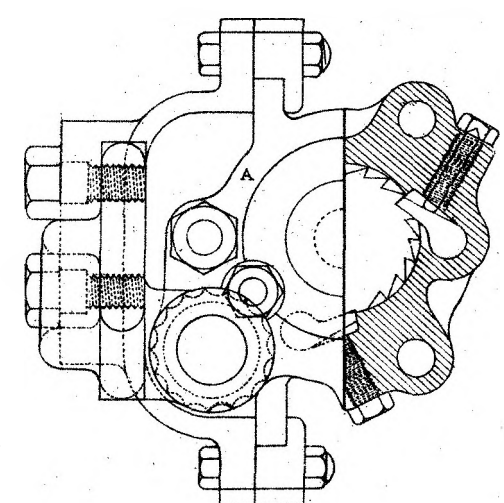


Fig 5

This is the Sheet of Drawing referred to in the recused Letters of Regulation granted to John Naylor and Robert Thornton the twenty ninth day of November 1887.
"Augustus Loftus"

PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE, SYDNEY, NEW SOUTH WALES.



A.D. 1881, 29th November. No. 1020.

HARRISON'S CONCENTRATOR.

LETTERS OF REGISTRATION to William Henry Harrison, for an invention entitled "Harrison's Concentrator."

[Registered on the 29th day of November, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS WILLIAM HENRY HARRISON, of Dowling-street, Sydney, in the Colony of New South Wales, metallurgist, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Harrison's Concentrator," which is more particularly described in the amended specification and the sheet of drawings which are hereunto annexed; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four: and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said William Henry Harrison, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said William Henry Harrison, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said William Henry Harrison shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this twenty-ninth day of November, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Harrison's Concentrator.

AMENDED SPECIFICATION.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, WILLIAM HENRY HARRISON, of Sydney, in the Colony of New South Wales, send greeting :

WHEREAS I am desirous of obtaining Her Majesty's special license that I, my executors, administrators, and assigns, and such others as I or they shall at any time agree with, and no others, should and lawfully might, from time to time, and at all times during a period of fourteen years to be computed from the day on which this instrument shall be left at the office of the Chief Secretary, make, use, exercise, and vend within the Colony of New South Wales and its dependencies, an invention for collecting, dressing, and separating ores and minerals from their gangues by a mechanical invention to be designated "Harrison's Concentrator"; and in order to obtain the said Royal Letters Patent I must, by an instrument in writing under my hand and seal, particularly describe and ascertain the nature of the said invention, and in what manner the same is to be performed, and must also enter into the covenant hereinafter contained: Now know ye, that the nature of the said invention and the manner in which the same is to be performed are particularly described and ascertained in and by the following statement, that is to say, I divide the Concentrator above mentioned into three parts, which I proceed to describe separately. These parts I term respectively "The Body," "The Carriage-frame," and the "Bed-frame," which parts when attached as hereinafter described comprise the within-claimed Patent complete.

1st. The "Body" is a dish-shaped vessel of wood or metal, having a floor horizontal if of wood, or it may be somewhat curved if of metal. I prefer this floor to be about six feet more or less in length, by about two feet more or less in width. To each side of the floor I attach side pieces of wood or metal at an angle of such a degree that the highest parts shall be from six to nine inches more or less in height from the lowest part or level of the floor. I also attach end pieces of wood or metal in such a manner that when the body so far described is complete it shall represent a vessel having a flat or slightly curved bottom, two inclined sides and two vertical ends. In the ends last named I provide a pair of slots or grooves (one pair to each end), in which I slide a pair of diaphragms or curtains of wood or metal, which are kept at any required height from the bottom by means of a set screw. I attach a pivot-bar longitudinally and beneath the body along its centre, the ends of which are round, being fitted into bearings which are fixed to the upper part of the carriage-frame. In the bottom of the body I pierce one or more holes about three inches more or less by six inches more or less, for discharging the heavy portions of ore being operated upon. I prefer them about nine inches apart. Beneath these holes I provide a flood-gate, which I prefer to be a flat piece of wood or metal free to move on a hinge. I attach a lever and hand-screw to regulate the flood-gate. The carriage frame is of wood or iron, and beneath it I attach one end of a connecting-rod. The carriage-frame is provided with two pair of flanged or grooved wheels six inches more or less in diameter; these run on springs of wood or steel, which are about two feet long and two inches more or less wide. These springs I attach to the upper sides of the bed-frame, which latter I make of wood or iron. Each spring is made fast to the bed-frame by the centre of the spring, its opposite ends being bent up an inch or two, and then horizontal, as shown in the drawings herewith. The ends of these springs are pierced with a hole through which a bolt is passed having a nut on it each side the spring. The lower end of each bolt is provided with an eye, secured by passing a bolt through the eye and bed-frame so that it shall be free to move in the plane of motion peculiar to the body of the Concentrator. On each spring I provide a percussion check, which is a piece of steel about twelve inches more or less in length and the same width as the spring. An oblong slot or hole is pierced through each check provided with a bolt and nut, which secures it at any distance from the flanged or grooved wheels desirable. One end of the check is reflected back upon itself about two inches thus:— The bed-frame is of wood or iron; I attach to it shaft-bearings, pulley, and an adjustable eccentric which I make as follows,—I provide a disc carrying an eccentric band in no way differing from ordinary eccentrics used for other machinery except that, instead of a hole being bored at a fixed point, I bore an oblong slot about four to six inches long. I slide a second segment of a disc on either one or both sides of the first-named disc—(I prefer and shall only describe one side). This is provided with one hole through which the shaft works and fits, being a fixed point. This fixed disc is elongated, and is provided with a set bolt and nut which secures the first-named disc at any required distance from the centre of the shaft within the limits named. The bed-frame being firmly secured to a foundation, and the carriage-frame with its wheels set on the springs, upon the carriage-frame I mount the body, by dropping each end of the pivot-bar into its corresponding journal or bearing. Beneath the sides of the body I attach a regulating screw, to keep the body at any angle required from the pivot-bar. The method of the action of the within-claimed Patent is as follows:—The material to be operated upon is carried by water between the diaphragms, beneath which it passes, depositing the heavier portions on the bottom, whence they escape by the flood-gates. The lighter particles rise to the top, and are floated and carried off over the edges of the inclined sides as tailings. I give the Concentrator by preference a stroke of about one inch more or less at a velocity of about eighty revolutions of the eccentric per minute. At each revolution the wheels receive a shock or percussion by striking against the check. As a general rule I prefer the stroke of the eccentric and speed of driving as described, but for very fine slimes the stroke should be shorter and the speed quicker. The percussive shock communicated by the impact of the wheels against the checks communicates a vertical and general disturbance throughout the contents of the Concentrator, settling the heavier and finer particles to the bottom, the coarser and lighter particles rising from under the diaphragms until the body is full, after which they escape over the edges of the inclined sides. When the deposit of heavy stuff has attained a depth of about three inches I open the flood-gates in the bottom, upon which the said heavy material falls through the gates into suitable receptacles which form no part of this patent. When it is found that the ore or mineral is escaping over the edges of the inclined sides, the flood-gates in the bottom are closed by the lever and screw described for the purpose of regulating the said flood-gates until the desired degree to concentration is ascertained; and on the contrary, when it is found that too much sand or gangue is escaping

Harrison's Concentrator.

escaping, the flood-gates will require to be closed until the desired degree of concentration is ascertained. In the above-described invention I have sought, by arranging the discharge of the tailings to be at right angles to the motion of the Concentrator, to obviate the existing tendency common to ordinary shaking tables of throwing all the stuff in a direct line with the motion of the cranks or other means of shaking, and thereby to obtain the result of simply holding the light particles in suspension until they float quietly away; and further, by means of the percussive action of the wheels against the checks I secure an upward motion to the particles, whereby the coarse particles lever themselves above the finer particles.

I claim the form and position of the body. I claim the use of the levers as an improved method of actuating the flood-gates or discharge holes at the bottom of the body. I claim the use and application of the diaphragms or curtains for the purpose of inducting ores or minerals beneath them, with a view to the lighter and coarser particles to rise to the surface and escape over the inclined sides as tailings. I claim the application of the pivot-bar attached to the body to alter its angle of inclination to either side. I claim the application and use of the flanged wheels, the springs and checks as described. I do not confine myself to the exact dimensions herein mentioned, but I prefer them to be about those ascertained herein, and in the sheet of drawings accompanying this specification with references attached thereto, also below.

And I do hereby for myself, my heirs, administrators, and assigns, covenant with Her Majesty and Her Successors, that I do not believe that any other person than myself is the true and first inventor of the said invention, and that I will not deposit these presents at the office of the Chief Secretary with any such knowledge or belief as last aforesaid.

In witness whereof, I have hereunto set my hand and seal, this sixteenth day of September, one thousand eight hundred and eighty-one.

WILLIAM HENRY HARRISON.

This is the amended specification referred to in the annexed Letters of Registration granted to William Henry Harrison, this twenty-ninth day of November, A.D. 1881.

AUGUSTUS LOFTUS.

REPORTS.

Sir,

Sydney, 24 August, 1881.

In reply to your blank cover communication of the 1st instant, No. 7,592, transmitting Mr. William Henry Harrison's Petition for the registration of Harrison's Concentrator, we do ourselves the honor to report that, on receipt of your further letter of the 8th instant, No. 7,662, we requested Mr. J. M. Curtis to explain to us the particulars of his objection to the issue of Letters of Registration in question; and we have now to state that we are of opinion the claims as set forth in Mr. W. H. Harrison's specification cannot as a whole be granted, but in the event of Mr. Harrison modifying his application we should be prepared to recommend his Petition to the following extent, viz.—“The form of the body of his machine, the application of curtains and diaphragms, application of pivot-bar attached to body, application of grooved or flanged wheels in connection with the use of springs and checks.”

We have, &c.,
GOTHER K. MANN.
A. LEIBIUS.

The Under Secretary of Justice.

Sir,

Sydney, 3 October, 1881.

In reply to your letter of the 19th ultimo, enclosing Mr. W. H. Harrison's amended specification, we do ourselves the honor to report that, on examination, we find the claims therein set forth to the following extent substantially the same as those recommended in our letter of the 25th August last, viz.—The form and position of the body—the use of levers as an improved method of actuating the flood-gates, Mr. Harrison having now submitted a detailed drawing of the same—the use and application of diaphragms or curtains—the application of pivot-bar attached to the body—the application and use of the flanged wheels, the springs and checks as described,—and we are of opinion that the prayer of Mr. Harrison's Petition may be granted to the above extent only.

We have, &c.,
GOTHER K. MANN.
A. LEIBIUS.

The Under Secretary of Justice.

Sir,

Sydney, 21 October, 1881.

We do ourselves the honor to report, in reply to your blank cover communication of the 17th instant, No. 10,003, that we are of opinion the prayer of Mr. W. H. Harrison's Petition may now be granted, in terms of his modified specification and claim.

We have, &c.,
GOTHER K. MANN.
A. LEIBIUS.

The Under Secretary of Justice.

HARRISON'S CONCENTRATOR

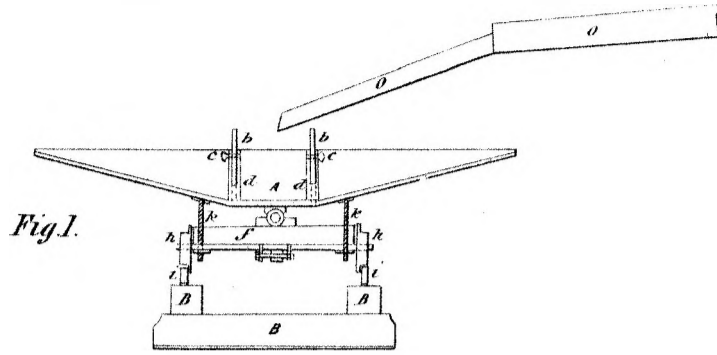
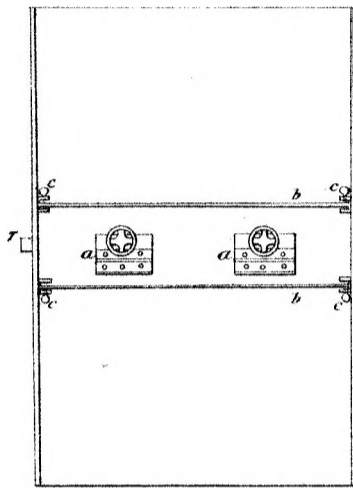
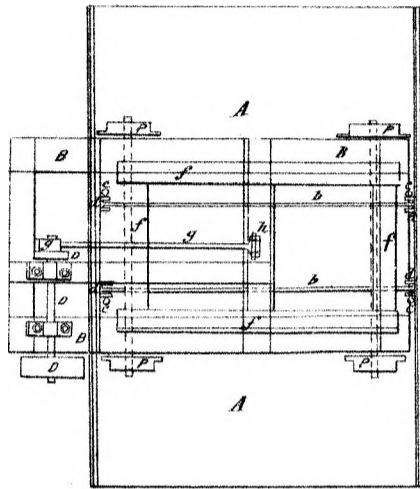


Fig. 1.

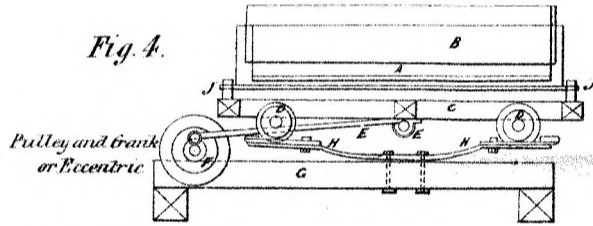
Fig. 2.

Fig. 3.



See diagrams on Specification for improved lever for regulating discharge gates in bottom of body

Fig. 4.



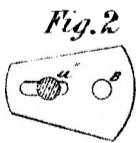
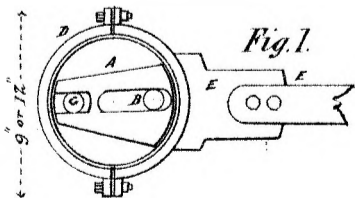
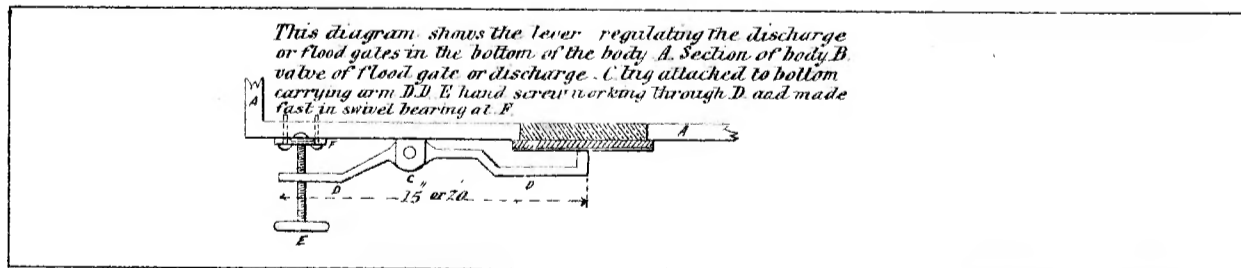
Pulley and crank or Eccentric

For improved adjustable eccentric see Diagrams on Specification.

Fig. 1.—End section. A, the body; bb, curtains or diaphragms; cc, screws to bind bb; dd, slots in which bb slide; e, ends of pivot bar and journals on carriage frame f; g, attachment for end of connecting rod; hh, flanged or grooved wheels on h, springs; B, bed frame; oo, feet boxes and shoes delimiting ore; kb, hand-screws to adjust angle of the body.
Fig. 2.—Plan. A, A, body; bb, curtains or diaphragms; ccc, screws for binding bb; dddd, slots; fff, carriage frame; gg, connecting rod attached to carriage frame at k; B B B, bed frame carrying pulley-shaft and eccentric or crank D D D; P P P P, flanged wheels.
Fig. 3.—Plan showing discharge valves, aa; bb, curtains or diaphragms, showing slots and binding screws at ooo; ends of pivot bar at T T.
Fig. 4.—Side elevation. A, body, showing curtain B; C, carriage frame, carrying pivot bar at J, and grooved or flange wheels at D D, sitting on springs and checks H H, springs bolted to bed frame G.

WILLIAM HENRY HARRISON,
137, Docking-street,
Smyrna.

This is the Sheet of Drawings referred to in the annexed Letters of Registration granted to William Henry Harrison, the twenty-ninth day of November, A. D. 1881.
Augustus Loftus



Eccentric not claimed as a part of this patent
W. H. Harrison.

This diagram shows the within-mentioned adjustable eccentric, Fig. 1, the first-named disk, marked A, with longitudinal slot B, through which the shaft may slide; C, hole pierced to receive jam nut shown at Fig. 2 A'; D, eccentric ring; E F, connecting rod to eccentric. Fig. 2 shows the second-named segment disk; A', slot to adjust by jam nut at Fig. 1; f, hole for shaft.
The red lines over Fig. 1 show Fig. 2 in situ.



A.D. 1881, 29th November. No. 1021.

IMPROVEMENTS IN GAS-ENGINES.

LETTERS OF REGISTRATION to James Robson, for Improvements in Gas-engines.

[Registered on the 29th day of November, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS JAMES ROBSON, of North Shields, England, mechanical engineer, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in Gas-engines," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed ; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four ; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years : And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said James Robson, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof ; to have, hold, and exercise unto the said James Robson, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended : Provided always, that if the said James Robson shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this twenty-ninth day of November, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Gas-engines.

SPECIFICATION.

TO ALL WHOM IT MAY CONCERN: Be it known that I, JAMES ROBSON, of North Shields, in the county of Northumberland, England, have invented new and useful Improvements in Gas-engines, which improvements are fully set forth in the accompanying drawings and specifications.

My invention relates to engines substantially of the following construction:—

One arrangement of my improved engines consists of a horizontal or vertical cylinder closed at both ends, in which works a piston and rod. I use one stroke of the piston to draw in a charge of gas or vapour and air, on the front side or the underside of the piston, by means preferably of a flap valve, and on the return stroke this charge is forced through a lift-valve and passage into a reservoir, and retained there by the closing of this lift-valve, at which time the piston has completed its outward or downward stroke; at this moment the escape-valve is opened by an eccentric on the crank shaft, and permits the products of combustion to escape out by a port situated in the cylinder's side, about the middle of it, desirably nearer the end of the piston's travel. A self-acting valve now opens or is opened by a cam or eccentric between the back or upper space in the cylinder and the reservoir, and allows the compressed gases in the reservoir to enter the cylinder and expel the remaining products of combustion through the escape port. When the piston has moved back or upwards a short distance the escape valve closes, and then the valve communicating with the reservoir also closes, confining the partially compressed inflammable gases in the back or upper space and port-ways of the cylinder, which compression is completed by the backward motion or by the ascent of the piston. When the piston is at its back or upper end, the compressed gases occupy a space between it and the cylinder cover, and also in the port-ways. About this period a slide-valve worked by an eccentric on the crank-shaft containing a gas flame is brought over a porthole in the cylinder and explodes the gases, which by their consequent augmented pressure and expansion drive the piston forward or downward, which by a connecting rod turns the crank, the shaft, and the fly-wheel during each successive outward or downward stroke, the return stroke being performed by the momentum of the fly-wheel.

In my second arrangement the gas is compressed into the reservoir in the same manner as in my first arrangement, but when the piston is at the back or upper end of the cylinder, the reservoir valve is opened and permits the gases to enter the cylinder; also the port-ways and space on the back or upper side of the piston. When the piston has travelled a short way out or down its stroke, the reservoir valve is now closed, and the flame slide is brought into communication with and explodes the gases on the back or upper side of the piston at each successive outward or downward stroke, which drives the piston, connecting-rod, crank shaft, and fly-wheel, as in my first described arrangement. An escape-valve at the back or upper end of the cylinder is opened during the entire backward or upward stroke of the piston, and allows the products of combustion to escape; an ordinary governor is used in connection with an eccentric, wedge and cock, to regulate the supply of gas or vapour or with a simple cock alone. In some cases I explode the gases in the cylinder by an insulated wire and electric spark obtained from an induction coil worked by a magneto-electric machine which is turned by the engine itself. I sometimes allow a portion of the exploded gases to force themselves through a tube and lift-valve into a reservoir, to be there stored and used for working a small engine with cylinder, piston, valves, crank-shaft, with toothed pinion gearing into a toothed wheel on the main engine shaft to turn and start the engine.

DESCRIPTION OF THE DRAWINGS.

The same figures are used for the like parts throughout.

Fig. A is a longitudinal section in which 1 is a water-jacketed cylinder, having a piston, 2, connected by its rod 3, and connecting rod 4 to a crank and shaft, 5, on which is a fly-wheel, 6, all being arranged on base 7. When the piston is moving back in a horizontal engine, or ascending in a vertical engine, it draws in a charge of combustible gas or vapour and air through a flap-valve, 8, provided with gas and air ports, 9 and 10, as seen in fig. K; on the return stroke of the piston this charge is forced through a lift-valve, 11, and passage, 12, into and retained in a reservoir, 13, at which time the piston has completed its outward or downward stroke; at this moment the escape valve 14 is opened by an eccentric and rod, 15, and permits the products of combustion to escape out by the ports 16 in the cylinder's side, about the middle or near the end of the piston's travel. A self-acting valve, 17, now opens and allows the compressed gases in the reservoir to enter the cylinder and ports 18, and expel the remaining products of combustion through the escape-valve. When the piston has moved back or upwards a short way the escape valve closes, and then the valve communicating with the reservoir also closes, confining the partially compressed inflammable gases in the back or upper space and portways of the cylinder, which compression is completed by the backward motion, or by the ascent of the piston. When the piston is at its back or upper end, the compressed gases occupy a space between it and the cylinder cover and also in the port-ways 18. About this period a slide valve, 19, worked by an eccentric and rod, 20, containing a gas flame, is moved over the cylinder port, and ignites the gases which, by their consequent augmented pressure and expansion, drive the piston forward or downward, which by its rod and connecting rod turns the crank-shaft and fly-wheel at each successive out or down stroke, the return stroke being performed by the momentum of the fly-wheel. To ensure the gases firing, I construct the slide 19 as shown in larger scale in figs. D, E, and F. 21 is the flame cavity supplied with gas by a pipe and hole in the slide back 22, which is cut off by the movement of the slide just before the flame cavity opens to the cylinder port, at which moment a small portion of the cylinder gases is allowed to pass from the port 18, through the cavity 21, and shield 23, and lower air-way 24, in the slide back into the atmosphere, or through small holes 25, figs. E and F, and then by a tube into the bed-plate; the slide flame is re-lighted each time by a constant flame, 26, in the air-circulating recess 27; 28 is one or more plates in the cylinder end for the uniform distribution of the entering gases; fig. G shows a cylinder constructed according to my second arrangement. The gases are compressed into the reservoir 13, the same as in my first described arrangement, but when the piston is near the back of its travel the slide 29 allows the gases to enter the cylinder portways and tubular space 31, by way of 30, from the reservoir pipe 18 on the back side of the piston. When the piston has travelled a short way out or down its stroke, the slide then cuts the entering gases off, and brings the flame

Improvements in Gas-engines.

flame cavity over the cylinder port and ignites the gases as in the first arrangement. The escape valve 32 is open during the back stroke of the piston; an ordinary governor, 33, is used in connection with a cock or valve, 34, for controlling the gas or in connection with an eccentric wedge and cock to cut the supply of gas entirely off at intervals. In figs. A and B, 35 is a spring-loaded lift-valve, which on the explosion of the gases in the cylinder lifts and allows part of the high pressure gases to pass by the tube 36, into the reservoir 37, to be there stored and used for working a small engine, 38, with cylinder, piston, valves, and crank-shaft similar to a steam-engine, having on its shaft a friction toothed pinion, 39, gearing into a large similarly toothed wheel on the fly-wheel, 6, on the main engine shaft; the small engine shaft runs in rocking supports, 40, which are supported and turn with a shaft, 41, which moves in and is supported by a bracket, 42, fixed to the bed-plate. A lever handle, 43, is fixed to the shaft 41, so on starting the small engine by letting the compressed gases, from the reservoir 37, by the cock 44 into it and then pressing the pinion 39 against the large wheel 6 by the lever handle 43, which may be moved by a screw or by hand, the main engine is started with little manual exertion. I lubricate the cylinder and piston by using a lubricator, 45, with a revolving plug, 46, in which is one or more cavities to take a little oil round each revolution of the plug from the outside oil-cup, and deposit it in a hole opening into the top of the cylinder; the plug 46 is revolved by a ratchet wheel and lever, 47, worked by the eccentric rod 20; a similar lubricator is used for the slide-valve.

Having now particularly described and ascertained the nature of the said invention and in what manner the same is to be performed or carried out in practice, I hereby declare that I claim the invention of improvements in gas-engines, substantially as hereinbefore set forth and described, wherein the following are important points or features:—

Firstly—The arrangement and general combination of engine by which a charge of inflammable gases is drawn in, and then compressed into a reservoir by one side of a piston working in a cylinder, and the expulsion and replacement during the backward stroke on the other side of such piston of the burnt gases of the previous forward stroke by the compressed gases from such reservoir, and completing the compression of the gases by the continued backward motion or ascent of such piston and explosion on the forward stroke for obtaining motive power, substantially as hereinbefore described, or any mere modification thereof.

Second—Constructing the igniting valve with a shield plate in the internal flame cavity, to protect such flame from the violent inrush of the compressed gases from the cylinder, substantially as hereinbefore described, or any mere modification thereof.

Thirdly—Using a small supplemental engine worked by the high pressure exploded gases obtained from the cylinder, and stored in a reservoir for starting gas-engines, substantially as hereinbefore described, or any mere modification thereof.

In witness whereof, I, the said James Robson, have hereunto set my hand and seal, this twenty-second day of September, in the year of our Lord one thousand eight hundred and eighty-one.

JAMES ROBSON.

By his Attorney,

OWEN BLACKET.

This is the specification referred to in the annexed Letters of Registration granted to James Robson, this twenty-ninth day of November, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 18 October, 1881.

We have the honor to report that we are of opinion that there is no objection to the issue of Letters of Registration to Mr. James Robson for his invention of "Improvements in Gas-engines," in accordance with his Petition, specification, and claim, transmitted to us under your B.C. communication, No. 81-9,274, of the 24th ultimo.

We have, &c.,

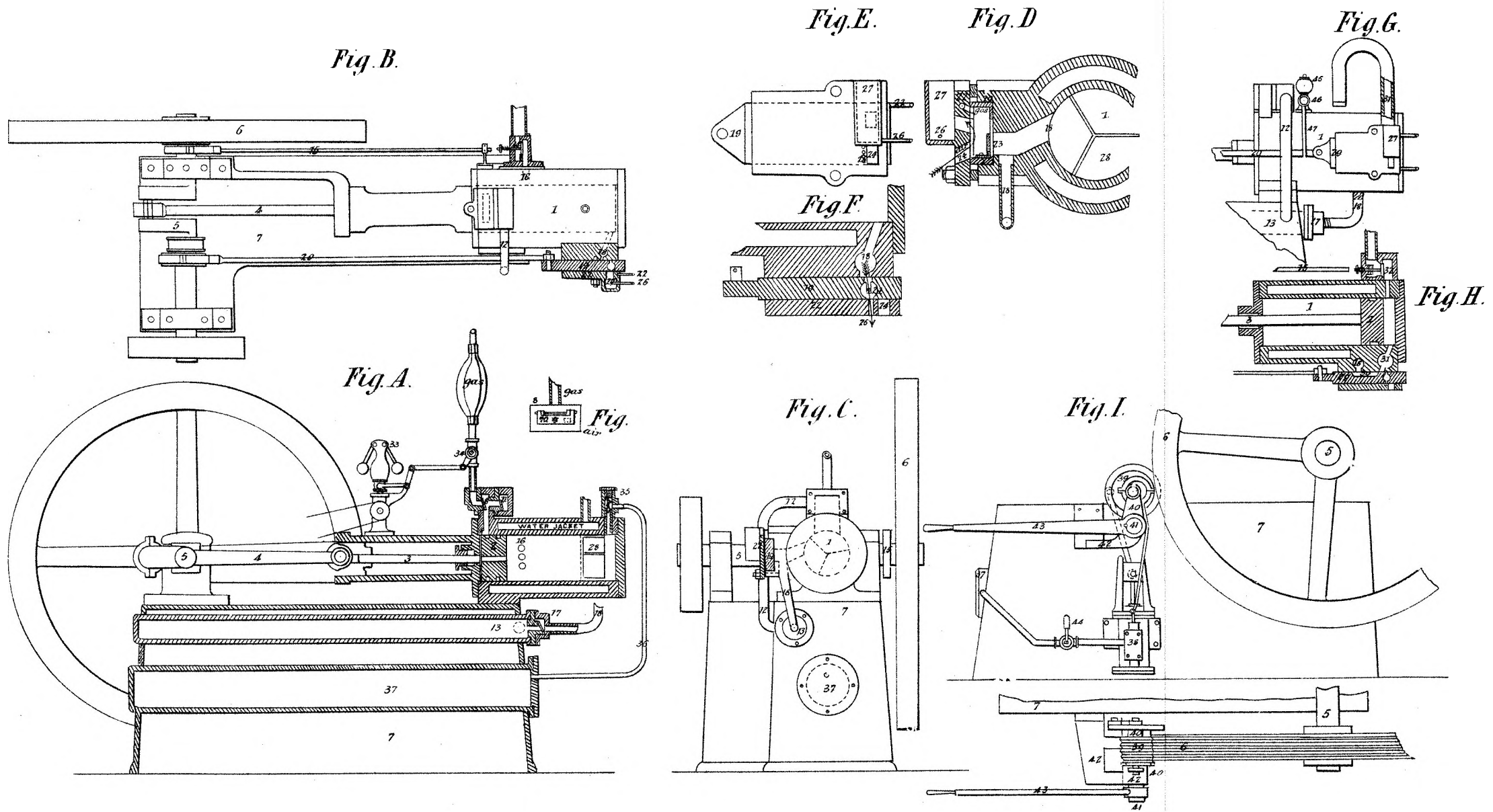
JAMES BARNET.
E. C. CRACKNELL.

The Under Secretary of Justice.

[Drawings—one sheet.]

No. 1022.

[Assignment of Nos. 946 and 972. See pages 171 and 267.]



*This is the Sheet of Drawings referred to in the annexed
Letters of Registration granted to James Robson, the twenty
ninth day of November A.D. 1881.*

Augustus Loftus.

*James Robson
By his attorney
Gump & Co.*



A.D. 1881, 13th December. No. 1023.

LANGWILL'S IMPROVED NASO-ORAL ANTISEPTIC RESPIRATOR.

LETTERS OF REGISTRATION to Peter Langwill, for an Improved Naso-oral Antiseptic Respirator.

[Registered on the 14th day of December, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS PETER LANGWILL, of 55, Flinders-street West, in the city of Melbourne, in the Colony of Victoria, merchant, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Langwill's Improved Naso-oral Antiseptic Respirator," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed ; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four ; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years : And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said Peter Langwill, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof ; to have, hold, and exercise unto the said Peter Langwill, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended ; Provided always, that if the said Peter Langwill shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this thirteenth day of December, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

Langwill's Improved Naso-oral Antiseptic Respirator.

SPECIFICATION.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, PETER LANGWILL, of 55, Flinders-street West, in the city of Melbourne, in the Colony of Victoria, merchant, send greeting:

WHEREAS I am desirous of obtaining Royal Letters Patent for securing unto me Her Majesty's special license that I, my executors, administrators, and assigns, and such others as I or they should at any time agree with and no others, should and lawfully might from time to time, and at all times during the term of fourteen years (to be computed from the day on which this instrument shall be left at the office of the Registrar-General), make, use, exercise, and vend within the Colony of New South Wales and its dependencies, an invention known as "Langwill's Improved Naso-oral Antiseptic Respirator"; and in order to obtain the said Letters Patent I must, by an instrument in writing under my hand and seal, particularly describe and ascertain the nature of the said invention, and in what manner the same is to be performed, and must also enter into the covenant hereinafter contained: Now know ye that the nature of the said invention, and the manner in which the same is to be performed, is particularly described and ascertained in and by the following statement (that is to say):—I construct of any metal, wood, or other material a short mouth-piece, as shown in figure A of drawings herewith. This mouth-piece is at both ends quite open. The end applied to the face is, as shown in drawing (letters *a a*), covered with soft padding. The other end is shaped of tube fashion, to admit of its acting as a socket to another part of instrument marked B and hereafter described, which fits into it in telescopic fashion. On the top of said mouth-piece marked A is an expiratory valve, *b*, the whole of which is covered with india-rubber or other material. This cover is secured to the mouth-piece at one part only, and opens and shuts with the action of breathing. Figure B is of tube shape, and constructed of metal, wood, or any other material in one piece, with the exception of the cap *c c*. This cap is of similar material, fitted on to one end of the said tube B, and faced with wires or netting or perforated plate, as shown in drawing. The other end of said tube is covered in, with the exception of the central opening or inspiratory valve *d*, as shown in drawings B and C. The rib *e e* shown on the body of tube, figure B, is adapted to its adjustment to the opening for its reception in mouth-piece, figure A, and prevents its further introduction there beyond such band. The dotted line *f f* on the tube shown in drawing B indicates the extent of the interior chamber for holding a sponge or other absorbent material, which is at such dotted line barred by similar wires or netting or perforated plate to that used at the opening before mentioned. Figure C shows only the same tube as described in last paragraph, with a view of its other end showing the inspiratory valve *d* there introduced; this valve-hole may be covered with india-rubber or other material, opening outwardly or towards the mouth with the inspiration of the wearer. Figure D shows the completed instrument, for which I claim the following particulars as novelties:—

1. The construction in telescopic form of the whole instrument, which permits of portability, ready adjustment, and facilities for cleaning or repairing.
2. The special construction of the tube shown in figure B, and especially therein the covered back with the inspiratory valve, the action of which effectually prevents the wearer's breath contaminating the contents of the chamber containing the antiseptic.
3. The receptive or telescopically shaped opening of figure A, for receiving the telescopic part of figure B.

And I do hereby, for myself, my heirs, executors, and administrators, covenant with Her Majesty, Her Heirs and Successors, that I believe the said invention to be a new invention as to the public use and exercise thereof, and that I do not know or believe that any other person than myself is the true and first inventor of the said invention, and that I will not deposit these presents at the office of the Registrar-General with any such knowledge or belief as last aforesaid.

As witness the hand and seal of the said Peter Langwill, the twenty-second day of October, one thousand eight hundred and eighty-one.

P. LANGWILL.

Signed, sealed, and delivered, in presence of—

JAS. HINGSTON, Notary Public, Melbourne.

This is the specification referred to in the annexed Letters of Registration granted to Peter Langwill, this thirteenth day of December, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

The application of Mr. Peter Langwill for Letters of Registration for his "Improved Naso-oral Antiseptic Respirator" having been referred to us, we have examined the specification and drawings accompanying the same, and have now the honor to report that we see no objection to the issue of Letters of Registration as prayed for.

Sydney, 5 November, 1881.

We have, &c.,

J. SMITH.

CHAS. WATT.

The Under Secretary of Justice.

[Drawings—one sheet.]

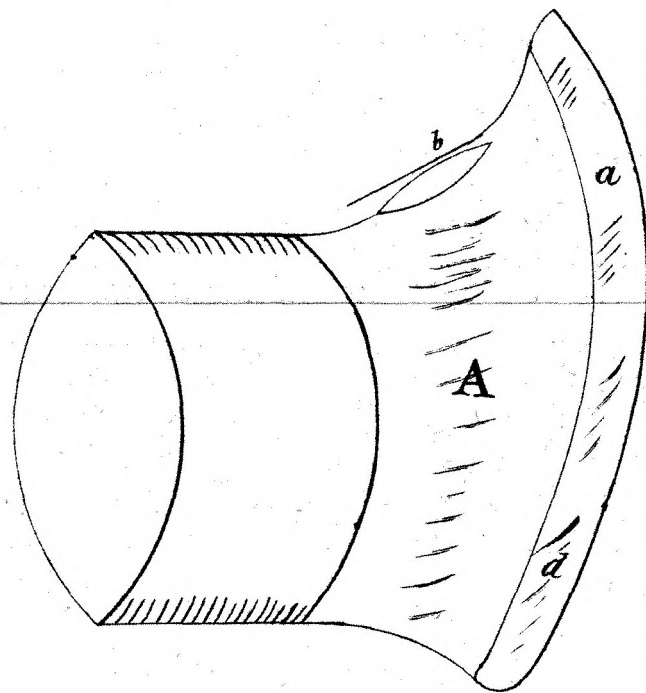
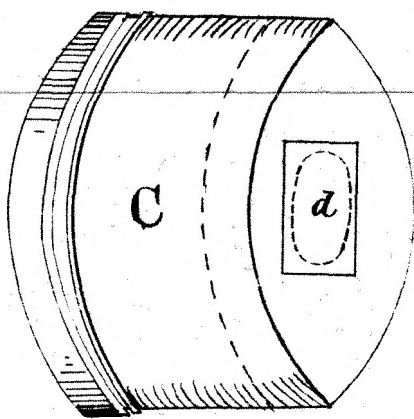
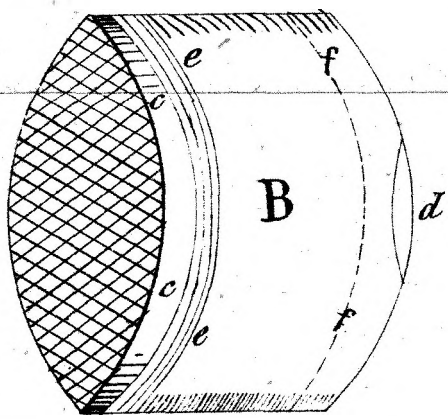
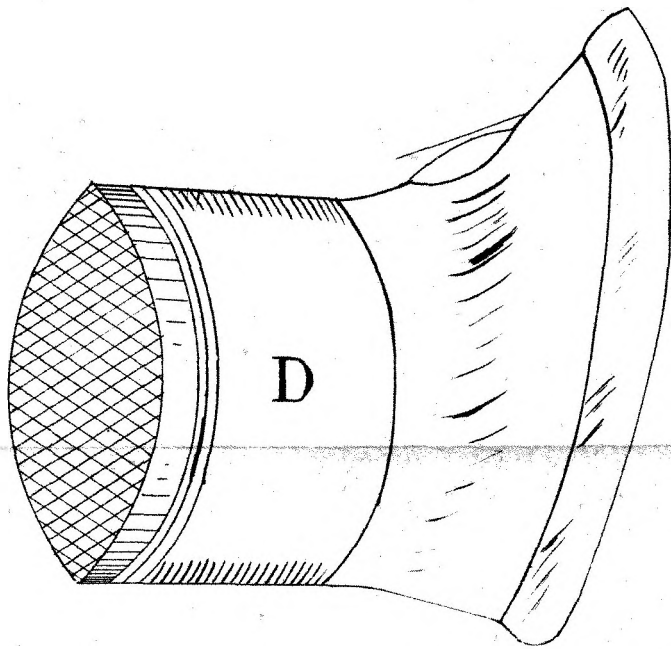
No. 1024.

[Assignment of No. 884. See Letters of Registration for 1880, page 289.]

No. 1025.

[Assignment of No. 990. See page 317.]

LANGWILL'S IMPROVED NASO-ORAL ANTISEPTIC RESPIRATOR



Melbourne, October 22, 1881.

P. Langwill.

*This is the Sheet of Drawings referred to in the annexed
Letters of Registration granted to Peter Langwill, this thirteenth
day of December, A.D., 1881.*

Augustus Loftus.



A.D. 1881, 22nd December. No. 1026.

AN IMPROVED METHOD OF CONSTRUCTING TRAMWAYS AND LIGHT LINES OF RAILWAY.

LETTERS OF REGISTRATION to William Robert Rowan, for an improved method of constructing Tramways and light lines of Railway.

[Registered on the 22nd day of December, 1881, in pursuance of the Act 16 Vic. No. 24.]

BY HIS EXCELLENCY THE RIGHT HONORABLE SIR AUGUSTUS WILLIAM FREDERICK SPENCER LOFTUS (commonly called LORD AUGUSTUS LOFTUS), Knight Grand Cross of the Most Honorable Order of the Bath, a Member of Her Majesty's Most Honorable Privy Council, Governor and Commander-in-Chief of the Colony of New South Wales and its Dependencies.

TO ALL TO WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS WILLIAM ROBERT ROWAN, of Hamburg, in Germany, civil engineer, hath by his Petition humbly represented to me that he is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "An improved method of constructing Tramways and light lines of Railway," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed; and that he, the said Petitioner, hath deposited with the Honorable the Treasurer of the said Colony of New South Wales the sum of Twenty Pounds sterling, for defraying the expense of granting these Letters of Registration, as required by the Act of Council, sixteenth Victoria, number twenty-four; and hath humbly prayed that I would be pleased to grant Letters of Registration, whereby the exclusive enjoyment and advantage of the said invention or improvement might be secured to him for a period of fourteen years: And I, being willing to give encouragement to all inventions and improvements in the arts or manufactures which may be for the public good, and having received a report favourable to the prayer of the said Petition, from competent persons appointed by me to examine and consider the matters stated therein and to report thereon for my information, am pleased, with the advice of the Executive Council, and in exercise of the power and authority given to me by the said Act of Council, to grant, and do by these Letters of Registration grant unto the said William Robert Rowan, his executors, administrators, and assigns, the exclusive enjoyment and advantage of the said invention or improvement, for and during the term of fourteen years from the date hereof; to have, hold, and exercise unto the said William Robert Rowan, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and unto the full end and term of fourteen years from the date of these presents next and immediately ensuing, and fully to be complete and ended: Provided always, that if the said William Robert Rowan shall not, within three days after the granting of these Letters of Registration, register the same in the proper office in the Supreme Court, at Sydney, in the said Colony of New South Wales, then these Letters of Registration, and all advantages whatsoever hereby granted, shall cease and become void.

In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this twenty-second day of December, in the year of our Lord one thousand eight hundred and eighty-one.

[L.S.]

AUGUSTUS LOFTUS.

An Improved method of constructing Tramways and light lines of Railway.

SPECIFICATION of WILLIAM ROBERT ROWAN, of Hamburg, in Germany, civil engineer, for an invention entitled "An improved method of constructing Tramways and light lines of Railway."

My improved method of constructing tramways and light lines of railway has been devised for the purpose of reducing their cost without lessening their efficiency. By it there is less earthwork required than for a line of the same gauge and traffic-bearing capacity constructed in the ordinary way. Lighter rails can be used. A smaller cubic amount of sleeper and less ballast are required. According to my invention, the ordinary cross sleepers embedded in ballast are discarded; and also the plan of laying ballast for the whole width or more of the rail-track, and instead thereof I excavate two trenches of suitable depth and width in the earth formation of the line, which trenches are separated by a space dependent on the gauge of the line. In laying the line, longitudinal sleepers are employed, supported by and embedded in ballast of suitable nature, preferably of broken stone. On these longitudinal sleepers the rails are laid—the rails may be of any good section, but are preferably of steel, and of the "bridge" pattern, sufficiently deep to allow of the ordinary rolling stock of the railways of the country running over them without detriment to the wheel-flanges. The rail joints are connected by fish-plates, which in the case of the bridge rail fit inside the rails themselves, and the fixity of gauge is assisted by wrought-iron tie-bars at suitable intervals connecting the lines of rails. Provision is made for drainage by transverse drains of suitable size and at proper intervals leading to the side drains of the line itself, or to the road drains which act as such. In order however that my invention may be clearly understood, I will now proceed to describe the drawings hereto attached, in which my method is clearly illustrated.

Figure 1 represents a half-rail length of track laid with steel bridge rail 24-lbs. per yard, and giving a line capable of effectively bearing a wheel pressure of two and a half to three tons, at speeds not to exceed twenty miles per hour; figure 2 represents a half-section of line at a joint A B, showing the fish-plate inside the rail; figure 3 represents a half-section of line at C D, that is to say at the centre of a rail, and shows one of the occasional stone drains; figure 3a is a similar view to figure 3 when in a wet cutting; figure 4 represents a half-section of line at E F, that is to say between two sleepers, and also shows how the tie-bars are secured; figure 5 is a plan of a small portion of line; figure 6 is a side elevation of same; figure 7 is a cross section of the joint; and figure 8 is a cross-section of the rail and sleeper through the tie-rod.

Having thus described the nature of this invention and the manner of performing same, I would have it distinctly understood that I do not claim to be the inventor of longitudinal sleepers for supporting the rails of either rail or tramways, as I am aware that this has been done before, but what I believe to be new, and therefore claim as my invention, is—

The construction of tramways and light lines of railway with two parallel trenches filled with ballast and supporting thereon longitudinal sleepers carrying the rails, substantially as herein described and explained, and as illustrated in my drawings.

In witness whereof, I, the said William Robert Rowan, have hereto set my hand and seal, this sixth day of October, one thousand eight hundred and eighty-one.

Witness—

EDWD. WATERS,
Melbourne, Patent Agent.

W. R. ROWAN,
By his Agent,
F. C. ROWAN.

This is the specification referred to in the annexed Letters of Registration granted to William Robert Rowan, this twenty-second day of December, A.D. 1881.

AUGUSTUS LOFTUS.

REPORT.

Sir,

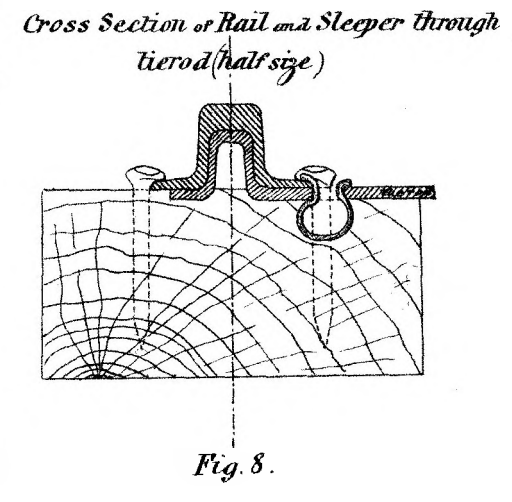
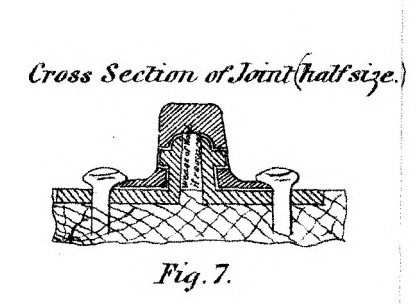
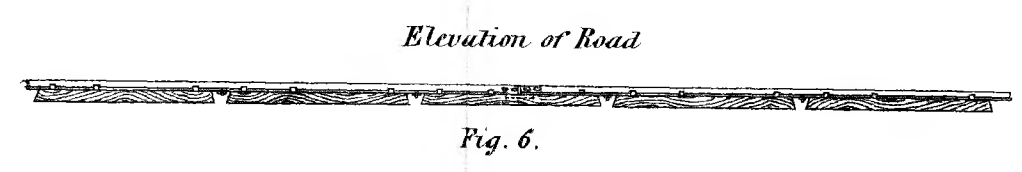
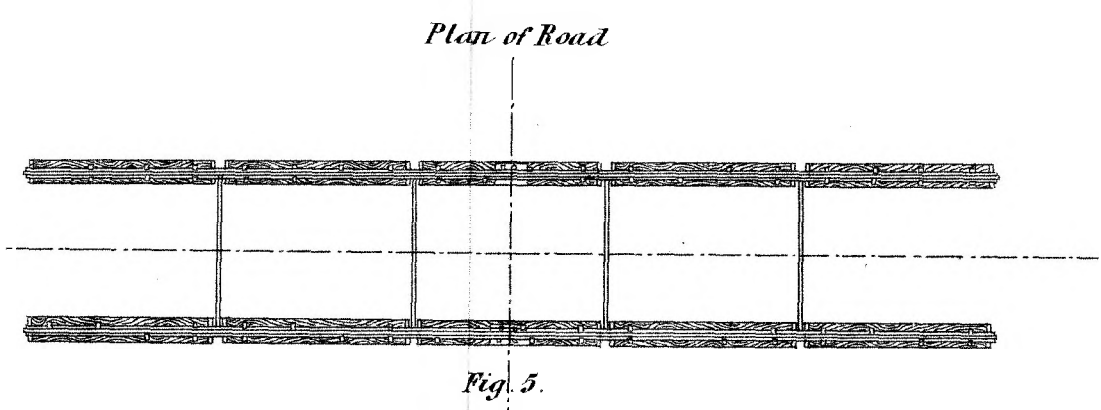
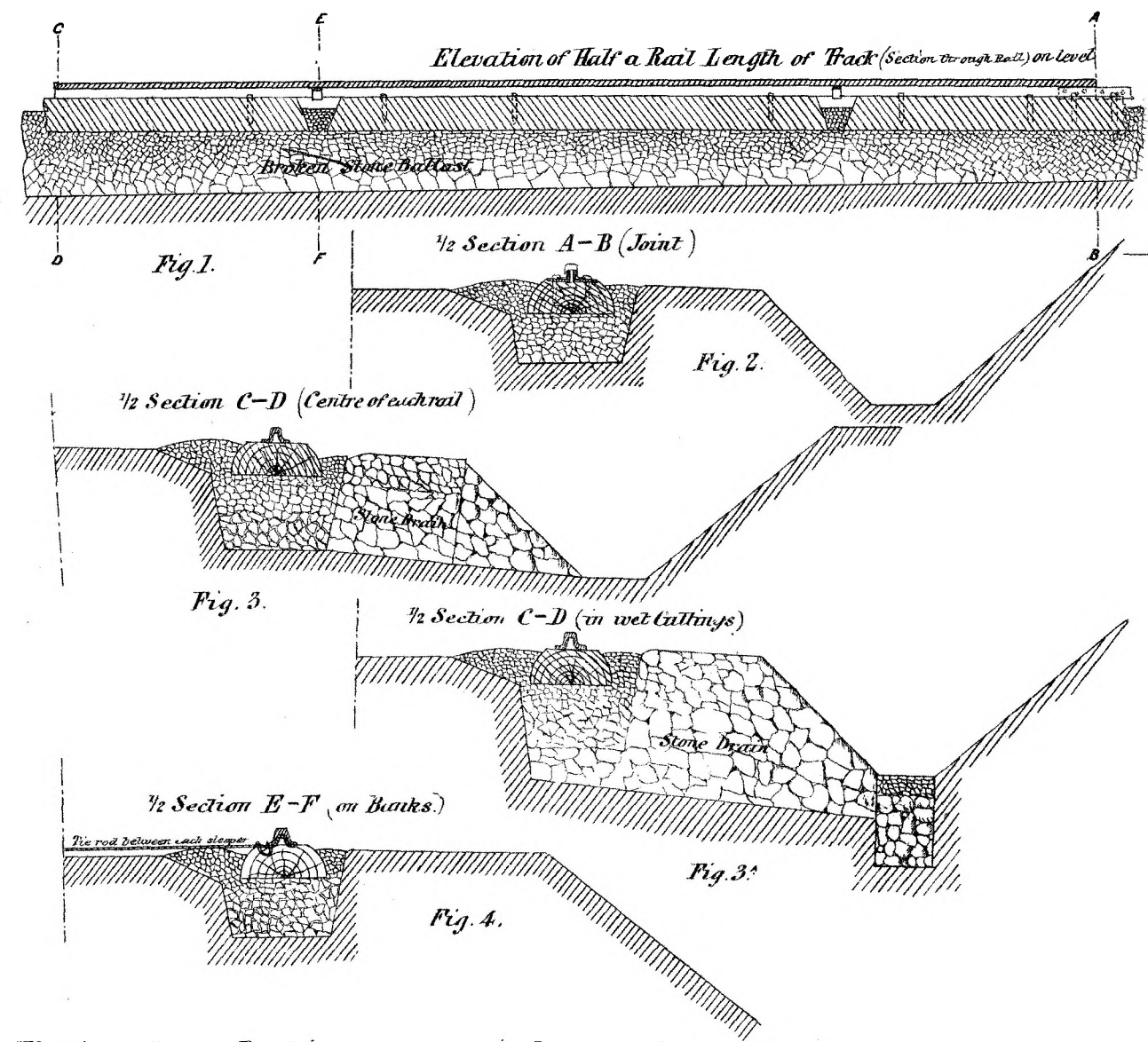
Having examined the specification and plans accompanying the Petition, we have the honor to recommend that Letters of Registration should be issued to W. R. Rowan, for an invention entitled "An improved method of constructing Tramways and light lines of Railway," as shown in the drawing and described in the specification attached to his Petition.

We have, &c.,
JOHN WHITTON.
E. O. MORIARTY.

The Under Secretary of Justice.

[Drawings—one sheet.]

ROWAN'S PATENT



This is the Sheet of Drawings referred to in the annexed Letters of Registration granted to William Robert Rowan, this twenty second day of December, A.D. 1881.

Augustus Loftus

1883.

LEGISLATIVE ASSEMBLY.
NEW SOUTH WALES.

LETTERS OF REGISTRATION.

(COST OF OBTAINING, &c.)

Ordered by the Legislative Assembly to be printed, 19 April, 1883.

RETURN (*in part*) to an *Order* of the Honorable the Legislative Assembly of New South Wales, dated 5th September, 1882, That there be laid upon the Table of this House a Return showing,—

- “(1.) The names of all applicants for Letters of Registration (since the “passing of the Letters of Registration Act of 1852), with the title of “their Invention.
- “(2.) The name of the Examiner to whom each case was referred.
- “(3.) The amount of remuneration paid to such Examiner in each case.
- “(4.) How the balance of the £20 fee was disposed of.
- “(5.) The names of all Patent Examiners.
- “(6.) The date of and by whom appointed.
- “(7.) The special qualification of each one.
- “(8.) Whether still on the Patents Board.
- “(9.) The number of cases considered.
- “(10.) The total amount paid to each one every year.”

(*Mr. Garrard.*)

LETTERS OF REGISTRATION.

APPLICATIONS received from 14th September, 1880 (being the date upon which the business relating to Patents was transferred to the Department of Justice), to 31st December, 1882:—

(1.) *The names of all applicants for Letters of Registration since the passing of the Letters of Registration Act of 1852, with the title of their invention.*

(2.) *The name of the Examiner to whom each case was referred.*

Names of Applicants.	Titles of Inventions.	Names of Examiners.
1880.		
John Berger Spence	Certain improvements in the manufacture of metallic compounds, and in the applications of such compounds to various purposes.	Messrs. Charles Watt and E. C. Cracknell.
David Smith	Certain improvements in railway rails and tramway rails, and a new mode of repairing the same.	Messrs. John Whitton & William C. Bennett.
Quentin Leon Brin	Improvements in the production of light and heat, and in apparatus for same.	Messrs. John Smith & G. K. Mann.
Heinrich Trenk, Jean Ballatschano, and Constantin Ballatschano.	Improved processes and compositions for the tanning and condensing of hides or skins.	Messrs. G. K. Mann and Charles Watt.
Alexander William Winter and William Tell Coleman.	Improvements in bleaching, refining, and purifying fats and oils.	Messrs. John Smith and Charles Watt.
William Rasche	Improvements in Rasche's patent direct-acting battery for quartz-crushing, &c.	Messrs. John Smith and G. K. Mann.
George Fletcher and John Smethurst Fletcher.	Certain improvements in Exeter cooking-stoves.....	Messrs. James Barnet and G. K. Mann.
Alexander Morrison Fell.....	Improved corn husker and sheller	Messrs. R. G. Massie and E. O. Moriarty.
Dan Rylands.....	Improvements in means for stopping bottles or other hollow articles.	Messrs. James Barnet and Thomas Richards.
1881.		
Thomas Alva Edison	Improvements in dynamo or magneto electric machines and electric motors.	Messrs. E. C. Cracknell and E. O. Moriarty.
H. and L. Cambier	Improved chair for children, convertible at will into a perambulator or cradle.	Messrs. James Barnet & Edmund Fosbery.
William Rigg and William M'Lean.	Improvements in apparatus for the manufacture of gas.	Messrs. Charles Watt and H. C. Russell.
Paul Gustave Louis Gabriel Designolle.	Improvements in extracting gold and other precious metal from ores and other substances, and in the apparatus employed therein.	Messrs. E. C. Cracknell and A. Leibius.
John Lamont	Improvements in stoppers for bottles for containing aerated or gaseous liquids.	Messrs. Charles Watt and Thomas Richards
Owen Blacket	Automatic revolving earth-scoop	Messrs. James Barnet & William C. Bennett.
Thomas John Mullings	A new and improved process for extracting oil and fat and oily and fatty matters from wool and other substances, and the apparatus connected therewith and applicable thereto.	Messrs. John Smith & Charles Watt.
Louis John Crossley	Improvements in apparatus and arrangements for telephonic and microphonic purposes.	Messrs. E. C. Cracknell and H. C. Russell.
William Bickford Smith and John George Smith.	An instrument or contrivance for the simultaneous ignition of a number of safety or other fuses.	Messrs. E. C. Cracknell and G. K. Mann.
Thomas Alva Edison	Improvement in means for measuring the amount of electrical current flowing through a circuit which is denominated a vebermeter.	Messrs. E. C. Cracknell and G. K. Mann.
Thomas Alva Edison	Improvements in systems in conductors for the distribution of electricity as a lighting and motive power agent, and appliances connected therewith.	Messrs. E. C. Cracknell and H. C. Russell.
Henry Rosales	An improved process of, and apparatus for, extracting gold from pyrites.	Messrs. A. Leibius and E. C. Cracknell.

Names of Applicants.	Titles of Inventions.	Names of Examiners.
<i>1881—continued.</i>		
Frederick Edward Blackett Beaumont.	Improvements in motor engines worked by compressed air or other elastic fluid under high pressure.	Messrs. John Whitton and E. O. Moriarty.
John Alves	Improvements in and relating to fire-bars and furnaces.	Messrs. John Whitton and E. O. Moriarty.
Lebbeus Baldwin Miller and Phillip Diehl.	Improvements in sewing-machines	Messrs. G. K. Mann and Thos. Richards.
Maurice Gandy	Improvements in and relating to belts or bands for driving machinery, and an improved mechanical process of manufacturing the same and machinery employed therefor.	Messrs. Edmund Fos- bery and G. K. Mann
John Walter Grierson	A keyed wood and composite pavement	Messrs. James Barnet and E. O. Moriarty.
Leicester Allen.....	Improvements in processes and apparatus for cooling and drying air, applicable to all purposes which require air cool or dry or both cool and dry air, but more particularly to the preservation in large refrigerators of animal and vegetable substances or products.	Messrs. John Smith and Charles Watt.
Thomas Alva Edison	Improvements in electric lamps, and in carbons or incandescing conductors therefor, and in means for and methods of manufacturing the same.	Messrs. E. C. Cracknell and G. K. Mann.
William Dalziel	An improved combination of cock and valve for the positive prevention of waste of water, for water-closets and other domestic purposes.	Messrs. James Barnet and Thos. Richards.
Henry Glover	Improvements in apparatus employed in the burning of sulphur or of materials containing sulphur, and in the application and use of the heat-generator.	Messrs. John Smith and Chas. Watt.
The Tasmanite Manufacturing Company (Limited).	Improvements in the treatment of Tasmanite for the purpose of producing silicate colours in powder, polishing-powder, and Moulder's powder.	Messrs. John' Smith and Chas. Watt.
Adam Cyrus Engert	Improvements in fire-grates	Messrs. James Barnet and G. K. Mann.
Henry Francis Parsons	An improved portable hand-power machine for drilling holes in rocks and other substances.	Messrs. E. O. Moriarty and John Whitton.
William Weber.....	A new process of tanning leather with the aid of chemicals, &c.	Messrs. John Smith and Chas. Watt.
Thomas Bell Lightfoot	Improvements in refrigerating apparatus	Messrs. Charles Watt and G. K. Mann.
Robert Bodington	Improvements in apparatus for arresting sparks from steam-engines.	Messrs. E. O. Moriarty and John Whitton.
Frederick Siemens	Improvements in lamps.....	Messrs. G. K. Mann and Thos. Richards.
Henry Cherry	Improvements in machinery or apparatus for raising and lowering heavy bodies.	Messrs. G. K. Mann and E. C. Cracknell.
Paul Gustave Louis Gabriel Designolle.	Improvements in the treatment of ores or compounds containing copper and the separation of copper from precious metals, and in apparatus connected therewith.	Messrs. John Smith and Charles Watt.
Elphinstone Roe	Nyctagraph, or improved system of signalling	Messrs. Francis Hix- son & H. Broderick.
Christian Heinzerling	Improvements in converting skins or hides into leather.	Messrs. John Smith and Charles Watt.
Thomas Denny	An improved furnace for the combustion of fuel ...	Messrs. John Whitton and E. O. Moriarty.
Frederick Allen Gower	An improvement in telephonic apparatus	Messrs. E. C. Crack- nell and Gother K. Mann.
Edward Davies	Improvements in apparatus for feeding locomotives and other steam boilers or generators, applicable also for raising and forcing liquids for other purposes.	Messrs. John Whitton and W. C. Bennett.
Richard James Tonks	Improvements in machinery for crushing, pulverizing, and amalgamating.	Messrs. John Smith and Chas. Watt.
James Nicholas Douglass ...	Improvements in burners	Messrs. John Whitton and W. C. Bennett.

Names of Applicants.	Titles of Inventions.	Names of Examiners.
<i>1881—continued.</i>		
William Archer, Willaim Alinar Fanning, George Fairbairne, Alexander Donald Macleay, Francis A. Gwynne, Alexander Caldcleugh Macleay, Herbert Maguire Whitehead.	Improved machinery for the artificial production of cold for ice-making and other purposes.	Messrs. John Smith and Chas. Watt.
John Auguste Arnold Buchholz.	Improvements in machinery for grinding wheat and other grain and in the process of converting wheat into flour and bran.	Messrs. G. K. Mann and E. Fosbery.
Thomas Alva Edison	Improvements in the construction of machinery and appliances for electro-magnetic railroads, and in the generation, distribution, and translation of electricity for working the same.	Messrs. John Smith and Charles Watt.
Leon Ribourt	Improvements in apparatus for preserving alimentary substances by means of cold.	Messrs. John Smith and Charles Watt.
Henry Ferdinand Ihlee and William Cullen Horne.	Improvements in painting, varnishing, and whitewashing.	Messrs. James Barnet and Thos. Richards.
Alfred Lee, John Alston Wallace & Robert Wright Knox.	Improvements in tins or cans for preserving meat...	Messrs. Charles Watt and G. K. Mann.
John Louis Castner	A regulator for regulating the flow of gas or gases...	Messrs. John Smith and Charles Watt.
Thomas Alva Edison	Improvements in magneto or dynamo electric machines, applicable to both generators and engines.	Messrs. John Smith and H. C. Russell.
Raoul Pierre Pietet.....	Improvements in producing cold, and in the manufacture of sulphurous acid, and in apparatus for these purposes.	Messrs. John Smith and Charles Watt.
John Addison Coleman	Improvements in apparatus for the manufacture of nails for fastening horse-shoes and other purposes	Messrs. E. O. Moriarty and Edmund Fosbery
James Morrow and William Henry Nicholson.	An improvement in machines for stripping grain....	Messrs. E. O. Moriarty and John Whitton.
Gilbert Smith Dean.....	Improvements in the preparation of nitro-glycerine compounds.	Messrs. John Smith and Charles Watt.
Thomas Denny.....	A machine for separating and concentrating auriferous pyrites, and for washing auriferous gravel, and for saving the gold resulting therefrom.	Messrs. A. Leibius and G. K. Mann.
Carl Wageman.....	Improvements in machinery for reducing and classifying ores, and for amalgamating the metals contained therein.	Messrs. John Smith and Charles Watt.
George Westinghouse, junior	Improvements in apparatus for working brakes by fluid pressure.	Messrs. John Whitton and W. C. Bennett.
Nicolaus August Otto.....	Improvements in gas motor engines.....	Messrs. John Whitton and James Barnet.
Andrew Smith Hallidie	Improvements in wire-rope tramways, for transporting articles and substances from place to place, and in the machinery and apparatus connected therewith.	Messrs. John Whitton and W. C. Bennett.
Thomas Alva Edison	Improvements in vebermeters or devices for measuring and registering the current flowing through conductors.	Messrs. G. K. Mann and E. C. Cracknell.
Thomas Alva Edison	Improvements in systems of electric lighting, in electric lamps, and in constituent parts thereof, and in means and methods of manufacture connected therewith.	Messrs. E. C. Cracknell and G. K. Mann.
John Dixon	The manufacture of an improved gas and the apparatus and method therein employed.	Messrs. James Barnet and E. C. Cracknell.
John F. Allen and Louis Ginter.	A cigarette of which the rice-paper at one end is prepared with an amber saliva-proof substance preventing the rice-paper sticking to the lips or becoming moist in any way.	Messrs. Thos. Richards and A. C. Fraser.
Peter Tyrer	Improved contrivances for arresting and extinguishing sparks from steam-engines.	Messrs. John Whitton and E. O. Moriarty.
John Mitchell	Improvements in rock-drills	Messrs. John Whitton and E. O. Moriarty.

Names of Applicants.	Titles of Inventions.	Names of Examiners.
<i>1881—continued.</i>		
Louis Thenot	Improvements in the treatment of quartz, auriferous sand and soil, and argentiferous and other ores, which may undergo amalgamation, and improved apparatus in connection therewith.	Messrs. A. Leibius and G. K. Mann.
Alfred Lee, John Alston Wallace, & Robert Wright Knox.	Improvements in the process of preserving meat and in tins for containing the same.	Messrs. John Smith and E. C. Cracknell.
George Blackeby	Improved lasts for making full and half sizes of boots and shoes.	Messrs. A. C. Fraser and Thos. Richards.
Orazio Lugo	Improvements in telegraphy.....	Messrs. E. C. Cracknell and G. K. Mann.
John Griffith Corey and Nathan Weston Spaulding	Improvements in sheep-shears	Messrs. G. K. Mann and E. C. Cracknell.
George Ashcroft	Ashcroft's quartz-crushing and gold-saving machine	Messrs. A. Leibius and G. K. Mann.
Leopold Hesse	Improvements in closets and closet-pans, and in the process of and apparatus for deodorizing and converting offensive matters, such as excreta, offal, &c., into a fertilizing material.	Messrs. John Smith and Charles Watt.
Marie Jean Leon Marie	Improvements in furnaces for burning cane-trash and other fuel.	Messrs. G. K. Mann and E. C. Cracknell.
Friederich Petrie	Improved processes for the preparation and utilization of materials for the disinfection of fecal and other like matter, which when disinfected may serve as manure or fuel.	Messrs. John Smith and Charles Watt.
Pierce Butler Wilson	Improvements in amalgamators	Messrs. E. C. Cracknell and G. K. Mann.
Juan Francisco Nepomuceno Macay.	Improved apparatus for dissolving and filtering and for effecting chemical reactions in chemical and metallurgical processes.	Messrs. John Smith and Charles Watt.
James Martin, John Felix Martin, and Frederick May.	Improvements in machinery for threshing grain ...	Messrs. Edmund Fosbery & R. G. Massie.
Thomas Alva Edison	Improvement in devices for measuring the electric current passing through or used upon a certain circuit.	Messrs. E. C. Cracknell and G. K. Mann.
Francis Seaman	An improved method of washing sheep and preventing cruelty to animals.	Messrs. G. K. Mann and R. G. Massie.
Francis Edward de Lacye Richards & John Kinloch.	A portable pantascope gas-light	Messrs. James Barnet and E. C. Cracknell.
Robert Dale Owen Smith ...	Improvements in closets, commodes, urinals, sinks, traps, and other depositories for offensive matters.	Messrs. James Barnet and Chas. Watt.
John Dickinson Brunton ...	Brunton's heading machine	Messrs. James Barnet and G. K. Mann.
Thomas Haxton	An improved harrow or grubber	Messrs. E. C. Cracknell and G. K. Mann.
Jules Gerard and Eugene Serullas.	The industrial treatment of bagauze so as to extract therefrom sugar, and at the same time to obtain a ligneous paste especially suitable for the manufacture of paper.	Messrs. Thos. Richards and A. C. Fraser.
Antonie Apraxine	Improvements in aerial balloons	Messrs. John Smith and Chas. Watt.
Henri Herrenschmidt	A process of smelting antimony ore without the aid of any metals or chemicals.	Messrs. John Smith and A. Leibius.
Samuel Henry Crocker	An improved process of engraving on glass or glassy surfaces either direct or by transfer.	Messrs. James Barnet and G. K. Mann.
Charles Frederic Gardner ..	Improvements in sewing machinery chiefly designed for the manufacture of boots and shoes.	Messrs. E. C. Cracknell and G. K. Mann.
William Stephens	Improvements in and relating to machines for boring in the earth.	Messrs. E. C. Cracknell and G. K. Mann.
The Escape Door Lock Company, Limited.	An improved door-fastening.	Messrs. James Barnet and E. C. Cracknell.
George Blackeby	For pricking, channelling, nailing, and channel-setting soles of sewn boots and shoes.	Messrs. A. C. Fraser and Thos. Richards.
Almerin Hubbell Lighthall...	Improvements in heading and harvesting machines for heading and threshing grain in the field.	Messrs. G. K. Mann and R. G. Massie.

Names of Applicants.	Titles of Inventions.	Names of Examiners.
1881—continued.		
Thomas Alva Edison	Improvements in electric lights, and fittings and fixtures therefor.	Messrs. E. C. Cracknell and G. K. Mann.
Thomas Alva Edison	Improvements in electric arc lights.....	Messrs. E. C. Cracknell and G. K. Mann.
Thomas Alva Edison	Improvements in magneto and dynamo electric machines or motors, and means and methods for controlling their generative force.	Messrs. E. C. Cracknell and G. K. Mann.
John Thomas Toohey and James Toohey.	Improvements in the manufacture of beer and yeast by means of a cooling system.	Messrs. A. C. Fraser and Thos. Richards.
George Harrison	A machine for polishing and burnishing the edges of the soles of boots and shoes.	Messrs. A. C. Fraser and Thos. Richards.
Edward D. Barker	Improvements in the method of actuating railway-brakes.	Messrs. John Whitton and G. K. Mann.
Thomas Alva Edison	Improvements in electric lamps, and the manufacture thereof, and in systems thereof.	Messrs. E. C. Cracknell and G. K. Mann.
Thomas Alva Edison	Improvements in magneto or dynamo-electric machines or electric engines.	Messrs. E. C. Cracknell and G. K. Mann.
James Hornsby, John Innocent, & George T. Rutter.	Improvements in harvesting and sheaf-binding machinery or apparatus.	Messrs. Edmund Fosbery and G. K. Mann.
Henry Upton Alcock	An improved table, convertible into either a billiard or a dining table.	Messrs. A. C. Fraser and Thos. Richards.
David Barnes	A machine for splitting wood.....	Messrs. Edmund Fosbery & James Barnet.
John Naylor and Robert Thornton.	Improvements in rock-drills.....	Messrs. James Barnet and G. K. Mann.
Thomas Alva Edison	Improvements in commutators for dynamo or magneto electric machines or electro motors.	Messrs. E. O. Moriarty and E. C. Cracknell.
William Henry Harrison ...	Harrison's concentrator.....	Messrs. G. K. Mann and A. Leibius.
James Robson	Improvements in gas-engines	Messrs. James Barnet and E. C. Cracknell.
Peter Langwill.....	Langwill's improved naso-oral antiseptic respirator.	Messrs. John Smith and Charles Watt.
William Robert Rowan	An improved method of constructing tramways and light lines of railway.	Messrs. John Whitton and E. O. Moriarty.
The Acme Horse-shoe Nail Company.	Improvements in machinery or apparatus for the manufacture of horse-shoe nails.	Messrs. E. Fosbery and G. K. Mann.
1882.		
Charles Capel Greenway.....	The Australian washing-machine	Messrs. James Barnet and W. C. Bennett.
Claude Theodore James Vautin, Russell Barton, and George Hardie.	Improvements in the refining of impure commercial copper.	Messrs. J. Smith and A. Leibius.
Robert Holden Stone	An improvement in the process of manufacturing artificial stone.	Messrs. James Barnet & Edmund Fosbery.
St. George Lane Fox	Improvements in and connected with the distribution and application of energy by electricity for lighting or other purposes, and in the means or apparatus employed therein.	Messrs. E. C. Cracknell and G. K. Mann.
Thomas Anthony Connolly...	Improvements in telephonic and telegraphic apparatus.	Messrs. E. C. Cracknell and G. K. Mann.
John Alston Wallace.....	An improvement in the construction of blast furnaces.	Messrs. E. O. Moriarty and John Whitton.
John William Janson	Improvements in machinery for unhairing, fleshing, paring, shaving, and setting hides, skins, or pelts.	Messrs. Edmund Fosbery & R. G. Massie.
Robert Archibald White.....	Improvements in contrivances for working semaphore.	Messrs. Francis Hixson and E. O. Moriarty.
Alexander Richard Mackenzie and John Frederick MacLaren.	Mackenzie and MacLaren's combined ejector and Toricellian vacuum pan.	Messrs. E. C. Cracknell and G. K. Mann.

Names of Applicants.	Titles of Inventions.	Names of Examiners.
1882—continued.		
Charles Phillips	Improvements in the concentration and classification of dry ores and auriferous material.	Messrs. A. Leibius and E. C. Cracknell.
Robert Archibald White	Improvements in machinery for opening and closing railway gates.	Messrs. John Whitton and E. O. Moriarty.
Charles William Maclean ...	Improvements in self-acting grabs and in the contrivances used for working same.	Messrs. E. C. Cracknell and G. K. Mann.
Stephen Dennis, Antonio Samper, and Julio Valenzuela.	Improved means of transmitting rotary motion.....	Messrs. W. C. Bennett and E. O. Moriarty.
Thomas Alva Edison	Improvements in systems of electric lighting.....	Messrs. E. C. Cracknell and G. K. Mann.
Thomas Alva Edison	Improvements in electrical distribution systems ...	Messrs. E. C. Cracknell and G. K. Mann.
Thomas Alva Edison	Improvements in meters for measuring electric currents.	Messrs. E. C. Cracknell and G. K. Mann.
Thomas Alva Edison	Improvements in and connected with dynamo or magneto electric machines and electro motors.	Messrs. E. C. Cracknell and G. K. Mann.
Hiram Stevens Maxim.....	Improvements in and relating to dynamo-electric machines.	Messrs. E. C. Cracknell and G. K. Mann.
Thomas Alva Edison	Improvements in dynamo or magneto electric machines.	Messrs. E. C. Cracknell and G. K. Mann.
Thomas Cramm	Cooling wines or other liquids on draught	Messrs. Edmund Fosbery & R. G. Massie.
Thomas Alva Edison	Improvements in the manufacture of carbon conductors for incandescent electric lamps.	Messrs. E. C. Cracknell and James Barnet.
Thomas Alva Edison	Improvements in electric lamps, and the manufacture thereof.	Messrs. E. C. Cracknell and G. K. Mann.
John Thomas	Thomas' automatic coupling	Messrs. John Whitton and E. O. Moriarty.
Alexander Wm. Gillman and Samuel Spencer.	Improvements in the treatment of grain or cereals to be used in brewing, distilling, and vinegar-making, and in means or apparatus employed therein.	Messrs. Charles Watt and R. G. Massie.
Henry Benjamin Liebmann...	The automatic card-winder	Messrs. James Barnet and W. C. Bennett.
Robert Rillieux.....	Improvements in evaporating and boiling apparatus employed in the manufacture of sugar and in the application of megasse as fuel, part of which apparatus is also applicable for evaporating and boiling other substances.	Messrs. A. Leibius and Charles Watt.
James Ben Ali Haggin and William Irelan.	Improvements in sheep-washes.....	Messrs. Charles Watt and E. O. Moriarty.
Edward Weston	Improvements in apparatus for generating electric currents and for producing electric light.	Messrs. E. C. Cracknell and G. K. Mann.
Hiram S. Maxim	Improvements in and relating to electric-lighting apparatus and the manufacture of carbonized material to form conductors for the same, and for other purposes.	Messrs. E. C. Cracknell and Chas. Watt.
Walter Buttery	Improvements in billiard and bagatelle tables	Messrs. John Whitton and James Barnet.
Ewald Brüncker	Improvements in lockstitch sewing-machines.....	Messrs. James Barnet and W. C. Bennett.
Edmund Taylor and William Humble.	Improvements in and connected with portable refrigerators and in refrigerating chambers.	Messrs. Charles Watt and James Barnet.
Ebenezer Farie Macgeorge ...	An improved method of and apparatus for ascertaining the gradient of any internal or external surface, together with the magnetic bearing of such gradient.	Messrs. E. C. Cracknell and G. K. Mann.
Elizabeth Barnston Parnell...	E. B. Parnell's pyrites process.....	Messrs. A. Leibius and G. K. Mann.
James Ker Gulland.....	Improvements in apparatus for boring or drilling in stone and other matters.	Messrs. James Barnet and W. C. Bennett.
Richard Bowyer Smith.....	Improvements in ploughs and cultivators	Messrs. E. O. Moriarty and James Barnet.
James Morrow and William Henry Nicholson.	An improvement in the construction of grain-stripping machines.	Messrs. G. K. Mann and James Barnet.

Names of Applicants.	Titles of Inventions.	Names of Examiners.
<i>1882—continued.</i>		
John Hammond Robinson & Charles James Robinson.	Improvements in earth-scoops	Messrs. E. O. Moriarty and John Whitton.
Joseph Walker Oakman.....	Improved concave vehicle-springs.....	Messrs. John Whitton and E. O. Moriarty.
Jonathan Sherman, jr., James L. Hill, and Emily Coursen	Preparing iron-bark for transportation	Messrs. A. C. Fraser and Thos. Richards.
Augustus F. Nagle	Improvements in presses for pressing bricks and concrete blocks.	Messrs. E. O. Moriarty and John Whitton.
George Westinghouse.....	Improved apparatus for working railway-brakes by fluid pressure.	Messrs. John Whitton and W. C. Bennett.
Camille Alphonse Faure ...	Improvements in galvanic batteries	Messrs. E. C. Cracknell and G. K. Mann.
James Webster.....	A new or improved method of producing alumina suitable for the manufacture of aluminium.	Messrs. Chas. Watt and A. Leibius.
Alfred Walker	A machine for moulding and compressing artificial blocks or bricks.	Messrs. E. O. Moriarty and John Whitton.
Heinrich Wilhelm Ferdinand Kayser	Improvements in machinery or apparatus for classifying, dressing, and concentrating ores and other metalliferous material.	Messrs. A. Leibius and Chas. Watt.
William Robert Rowan	Improvements in rolling-stock adapted for railways and tramways.	Messrs. John Whitton and E. O. Moriarty.
James Lees, John William Rock, and Charles Gifford Moore.	An improved barbed fencing-wire and an improved machine for making it.	Messrs. E. O. Moriarty and James Barnet.
James Sykes Wethered	An improvement in the manufacture of concrete materials and in blocks made thereof for paving, building, and similar purposes.	Messrs. E. O. Moriarty and John Whitton.
Louis Carnegy Auldjo.....	The combined water-jet vapour exhaustor and condensor.	Messrs. E. C. Cracknell and G. K. Mann.
Alfred Charles Brown and Henry Alfred Charles Saunders.	Improvements in telephonic and telegraphic signalling apparatus.	Messrs. E. C. Cracknell and Francis Hixson.
Frederick Sheppard Grimwade.	Improvements in the preparation of phosphorized material for the destruction of vermin.	Messrs. Chas. Watt and James Barnet.
John F. Allen & Lewis Ginter	New and useful improvements in cigarettes	Messrs. Thos. Richards and A. C. Fraser.
Edgar Dredge, David Beath, & Joshua Alexander Kay.	Improvements in machinery for cutting cloth, leather, rubber, wood, &c.	Messrs. A. C. Fraser and Thos. Richards.
Tom Ernest Gatehouse... ..	Improvements in obtaining electric light and in apparatus to be employed therefor.	Messrs. E. C. Cracknell and G. K. Mann.
Gustaf Liedman and Carl Beger.	An improved apparatus for giving motion to carriages, vessels, machines, and other moving bodies.	Messrs. E. C. Cracknell and G. K. Mann.
Francis Raymond Welles ...	Improvements in contrivances used in telephony and telegraphy.	Messrs. E. C. Cracknell and G. K. Mann.
William Henry Harrison and John Cornelius Craigie Halkett.	Harrison's hydrogen smelting process	Messrs. A. Leibius and Chas. Watt.
Thomas Kenedy Park	The dry-blowing ore separator	Messrs. A. Leibius and Chas. Watt.
Thomas Bladen.....	Bladen's improved rail and guard for tramways.....	Messrs. John Whitton and E. O. Moriarty.
Walter Francis Reid & David Johnson.	Improvements in the manufacture of explosives.....	Messrs. E. O. Moriarty and John Whitton.
John Ambrose Fleming	Improvements in the preparation of materials to be employed for the purpose of electric insulation.	Messrs. E. O. Moriarty and E. C. Cracknell.
Knud Geelmuyden Bull	Bull's Australian cement	Messrs. James Barnet and Charles Watt.
David Reginald Ashton and James Neville Sperry ..	Improvements in cocks and valves	Messrs. A. C. Fraser and Thos. Richards.
Wilkinson Wayman and George Kay.	An improved method of constructing engines and machines, in which the motive-power is applied to either side of the piston alternately.	Messrs. E. O. Moriarty and W. Bennett.
Alexander Binnie and Edward Wills U'Ren.	An improved process of and apparatus for the manufacture of gas for illuminating and other purposes.	Messrs. James Barnet and E. C. Cracknell.

Names of Applicants.	Titles of Inventions.	Names of Examiners.
<i>1882—continued.</i>		
Jules Louis Moret	An improved composition for unhairing and preserving hides and skins.	Messrs. Chas. Watt and W. C. Bennett.
Frederick Settle Barff	A new compound to be employed in the preservation of organic substances.	Messrs. Chas. Watt and W. C. Bennett.
John Dickinson Brunton ...	Improvements in machinery or apparatus for tunnelling, shaft-sinking, and excavating.	Messrs. E. O. Moriarty and W. C. Bennett.
Charles Vernon Boys	A new or improved electric meter or apparatus for measuring and registering the quantity of electricity passed through a conductor.	Messrs. E. C. Cracknell and G. K. Mann.
Frederick Arthur Pulleine ...	The automatic fruit-evaporator.....	Messrs. Chas. Watt and A. Leibius.
Nicholas Belfield Dennys ..	A composition for protecting the bottoms of iron vessels, metals, and wood, from the action of sea-water, fouling, damp, and atmospheric influence.	Messrs. Francis Hixson and H. Broderick.
Joseph Thos. Burton Gibbs...	New automatic multicolour printing apparatus	Messrs. Thos. Richards and A. C. Fraser.
James Richard Thomson.....	Improvements in valves for the air-pumps of steam-engines.	Messrs. E. O. Moriarty and W. C. Bennett.
William Watson	Improvements in mining and deep-lift pumps.. ..	Messrs. A. Leibius and James Barnet.
James Fyfe	Improvements in electric lamps	Messrs. E. C. Cracknell and G. K. Mann.
John Jeyes	Improved antiseptic preservative, curative, and cleansing compounds for sanitary and other purposes.	Messrs. A. Leibius and Charles Watt.
Robert Savage and Frederick York Wolseley.	Improvements in earth-scoops	Messrs. James Barnet and W. C. Bennett.
Daniel Howard Martin	Improvements in the production and manufacture of air-gas from gasoline.	Messrs. Charles Watt and A. Leibius.
John Halley and Alexander Barr.	Improvements in apparatus for holding or carrying eggs.	Messrs. A. C. Fraser and Thos. Richards.
Joseph James Coleman	Improvements in apparatus for obtaining and applying cold air.	Messrs. E. C. Cracknell and Chas. Watt.
James Cosmo Newbery, John Lister Morley, and Barry Cleveland.	Improvements in furnaces for reducing and smelting certain descriptions of ores.	Messrs. A. Leibius and E. O. Moriarty.
Charles Sebastian Smith and Thomas Moore.	An improved method of and apparatus for breaking down or getting coal and other minerals in mining, quarrying, or tunnelling operations.	Messrs. James Barnet and W. C. Bennett.
Heinrich Western	Improvements in apparatus for ventilating, cooling, and warming buildings and rooms.	Messrs. James Barnet and W. C. Bennett.
David Anderson	Improvements in contrivances for varying the gauge of the wheels of rolling-stock for rail and other permanent ways.	Messrs. John Whitton and E. O. Moriarty.
George Westinghouse, junr.	Improvements in pneumatic-brake apparatus for railway trains.	Messrs. John Whitton and E. O. Moriarty.
Joshua Alexander Kay	Improvements in machinery for breaking up and tilling the ground.	Messrs. John Whitton and E. O. Moriarty.
Joel Wilson	Improvements in furnaces for reducing iron-ores ...	Messrs. A. Leibius and Charles Watt.
James Pitkin	Improvements in secondary batteries	Messrs. E. C. Cracknell and G. K. Mann.
Antonio Buzolich and Thomas King Smith.	An improved composition to be used as a paint either with or without the ordinary pigments.	Messrs. James Barnet and Charles Watt.
Edme Augustin Chameroy ...	Improvements in weighing-machines	Messrs. Edmund Fosbery and G. K. Mann.
Heinrich Wilhelm Ludwig Otto Von Roden.	Improved process of preserving milk	Messrs. Edmund Fosbery & Chas. Watt.
Sigismund Cohne.....	A new or improved electric accumulator for the storage of electric energy.	Messrs. E. C. Cracknell & G. K. Mann.
Hugh Giffen M'Kinney	Improved method of burning bricks, tiles, or other articles of earthenware.	Messrs. James Barnet and W. C. Bennett.
Henry Francis Joel.....	Improvements in magneto-electric machines	Messrs. E. C. Cracknell & G. K. Mann.

Names of Applicants.	Titles of Inventions.	Names of Examiners.
<i>1882—continued.</i>		
William Henry Harrison ...	Harrison's bi-disc electric lamp	Messrs. E. C. Cracknell & G. K. Mann.
Leon Ehrmann.....	An improvement in the manufacture and use of sulphurous acid by a new apparatus.	Messrs. Charles Watt and A. Leibius.
Fritz Koenemann.....	Improvements in blasting-cartridges	Messrs. James Barnet & Edmund Fosbery.
The Brush Electric Light and Power Company of Australasia, Limited.	Improvements in current governors for dynamo-electric machines.	Messrs. E. C. Cracknell & G. K. Mann.
James Rutherford	Rutherford's electro-plated gold-saver.....	Messrs. A. Leibius and Chas. Watt.
The Brush Electric Light and Power Company of Australasia, Limited.	Improvements in reflectors	Messrs. E. C. Cracknell & G. K. Mann.
Augustus Figge	Improvements in water-wheels and paddle-wheels...	Messrs. Francis Hixson and H. Broderick.
Robert Officer	An improved machine for clearing scrub-lands.	Messrs. James Barnet and W. C. Bennett.
John Alves and John Logan..	Improvements in apparatus for the extraction of gold and the concentration of gold-bearing material such as pyrites from finely-divided auriferous material.	Messrs. A. Leibius and Chas. Watt.
Joseph Wilson Swan	Improvements in secondary cells and batteries or apparatus for storing electricity.	Messrs. E. C. Cracknell & G. K. Mann.
Henry Bulmer and Charles Sheppard.	Bulmer and Sheppard's patent Canada self-acting brick machine.	Messrs. E. O. Moriarty and G. K. Mann.
Paul de Puydt	Process for the manufacture of fibres by the treatment of textile materials, &c.	Messrs. Chas. Moore and James Barnet.
James Howard and Edward Tenney Bonsfield.	Improvements in ploughs and other tilling implements.	Messrs. A. C. Fraser and Thos. Richards.
Joshua Alexander Kay and David Beath.	Improvements in machinery for cutting cloth, leather, rubber, pasteboard, &c.	Messrs. A. C. Fraser and Thos. Richards.
John Scudamore Sellon	Improvements in secondary batteries or magazines of electricity.	Messrs. E. C. Cracknell and G. K. Mann.
Edward Horsepool	Improvements in fasteners for gloves and other articles of wearing apparel and analogous articles.	Messrs. Edmund Fosbery and G. K. Mann.
John Evelyn Liardet and Thomas Donnithorne.	Improvements in the means of and in the apparatus for storing electrical energy, and in the preparation of the materials to be employed.	Messrs. E. C. Cracknell and G. K. Mann.
Arthur Hill Rowan	Improvements in tramways	Messrs. John Whitton and E. O. Moriarty.
The Mallac Patent Electric Lighting Company, Limited	Improvements in galvanic batteries.....	Messrs. E. C. Cracknell and G. K. Mann.
John Woods.....	Improvements in railway-brakes	Messrs. John Whitton and E. O. Moriarty.
Robert Jacob Gülcher.....	Improvements in dynamo-electric machines or magneto-electric machines.	Messrs. E. C. Cracknell and G. K. Mann.
Robert Jacob Gülcher.....	Improvements in electric lamps	Messrs. E. C. Cracknell and G. K. Mann.
Richard Cook	Cook's centrifugal pulveriser and amalgamating tables.	Messrs. A. Leibius and Chas. Watt.
Richard Howling, Charles Walker, Granger Barton, & Wicksteed Charles Barton.	Howling's patent spark-arrester	Messrs. John Whitton and E. O. Moriarty.
Hiram Codd and Dan Rylands	Improvements in bottles for containing aerated liquids and in the manufacture of such bottles.	Messrs. Chas. Watt & A. Leibius.
Alfred Wilson	Improvements in apparatus for making gas	Messrs. A. Leibius and James Barnet.
George Dalton	Improvements in and connected with machinery or apparatus for crushing or reducing gold-quartz ores, coprolites, cement, clinker, or other like substances.	Messrs. A. Leibius and Chas. Watt.
Charles Cullen	Cullen's patent folding meat-safe.....	Messrs. James Barnet and W. C. Bennett.

Names of Applicants.	Titles of Inventions.	Names of Examiners.
1882—continued.		
Raphael Josia	Improvements in the manufacture of artificial stone and marble, and in colouring the same.	Messrs. James Barnet and W. C. Bennett.
Albert Paulding Brayton ...	Improvements in water-jackets for smelting-furnaces.	Messrs. A. Leibius and Chas. Watt.
Robert M'Cully	Improvements in machines for crushing, grinding, pulverizing, or similarly treating ore, grain, and other materials.	Messrs. James Barnet and W. C. Bennett.
Paul Lawrence, Edmund Icery, Leon Ehrmann, and Clare Bernard.	An improvement in the purification of juice from the sugar-cane and the syrups produced in the course of converting it into sugar; and also for obtaining a large yield of sugar by a new process.	Messrs. Chas. Watt and A. Leibius.
Henry Hudson.....	Improvements in leaf-springs	Messrs. James Barnet and W. C. Bennett.
John Edgecumbe Rendle	Improvements in the construction of glazed roofs and other glazed structures.	Messrs. James Barnet and E. Fosbery.
Francis Blundell WarreMalet	Malet's star barb fencing-wire	Messrs. John Whitton and W. C. Bennett.
Alexander Leslie Fyfe, John Main, Robert Bowman.	Improvements in and connected with dynamo-electric, magneto-electric, and electro-magnetic machines and motors, and in arc-electric lamps and regulators.	Messrs. E. C. Cracknell and G. K. Mann.
Charles Francis Brush	Improvements in secondary batteries or magazines of electricity, and in apparatus connected therewith.	Messrs. E. C. Cracknell and G. K. Mann.
Friederich Hoffman.....	Improvements in permanent way	Messrs. James Barnet and W. C. Bennett.
Harry Chas. Huntley Mohun	Improvements in the method of burning bricks, tiles, pipes, pottery, or any other material or substances.	Messrs. E. Fosbery and R. G. Massie.
Joseph Matthews.....	Matthews' auxiliary lever	Messrs. E. C. Cracknell and G. K. Mann.
George Fletcher & Son	Improvements in Younger's cooking-stoves	Messrs. James Barnet and W. C. Bennett.
Charles Hill Pennycook	Improvements in glazing bars	Messrs. James Barnet and W. C. Bennett.
Edward Horsepool	Improved fastener for gloves; applicable also to other articles of wearing apparel.	Messrs. E. Fosbery and G. K. Mann.
Joseph V. Nichols	Improvements in electric lamps or lighting apparatus	Messrs. E. C. Cracknell and G. K. Mann.

(3.) *The amount of remuneration paid to such Examiner in each case?*

Each member of the Examining Board received the sum of £3 3s. for his services in respect of each case.

(4.) *How the balance of the £20 fee was disposed of?*

The Attorney-General receives £5 for perusing the papers connected with each application and perusing and settling draft Letters of Registration; the Attorney-General's secretary receives £1; the Crown Solicitor receives £5 10s. 6d. for preparing Letters of Registration; the balance, £2 3s. 6d., remains in the Treasury.

(5.) *The names of all Patent Examiners?*(6.) *The date of and by whom appointed?*(7.) *The special qualification of each one?*(8.) *Whether still on the Patent Board?*

There is no fixed Board; but when occasion arises two competent persons are appointed to constitute a Board for the granting of Patents, and are nominated according to the nature of each particular case, and their aptitude or fitness, and facilities at their command, to examine and report upon applications for Letters of Registration. The gentlemen whose names are given in reply to No. 10 have been selected to report upon Petitions for Letters of Registration since the transfer of the business to the Department of Justice in September, 1880.

(9.) *The number of cases considered?*

255 cases have been dealt with since the 14th September, 1880, and up to the 31st December, 1882.

(10.)

(10.) *The total amount paid to each Examiner every year.*

Names of Examiners.	Amounts paid in 1880.			Amounts paid in 1881.			Amounts paid in 1882.		
	£	s.	d.	£	s.	d.	£	s.	d.
W. C Bennett	3	3	0	15	15	0	75	12	0
James Barnet	6	6	0	50	8	0	100	16	0
H. Broderick	Nil			3	3	0	6	6	0
E. C Cracknell	3	3	0	97	13	0	135	9	0
E. Fosbery	Nil			22	1	0	34	13	0
A. C. Fraser	Nil			22	1	0	25	4	0
Francis Hixson	Nil			3	3	0	12	12	0
A. Leibius	Nil			22	1	0	72	9	0
E. O. Moriarty	3	3	0	40	19	0	88	4	0
G. K. Mann	12	12	0	119	14	0	141	15	0
Chas. Moore	Nil			Nil			3	3	0
R. G. Massie	3	3	0	9	9	0	12	12	0
Thos. Richards	3	3	0	37	16	0	25	4	0
H. C. Russell	Nil			12	12	0	Nil		
John Smith	9	9	0	72	9	0	3	3	0
John Whitton	3	3	0	47	5	0	63	0	0
Charles Watt	9	9	0	78	15	0	88	4	0

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