

1883-4.

NEW SOUTH WALES.

VOTES

AND

PROCEEDINGS

OF THE

LEGISLATIVE ASSEMBLY

DURING THE SESSION

OF

1883-4,

WITH THE VARIOUS DOCUMENTS CONNECTED THEREWITH.

IN ELEVEN VOLUMES.

VOL. X.

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LEGISLATIVE ASSEMBLY.
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1883-4.

LEGISLATIVE ASSEMBLY.
NEW SOUTH WALES.

PATENTS AND TRADE-MARKS BILL.

(MESSAGE No. 77.)

Ordered by the Legislative Assembly to be printed, 30 July, 1884.

AUGUSTUS LOFTUS

Message No. 77.

Governor.

In accordance with the provisions contained in the 54th section of the Constitution Act, the Governor recommends for the consideration of the Legislative Assembly the expediency of making provision to meet the requisite expenses in connection with a Bill to amend the Law relating to Patents and Trade-marks.

Government House,

Sydney, 30th July, 1884.

GENERAL INDEXES

TO THE

LETTERS OF REGISTRATION

FOR

INVENTIONS AND IMPROVEMENTS IN THE ARTS OR MANUFACTURES.

GRANTED IN NEW SOUTH WALES.

PART II.

INDEXES TO PATENTS Nos. 901 to 1026 INCLUSIVE,

BEING THE PATENTS GRANTED DURING THE YEAR 1881, AND CONTAINED IN THE THIRD
VOLUME OF PATENTS, PUBLISHED IN 1882,

WITH

A DESCRIPTION OF THE SCHEME OF CLASSIFICATION, AND
VARIOUS OTHER PARTICULARS.

COMPILED UNDER THE DIRECTION OF THOMAS RICHARDS, GOVERNMENT PRINTER,
BY J. J. SPRUSON, ASSISTANT-REGISTRAR OF COPYRIGHT.

ORDERED BY THE LEGISLATIVE ASSEMBLY TO BE PRINTED,
30 September, 1884.



SYDNEY: THOMAS RICHARDS, GOVERNMENT PRINTER.

1884.



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PREFACE.

THIS Part is supplementary to the volume already published of General Indexes to the Letters of Registration granted in New South Wales for Inventions and Improvements made in the Arts and Manufactures up to the end of 1880, and embraces the Patents granted in the year 1881, namely, Nos. 901 to 1026 inclusive.

The general plan of the former publication has been followed—omitting matters that it is not considered necessary to repeat; but the Abbreviations of the Specifications have been made much more elaborate, and it is hoped they will be found correspondingly useful. These brief descriptions are not, however, intended to obviate the necessity of consulting the specifications from which they were drawn, in cases where the fullest information is required.

The “Scheme of Classification,” which is a new feature in this Part, is based upon the prefatory matter contained in the admirable volumes of Abridgments of Specifications of Imperial Patents, which have been issued from time to time since 1860, and now represent nearly 100 classes of subjects, covering almost the whole field of science.

The study of all these prefaces simultaneously has enabled a comprehensive view to be obtained of the classification and divisional treatment of each subject, as originally contemplated by one author, and afterwards improved upon by another. The discrepancies in the definitions were found to be numerous. In harmonizing the definitions, it became necessary to modernize a great deal of the matter, as most of the prefaces are old, and science has been advancing rapidly since they were printed. This involved the re-definition of some classes and the constitution of others. The first ninety classes or thereabout are, however, sufficiently identical with the Imperial series to serve as a key thereto, and the rest will be found to correspond in substance with future additions to the Imperial series, though the classes may prove to be differently numbered. The advantage of having the classes numbered and designated generally like those in the Imperial series is, that by such arrangement the history of any particular class of Patents can be traced through the Imperial Abridgments and Indexes, and thence through this publication; and this can be done with facility in Sydney, by referring to the large collection of works relating to Imperial Patents, that may be seen in the Free Public Library.

References to the Abridgments in Vol. 1 of this Index are supplied under all the headings, the classification of each Patent being made to correspond with the improved arrangement of this book, and the numbers of the Patents being given under different headings when they refer partly to one class and partly to another.

Government Printing Office,
19 September, 1884.

T. R.



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. 1026, GRANTED 22 DECEMBER, 1831.)

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, 1873.
10	" 501 to 562	501 to 562, 1876 ...	4 June, 1879.
11	" 563 to 651	563 to 651, 1877 ...	3 March, 1881. 1st Vol., 1881.
12	" 652 to 715	652 to 715, 1878 ...	26 October, 1881. 2nd Vol., 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 ...	1st Vol., 1882. 2nd Vol., 1882.
15	" 901 to 1026	901 to 1026, 1881 ...	3rd Vol., 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.]

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SCHEME OF CLASSIFICATION,

ADAPTED FROM ABRIDGMENTS OF IMPERIAL PATENTS.

[The pages given in the headings refer to the *Abridgments* in this book ; the numbers in the text, to the *Classes*.]

1: Drains and Sewers ; including the manufacture of Drain-tiles and Drain-pipes, p. 45.

This series comprises the inventions relating to the construction of sewers, house drains, and land or agricultural drains, including the construction of the pipes and other conduits for these purposes, as well as the machinery employed for excavating the ground to receive them.

Metal pipes when specifically claimed, and gutters, as well as most pipes made of clay and other plastic materials, are included, together with the machinery for making them ; but kilns for drying and firing, and methods of ornamenting them, are excluded. See "Bricks and Tiles," 22 ; "Pottery," 24 ; "Fuel, &c.," 30.

Methods of pulverizing clay preparatory to making "bricks, tiles, and pipes," are not included in this series, nor are machines for making bricks, unless they are claimed as applicable to pipe or drain tile making ; but to this latter rule one or two exceptions have been made, when certain machines have been shown as obviously capable of application, and no doubt intended to have been applied, to these specific purposes. For these see "Bricks and Tiles," 22, and "Pottery," 24.

Specifications descriptive of methods of utilizing sewage and generally disposing of it do not appertain to the present series, except where there are additions to or alterations in the form or construction of the sewers. The excluded specifications will be found in "Manure," 3.

Siphons for delivering water are only included in this series when their application to draining is stated ; other siphons are classed under "Hydraulics," 32.

2. Sewing and Embroidering, p. 45.

This series includes inventions relating to sewing and embroidering by hand or machinery, except inventions classed under "Saddlery, &c.," 34 ; "Books, &c.," 43 ; and "Wearing Apparel : Head Coverings, 65, Body Coverings, 66, and Foot Coverings, 67".

New and improved forms of needles are included ; but for the manufacture of needles the reader is referred to the heading "Needles and Pins," 45.

Inventions relating to needle-cases, thimbles, and what are known as "Ladies' Companions," are embodied in this series, with the view of rendering it complete.

Certain novel fabrics are also described, as well as improved methods of manufacturing others, some process of sewing or embroidering being in each case associated with them. The inventions relating to embroidery are not restricted to those in which a needle or some process of sewing is used,—any methods of producing similar embroidery, whether by weaving or otherwise, being comprehended.

The preparation of canvas patterns, and also of imitation embroidery, forms a branch of this series.

3. Manure, p. 45.

This class comprises those inventions in which different substances, whether animal, vegetable, or mineral, are either chemically or mechanically treated for subsequent use as manures. The inventions principally consist of the following :—

1. The precipitation of sewage through filtering tanks.
2. The separation of solid from liquid sewage by machinery.
3. The preparation of bones and similar fertilizing substances by grinding and crushing ; and the dissolution of such materials by chemical agents, as well as by heat, either in retorts, furnaces, or steam apparatus.
4. Deodorizers and disinfectants which are claimed as being capable of fixing certain valuable properties in manures, at the same time that they render the substances less noxious.

Disinfectants and deodorizers generally will be found in the series "Medicine, Surgery, and Dentistry," 25.

Modes of constructing drains and sewers, whereby the solid portion of the sewage is collected and the more fluid portion passes away, have been omitted from the present series. For these, see "Drains and Sewers," 1.

Pumping apparatus for raising sewage has also been omitted, for which see "Hydraulics," 32.

4. Preservation of Animal and Vegetable Substances (without the use of Cold) ; also, Preparation of same for Market, p. 45.

This series includes not only the apparatus and processes employed in the preservation of food (other than freezing agents, for which see "Ice-making, &c.," 85), but also the means of keeping such food after it has undergone a preservative process. It also includes the preservation of substances which are not of the alimentary class, and which are not referable to any other class ; and it includes the tinning, labelling, or other processes incidental to the preparation of such commodities for market, where such is not otherwise

otherwise provided for in the different classes. It may be mentioned likewise that, although in this series an endeavour has been made to include all the inventions bearing upon the preservation of grain and such like substances, yet the inventions relating to the processes or means for the preparation of corn-flour and analogous matters have been purposely omitted, for which see "Grinding Grain, &c.," 78.

Preserving skins, hides, and leather is classed under "Skins, &c.," 55, unless when freezing agents are employed; then they are placed under "Ice-making, &c.," 85.

5. Marine Propulsion, p. 46.

This class comprehends all inventions which have reference to the propulsion of ships and other vessels through the water, except those in which the vessel is propelled by means of sails. Marine engines, steam and other, have consequently been included, as also have all the apparatus for the production of motive power, when such power is to be applied to the propulsion of vessels. Oars, paddles, and propellers of various sorts, whether worked by manual or other power, are also included in the series. Apparatus for steering, when such apparatus acts by giving actual motion to the vessel (whether by ejecting jets of water, steam, air, or other fluid or aeriform matter, or by special paddle or screw), has been admitted; but steering mechanism which merely guides without moving the vessel has not. For this series, see "Steering, &c.," 75. Paddles for swimmers, and means for propelling the human body in the water, attached to a life-belt or otherwise, have been excluded. In some inventions the power of the wind upon sails resembling those of a windmill has been utilized; these will of course be included. The inventions of which the subject is connected with propulsion by means of sails, or with the rudders and rigging of ships, will be found under "Masts, Sails, &c.," 73. Those which treat of the construction of the hull must be looked for in the series "Ship-building, &c.," 21.

6. Manufacture of Iron and Steel, p. 46.

The scope of this series comprises all processes for the manufacture of cast-iron, steel, and malleable iron, as well as the preparation of special qualities of metal; also the production by rolling of sheets, plates, rails, rods, bars, angle-iron, &c. The production of metals, other than iron and steel, is given in another series, entitled "Metals and Alloys," 18. This latter is designed to embrace all inventions of general application for obtaining and manufacturing various metals, some of which may be applicable to the treatment of iron ores and iron as well as other ores and metals.

Under this class are placed all furnaces and kilns, particularly those applicable to the production of iron and steel, excepting when the inventions are restricted to methods of effecting combustion, utilizing waste heat, or economizing fuel, which have been reserved for the series relating to the combustion of fuel and to the construction of furnaces in general, for which see "Fuel, &c.," 30. Furnaces and kilns for calcining, smelting, and treating ores and metals other than iron and steel have been omitted, excepting where some reason, such as special applicability, appeared to render their insertion desirable. For these, see "Metals and Alloys," 18. With reference to the rolling of sheets, plates, rails, bars, &c., it should be explained that inventions for rolling metals generally, although the specifications do not state that such inventions are applicable to iron or steel, have been inserted under this heading; but those which are stated to relate only to other specified metals are omitted; the rolling of manufactured rods, tubes, and plates for purposes of ornamentation is likewise omitted. These are all placed under "Metals and Alloys," 18.

The manufacture of articles of finished iron is excluded, as well as the work of the smithy and of the engineer's shop, even when such work is restricted to the making in the rough state articles of special qualities of metal; as, for example, the piling and welding of iron for axles, or the casting of railway wheel tires. Some of these are included in the division "Shaping and Working," under "Metals and Alloys," 18, others under "Hardware, &c.," 104. The casting of solid ingots is contained in this series, together with various inventions relating to the subject of casting; but the production of useful or ornamental casting is omitted.

Blowing engines or machines for producing a blast of air are omitted, see "Ventilation," 52; "Metals and Alloys," 18; "Fuel, &c.," 30; but apparatus for heating the blast and conveying it into the fire are included.

Steam-hammers are, as far as possible, excluded; but shingling machines generally, and special machines for working the heavy balls obtained in certain mechanical puddling processes, will be found under this head. Hand tools for working the metal in process of manufacture are also included.

Alloys employed in iron and steel making, and metals which are regarded as mere varieties of iron and steel, are comprised in this series.

Tempering, annealing, and case-hardening processes for general applications are included, except for ironwork included in the manufacture of safes, &c.; see "Safes, &c.," 64.

7. Aids to Locomotion, p. 46.

This series includes inventions relating to broad wheels and rollers. Endless travelling railways are also included, when they comprise endless chains or rollers, endless chains or connected series of short rails, series of rails or supporting pieces applied separately to the wheel but acting as a continuous railway, or circular rails. Wheels with spikes, projections, or ribs on their tires, to give them a firm hold upon the ground; wheels with teeth to gear into fixed racks, for the purpose of more easily ascending railway inclines, &c.; endless series of levers or feet, for catching hold of the earth in succession and impelling the carriage; impelling legs or levers, which, by repeated backward strokes, force the carriage onward; supporting legs by which the carriage or implement is converted into a walking machine; wheels without tires, or with divided peripheries; wheels made with elastic or flexible peripheries, whereby a larger surface is caused to bear upon the ground or rail, and the bite of the wheel is increased,—are all placed in this class. It likewise includes inventions relating to fitting carriages or implements with a single broad wheel or roller; constructing vehicles of cylindrical and spherical forms; wheels having tires inlaid with wood, horn, india-rubber, gutta-percha, hide, leather, &c.; screw propellers to act against stationary points of resistance and impel the carriage or implement; and substitutes for supporting wheels and rollers.

8. Steam Culture, p. 46.

Steam Culture comprises not only the inventions which have for their object the employment of steam power for cultivating the soil or performing the field operations of agriculture, but also those inventions which are indirectly connected with the subject; the working of agricultural implements by electricity, explosive agents, heated air, compressed air, wind, atmospheric pressure, or water-power are excluded, and will be found under the classes referring to these subjects respectively; also the various plans of communicating motion to carriages or agricultural implements which have been subsequently adopted in steam culture, as by grooved pulleys travelling along or in contact with fixed or slowly moving ropes or chains, propelling screws, differential pulleys, winding up ropes or chains, &c., are included; likewise such improved forms of implements or machines as might be or have been adapted to till the soil by the agency of steam, as revolving harrows, cultivators, and clod-crushers, portable or travelling agricultural engines, digging machines, &c.

9. Watches, Clocks, and other Time-keepers, p. 46.

This class contains those inventions in which clockwork is employed to indicate time, either by visible or audible means, or in which horological apparatus is actuated by other means than clockwork.

Compound instruments, in part of which is a watch or clock (for instance where a barometer, compass, thermometer, and clock are placed together for facility of reference), have been admitted; but not mathematical instruments used in conjunction with a stop-watch, for the registrations of certain times or isolated periods of time, in order to ascertain speed or for similar purposes, which are placed under "Measuring, &c.," 100. Inventions relating to all the following subjects are included:—

The separate parts of a watch or clock, and the tools for making the same.

Scales for a new division of time.

Time teachers.

Toy watches.

Swivels, bows, pendants, or knobs, when intended to form part of a watch or watch-key; but not when described only as part of a chain, watch-guard, or property-protector, for which see "Wearing Apparel—Dress Fastenings and Jewellery," 68, "Chains, &c.," 90.

Inventions relating to the following subjects are excluded (excepting a few which also belong to some of the above included classes):—

Tell-tales and indicators for recording the arrival of workmen, &c., for which see "Measuring, &c.," 100.

Nautical and astronomical instruments by which time can be ascertained through celestial observations, which will be found under "Optical, &c.," 76.

Clockwork mechanism as a part of various machines, when it has not reference to the separate and distinct indication of time horologically, but is used mainly as a motive power moving by means of regulating apparatus at a determined and uniform speed, for instance in electric telegraph transmitting or receiving machines, musical instruments, and machines performing certain actions at fixed intervals—often styled "automatic."

10. Firearms and other Weapons, Ammunition and Accoutrements, p. 46.

The contents of this class being quite obvious, need not be particularized.

11. Paper: Manufacture of Paper, Pasteboard, Papier Mâché, &c., p. 46.

This series of abridgments contains inventions relating to the machinery, apparatus, processes, materials, and chemicals employed in making pulp for the manufacture of paper, pasteboard, and papier mâché, and the subsequent manufacture of pulps into paper, pasteboard, &c., including the finishing processes of drying, hot-pressing, glazing, and winding on the drum, but not such subsequent operations as cutting into sheets, folding or forming into special forms or shapes as envelopes, bags, &c.; these latter operations forming the subject of the series entitled "Cutting, &c., Paper," 12. The series also contains processes for treating waste and spent materials for their recovery or re-use in the manufacture.

"Pearl-hardening," "doughing," and other "loading," "filling," or thickening ingredients or compositions, as well as sizing materials, are included when mention is made of their applicability to paper-making. Likewise some waterproofing compositions are included, when such are to be blended with the paper during its manufacture; but not waterproofing or other compositions which are applied to the paper as a coating after its manufacture. Such inventions, together with staining, colouring, ruling, ornamenting paper, making paperhangings, &c., are to be found in the series "Cutting, Folding, and Ornamenting Paper, &c.," 12, which is devoted to the general treatment of paper subsequent to its manufacture.

For a wider collection of inventions relating to the various chemicals used in the different processes and stages of paper-making, the reader should refer to the series "Acids, &c.," 40; likewise to the series relating to "Starch, Gum, Size, and other Stiffening Materials," 105, which has a more extended scope than this series respecting sizing and loading compositions in general.

Preparing paper for use in electric telegraph printing machines, by submitting it to the action of chemical agents, will be found in the series devoted to "Electricity and Magnetism," 40. Treating paper for special use in connection with peculiar writing inks should be searched for in "Writing Instruments and Materials," 37. Similarly, other special processes for treating paper for particular purposes will be found in the series embracing the manufactures or arts for which such prepared papers are made. For instance, drawing and tracing papers are placed under "Artists' Instruments, &c.," 54; cigarette paper under "Tobacco," 42.

With respect to papier mâché, several inventions relating to compositions called by that name, by the inventors, nevertheless contain little or nothing of the nature of paper or pulp, whilst other compositions more nearly resembling the original papier mâché are merely denominated substitutes for that material; consequently it has been deemed advisable to include these latter substitutes, as well as the so-called papier mâché inventions; but all similar compositions, as artificial ivory, wood, leather, and other plastic compositions for moulding into various articles, are excluded.—See "India-rubber, &c.," 16.

12. Cutting, Folding, and Ornamenting Paper; including Envelopes, Cards, Paper-hangings, &c., p. 46.

The range of subjects allotted to this class comprises the general treatment of paper after its manufacture, in the way of preparing it for subsequent use, as *paper* (*viz.*, stationery, paper-hangings, linings, bindings, tickets, &c.) in contradistinction to the application of paper to the manufacture of shaped articles (such as boxes, book-covers, paper collars, &c.) other than envelopes and paper bags, which latter subjects are included in this series. It therefore includes the application of waterproofing or other compositions to paper, and staining, colouring, ruling, ornamenting, and otherwise treating paper after its manufacture.

Electric ruling machines are under "Electricity and Magnetism," 15.

13. Typographic, Lithographic, and Plate Printing (excluding Electro-telegraphic and Photographic Printing); also, Advertising, p. 46.

Besides the actual processes of printing on paper from types, stereotypes, blocks, plates, stones, dies, and stencil-plates, this series embraces the operations of casting type, stereotyping, engraving plates, cutting blocks, and the manufacture and preparation of all printing surfaces other than those included in "Photography, &c.," 19.

Electrotyping is placed under "Electricity, &c.," 15.

The manufacture of printing and lithographic inks is likewise included, but not ordinary oil or water colours, for which see "Paints, &c.," 50, nor writing inks, for which see "Writing Instruments, &c.," 37.

With regard to presses, only such are contained in this series as claim to be used for printing purposes.

Dies and embossing machines, for embossing either words or ornamentations, are included, unless intended for articles such as book-covers, picture mounts, paper collars, &c., in which cases they should be looked for in series embracing such subjects.

Chased cylinders, used for embossing sheets of paper for ornamental uses, are omitted. See "Cutting, Folding, &c., Paper," 12, where also will be found embossed paper lace.

Perforating, slotting, and punching sheets of stamps, cheques, counterfoils, &c., for facilitating detachment or for cancelling, and marking with perforated letters, dates, &c., are included; but not the perforation of paper or cardboard for fancy work, paper-lace, &c., which is included only in "Cutting, Folding, &c., Paper," 12.

Apparatus for obliterating postage stamps, or other stamps, and cheques, for dating tickets and stamping dates, and for printing consecutive numbers, are included in this series, as also are rubber stamps.

Printing for decorative purposes, in successive colours or shades, and in two or more colours simultaneously, is not included in this series, when such productions are intended for subsequent use as ornamental papers (as, for instance, wall-papers, book-covers, linings, &c.), these subjects being included in "Cutting, Folding, &c.," Paper, 12, which series embraces all processes of manufacturing paperhangings.

The series, however, contains inventions for the production of engravings, prints, and pictures on paper not intended to be applied in the manner indicated in the preceding sentence (as, for instance, playing cards, chromographic pictures resembling oil or water-colour paintings, and art engravings or prints from plates, blocks, stone, &c.)

The folding of printed sheets is contained in this series, but not any further making of the same in book form, nor the planing or ploughing of the edges of leaves, which subjects will be found in series relating respectively to "Books, Portfolios, &c.," 43 (for printed and stitched sheets), and "Cutting, Folding, &c., Paper," 12, for quires and packets of unprinted papers.

Electric Telegraph Printing-machines (whether printing by type-wheels or otherwise) are excluded, and will be found in the series relating to "Electricity and Magnetism," 15.

Inventions for producing pictures by the aid of light or photography are excluded, as also are the processes of preparing, by the aid of light, printing surfaces in metal, stone, or other material from which impressions in permanent ink may be obtained. All such inventions will be found under "Photography, &c.," 19. Advertising devices generally are included.

14. Bleaching, Dyeing, and Printing Calico and other Fabrics and Yarns, p. 47.

This series includes the engraving and manufacture of printing rollers, the preparation of drugs, and other processes. Besides embracing inventions relating to the subjects above enumerated, it includes the making of such substitutes for soap (washing or cleansing powders) as possess some affinity to bleaching powders and liquors, though soap itself is excluded, being placed under "Oils, &c.," 27.

The manufacture and application of special drugs (dyes, mordants, &c.) are included, with the exception of the manufacture of such generally used chemicals as are comprehended within the series "Acids, &c.," 40. Compounded preparations of chemicals for dyeing or bleaching purposes which would not occur in the last named series are included.

Paints, pigments, varnishes, and inks are excluded, with the exception of matters specially intended for printing calico and other fabrics and yarns.

The bleaching, dyeing, and printing referred to in the title are entirely restricted to the treatment of textile fabrics and yarns. Printing on paper or other non-woven fabrics (as, for instance, on certain descriptions of floor-cloth) is excluded, as also is printing on the prepared face of American cloth, oil-cloth, or any similar fabric with a woven body or backing; likewise inventions for printing with other material than moist or liquid matter (such as inks, thick or thin paint, mordants, &c.) are excluded, as are, for example, most inventions relating to printing with flock, foil, and metallic or other powder, which mainly refer to the ornamentation of paperhangings and other fabrics not treated of in this class. The classes of inventions mentioned in this paragraph as excluded will be found in "Artificial Leather, &c.," 80; "Books, &c.," 43; "Skins, Hides, &c.," 55; and "Cutting, Folding, &c., Paper," 12.

Inventions relating to bleaching and the similar treatment of unmanufactured fibrous materials, omitted from the present class, will be found in the series respectively devoted to "Spinning," 28, and "Manufacture of Paper, &c.," 11, according to the class of invention to which they claim to be preparatory processes.

Engraving and preparing surfaces (rollers or blocks for printing) on textile fabrics, &c., are included, but not the manufacture of printing or embossing surfaces for general use. "Washing

"Washing and Wringing Machines" constitute a separate series, 89, and are only included in this class when specially identified with bleaching or dyeing processes.

The series of washing and wringing machines contains rollers for wringing and expressing moisture from fabrics, whilst another series—"Dressing and Finishing, &c.," 91—comprehends the roller applied to mangling, finishing, or similar treatment of dry fabrics. The above-mentioned series, "Washing and Wringing Machines," however, has but a limited scope respecting vessels indiscriminately applicable to such operations as washing, bleaching, scouring, dyeing, steeping, rinsing, and general boiling; consequently, vats, tanks, bucking or bowking apparatus, and apparatus adapted to boil materials or articles with or without pressure, whether the vessels be closed or open, and adapted or not to create a circulation of the contained liquid, should be looked for in this class when described in connection with the processes treated of herein.

The series of abridgments devoted to inventions for "Dressing, &c.," comprehends drying and damping, mangling, smoothing, and ironing, including also apparatus used in the getting up of fabrics and goods for sale, as well as in domestic laundry work, with the exception only of washing and wringing machines.

15. Electricity and Magnetism, their generation and applications, p. 47.

The following rules have been adopted in deciding which specifications belong to this series of inventions :—

- 1st. To include all specifications in which mention is made of electric or magnetic force as applicable in carrying out the invention.
- 2nd. To include all which depend on electric or magnetic science, whether such dependence is mentioned or not.
- 3rd. To exclude those in which no mention is made of their application to electric or magnetic purposes, although it may be somewhat evident that such application might be made. For instance, as in the Specifications of Letters Patent, No. 6,896 (old law), no mention is distinctly and directly made of the application of gutta-percha to the coating or covering of wire for electrical purposes, it is not included in this series, although such an application of the invention is evident.
- 4th. To exclude all those in which no other allusion to electric or magnetic science is made than the word "galvanized," as applied to the ordinary process of zincing iron.

In all cases in which a reasonable doubt exists as to whether an invention is to be included in this series or not, the abridgment is included, and the cause of doubt stated. In making the abridgments of specifications of mechanical applications of electricity and magnetism, the rule of tracing their operation from the prime mover to the result has been observed when possible. A similar rule has been observed with reference to electro-chemical processes. The course of the electric current from one battery pole to the other, through the work to be done, has been traced in all cases in which such a method of treating the subject could tend to clearness of description. When the complicated nature of the subject requires it, each description is begun by a short summary of the whole action of the machine or process treated of.

In the title and in the abridgments the word generation is employed as the equivalent of the various expressions, "producing," "exciting," "inducing," or "developing."

Under the word "electricity" is included statical, frictional, or tension electricity, steam electricity, or hydro-electricity, galvanic or voltaic electricity, thermo-electricity, magneto-electricity, that induced in electro-dynamic coils by secondary currents, or by their movement across the lines of magnetic force, that evolved from heated substances, as tourmaline, talc, &c., pyro-electricity, and from electric fish, as the torpedo, gymnotus, electricus, &c., animal electricity, and other sources of less note.

Under the word "magnetism," that of permanent, induced, or electro-magnets, under whatever form they may be set forth, is included.

Applications of electricity or magnetism forming part of an apparatus in any other class are placed in such class.

This series contains also some inventions that relate to the protection of ships' bottoms from fouling and from corrosion. In cases where electric force is *prevented*, in order to ensure non-corrosion, the invention is not included; but when, by means of the corrosion, electric force is *called into action*, and the corrosion of the ship's bottom is thereby obviated, the invention is included in the present series.

The inventions registered in this Colony are arranged under the following divisions :—

1. Generation of electricity and magnetism.
2. Conducting and insulating.
3. Electric and magnetic telegraphy—signalling, transmitting, receiving, or recording apparatus.
4. Instruments for exhibiting electric effects.
5. Electric lighting, igniting, and heating.—This division, as its title implies, relates to lamps or instruments for giving light by electricity, and to apparatus for igniting or causing combustion, as well as for generating heat in various materials by an electric current; but the division does not contain the engines or instruments for producing the electric currents used in lighting, igniting, and heating, which will be found in Div. 1, nor the means of conducting the electricity to the lamps or other instruments or apparatus, which will be found in Div. 11. Apparatus for experimenting with electric light are included. Methods of using the electric current for causing combustion, both in those cases where the ignition of gas or other light is desired, or where an instantaneous firing for explosive purposes is required, are also included. The division also embraces inventions connected with gas-burners and taps which combine mechanism for turning the gas on or off or with an electrically-heated wire for igniting the gas when turned on; and in several of these inventions the electric current furnishes the motive power or actuating force for turning on or off the gas-valve, tap, or cock connected with the burner.
6. Electro-deposition and electrolysis.
7. Dynamo or magneto electric machines and electric motors and railways.
8. Electric apparatus for transmitting, recording, or reproducing sounds.
9. Measuring the electric current.
10. Electric printing (other than telegraphic), writing, and ruling apparatus.
11. Miscellaneous applications of electricity.

16. Preparation of India-rubber, Gutta-percha, Vulcanite, Ebonite, Celluloid, &c., p. 51.

This series comprises inventions relating to machines or apparatus for preparing, cleansing, cutting, masticating, vulcanizing, hardening, and moulding, or otherwise treating india-rubber or gutta-percha, or compounds thereof; it also contains the processes, mechanical and chemical, for preparing, cleaning, bleaching, vulcanizing, hardening, deodorizing, re-vulcanizing, re-covering, or otherwise treating the same, and likewise methods of producing the materials used in some of the above processes; and it further includes the preparation and recovery of some of the solvents employed in the treatment or manipulation of the foregoing substances.

The application of india-rubber and gutta-percha to a great variety of uses is excluded, as well as inventions for the manufacture of india-rubber or gutta-percha, or their compounds, into articles of any description, unless there appears to be an improvement in the mode of vulcanizing or treating the manufactured articles.

The subject of waterproofs is included in "Artificial Leather, &c.," 80, or "Skins, &c.," 55.

Elastic fabrics are classed under "Lace-making, &c.," 29.

The preparation of vulcanite, ebonite, artificial ivory, and such other plastic compositions for moulding into various articles, is included; but the articles manufactured therefrom are placed in the classes to which they respectively belong.

17. Production and Applications of Gas, p. 52.

This series embraces the inventions relating to the generation, purification, measurement, supply, and use of gas (excepting as applied to the production of motive power in gas-engines), which will be found under "Air, Gas, &c., Engines, 62." The manufacture and enrichment of gases by the use of hydrocarbon liquids, and the applications thereof, are included. Gas stoves, and gas, cooking, and heating apparatus are also included. Inventions relating to glass chimneys, shades, and globes generally, will be found in "Lamps, Candlesticks, &c.," 44, and those only are contained in this series which are described in the specifications as intended especially for gas-burners. Improvements in the production of chemical salts, dye colours, and other products of commercial value, from the refuse of gasworks, are not included in this series, unless they relate to some process in the manufacture of gas, for instance, the purification of gas. Such inventions will be found in "Acids, Alkalies, &c.," 40; "Bleaching, Dyeing, &c.," 14; "Manure," 3.

Instruments for indicating the presence of gases in mines are included in "Mining, &c.," 71.

Ordinary iron pipes and metal tubing are excluded, being placed under "Metallic Pipes, &c.," 70; but pipes specially adapted for gas, as well as flexible gas tubing and joints for gas-pipes, are included, so also are the tools used in making and fixing gas-fittings, and the apparatus for operating on gas mains. Exhausting apparatus employed in the manufacture of gas for illumination are included; but apparatus used for exhausting and forcing gases, air, and vapours or fumes, for other purposes, are omitted, and classed under "Ventilation," 52.

18. Metals and Alloys, p. 52.

This series comprises abridgments of specifications relating to metals and their mode of manufacture and treatment, and to the alloys formed by mixing various metals together. For the specifications relating to iron and steel, however, see "Manufacture of Iron and Steel," 6.

The specifications are arranged under the following divisions (but many of the inventions are equally applicable to two or more of these divisions):—

1. Alloys—Antimony—Bismuth—Copper, &c.
2. Gold, &c. (Alluvium, &c.)
3. Do. (Gold.)
4. Do. (Gold, silver.)
5. Do. (Gold, silver, other metals, precious stones.)
6. Do. (Quartz, &c.)
7. Minerals and other substances.
8. Nickel.
9. Ores, minerals, metals, &c.
10. Quartz, &c.
11. Shaping and working metals.
12. Silver, &c.
13. Sulphurets, amalgam, &c.
14. Tin, &c.

19. Photography, Photo-lithography, and Photo-mechanical Printing, p. 55.

To afford a more precise idea of the scope of the present series of abridgments than can be conveyed by the short title, the following definition is offered of the word "photography": the art of copying designs, figures, or images by the chemical or actinic action of light upon surfaces prepared to receive that action.

With respect to the printing of pictures obtained partly or wholly by photographic means, it has been found advisable to include also all successive processes for transferring or copying such pictures, and all subsequent printing of copies of the same in permanent inks or colours.

Optical and philosophical instruments not used directly in the process of photography are excluded from this series, being classed under "Optical, &c.," 76.

It should be particularly observed, in connection with the preceding paragraph, that all stereoscopes are so classed.

Improvements in books or albums for containing photographs or pictures should be looked for in "Books, &c.," 43; whilst improvements in mounting, holding, and framing photographs, &c., will be found in "Artists' Instruments, &c.," 54.

Inventions relating to the application of photographic pictures to such ornamental objects as jewellery, or to the embellishment of boxes, furniture, other articles, and surfaces of all kinds, are not contained in this series, unless some novelty in producing the picture is described or claimed. 20.

20. Weaving, p. 55.

In this series are included not only the inventions relating to looms, but also the apparatus for sizing, warping, and beaming yarns, likewise inventions for producing woven fabrics of novel structure, new materials or new combinations of materials. Fabrics having interwoven therein strands or threads of india-rubber are excluded, being classed under "Lace-making, &c.," 29. Inventions for producing chenille by weaving, twisting, or otherwise, will be found in the same abridgments. Machines for winding pirns as a preparatory operation to weaving are in this series, but inventions relating to the production of pirns or cops in the process of spinning and doubling are not included.

Machines for winding yarns generally are placed in "Spinning, &c.," 28, and excluded from this series, except where the abridgment has a necessary connection with inventions strictly belonging to "Weaving."

Canvas generally is included, but canvas for sail-making is placed under "Artificial Leather," 80.

21. Ship Building, Repairing, Sheathing, Launching, &c., p. 55.

This series relates to the above subjects, and also includes painting, lighting, ventilating, and extinguishing fires (excepting improvements in fire engines and pumps for which see "Fire-engines, &c.," 88), and also the means of preventing shipwrecks and other casualties.

Abridgments relating to steering and manœuvring vessels are inserted under "Steering, &c., Vessels," 75

Armour, and the modes of attaching and fastening it, are included, but not the modes of manufacturing such armour.

Inventions relating to anchors, cables, masts, and sails, and to rigging and navigating vessels, are placed in distinct classes, though some of these subjects form part of the inventions included in this series.

22. Bricks and Tiles, Artificial Stone and Concrete, p. 55.

This class comprises inventions relating to the different varieties of bricks and tiles, together with those referring to the materials from which they are manufactured, the methods of forming them, and the various contrivances for drying and burning them; it also includes inventions for manufacturing artificial stone and building blocks of various forms and dimensions. Inventions for indurating or protecting the face of bricks or tiles are included. Inventions relating to the manufacture of drain tiles are excluded, being placed in the series "Drains and Sewers," 1. A limited number of this class of abridgments mainly relate to improvements in building contrivances or materials, and to other inventions forming the subjects of distinct series. They have been, however, included because some portion of them refers to bricks or tiles.

23. Plating or Coating Metals with Metals, p. 55.

This series comprises only those specifications that relate to processes for coating metals with metals.

Applications in which processes have not been expressly stated are omitted, but whenever any reasonable doubt exists as to whether a specification should be embraced by the series or not, its abridgment is included; thus the title "plating or coating," &c., has been strictly adhered to. All inventions that specifically relate to pickling or otherwise preparing metals to be coated with metals are included in this series. These abridgments also comprise inventions that relate to combining metals that are intended for coating other metals.

Specifications that relate to electrotyping are not included in this series, but in "Electricity, &c.," 15. Only those electro depositing patents which refer to coating metals permanently with metals are comprised in this series; the rest are under electro-deposition and electrolysis, for which see "Electricity," 15.

Specifications that relate to coating iron with steel by case-hardening the iron are not included in this series, but in "Iron and Steel," 6.

24. Pottery, p. 55.

This series comprises inventions relating to the preparing of the various materials employed in the manufacture of earthenware, stoneware, porcelain, and other ceramic wares, likewise the machinery and methods of manipulation adopted throughout the various branches of manufacture, together with the processes for enamelling, glazing, painting, printing, drying, burning, and otherwise finishing the work. The series also includes the application to various purposes of the materials employed in the above manufacture. Drain tiles and drain pipes are included in "Drains and Sewers," 1; tiles and blocks of pottery, under "Bricks and Tiles," 22.

25. Medicine, Surgery, and Dentistry, p. 56.

This series consists chiefly of inventions relating to surgical instruments, medical baths, invalid beds and bedsteads, ambulances and invalid carriages, compound medicines, disinfectants, deodorizers, lollies, ointments, and artificial limbs and teeth. The inventions relating to the manufacture of sulphate of magnesia (Epsom salts) and such other salts, as well as alkalies and acids which, although employed in medicine, are principally used for industrial purposes, will be found in "Acids, &c.," 40. Veterinary medicines, and instruments for the surgical treatment of domesticated animals, must be looked for in the series "Farriery," 53.

26. Music and Musical Instruments, p. 56.

With respect to musical instruments, this series includes not only inventions relating to the construction, but such as are in any way connected therewith, consequently it contains abridgments of specifications which describe motive power engines specially constructed for working the bellows of organs, &c.; the applications of electro-magnetic apparatus to playing organs or pianofortes, and of glass and india-rubber to certain parts of instruments; casting and hanging church and musical bells (house bells excepted, for which see "House-building," 97); insulating, stringing, and tuning; means for cutting the fronts of pianofortes and other keyboard instruments, and materials for the foregoing purposes.

With

With regard to music, the inventions admitted are such as have reference to the construction of scales; to methods of teaching music and singing, of teaching the blind to read music, of teaching the principles of music, and of transposing music; to manifold writers and pens for writing music; to plates for engraving music on; to portfolios, clips, files, &c., for holding music; to ruling music paper; to printing and writing music; and to registering and printing musical notes as played on the instrument.

The other inventions connected with the subjects of the series, and abridged in it, are all that relate to apparatus for exercising and strengthening the fingers and hands, and for practising upon, such as dumb pianos; to castors, friction-joints, and hinges for keyboard instruments; to leaf-turners; to methods of conveying sound to a distance; to music desks, stands, and stools; to pallets, pistons, and valves for musical instruments; and to metronomes or timekeepers.

27. Oils, Fats, Lubricants, Candles, and Soap, p. 56.

This class comprises inventions for producing or treating animal, vegetable, or mineral oils, fats, lubricants, candles, and soap, also for the production or treatment of tar, but only where oils or fats are with the tar which is produced or result from its treatment.

Inventions relating to wax tapers are included, but not those relating to wax matches, for which see "Lamps, &c.," 44, and "Tobacco," 42. Crushing seeds for the extraction of oil is included.

28. Spinning; including the Preparation of Fibrous Materials and the Doubling of Yarns and Threads, p. 56.

This class embraces not only all the inventions relating to the preparing and spinning of fibrous materials, but also those relating to the doubling or twisting together of yarns and threads, and to the winding, reeling, gassing, and polishing of such yarns and threads.

All inventions relating to wool in the fleece, and some that are applicable to other fibres in their natural state, are classed under "Wool," 103; but not inventions relating to sheep-washing and shearing, for which see "Farristry," 53.

29. Lace-making, Knitting, Netting, Braiding, and Plaiting; including the Manufacture of Fringe and Chenille, p. 56.

This series includes the manufacture of a great diversity of fabrics from spun threads, by twisting, interlooping, knotting, and plaiting, as distinguishable from textile fabrics made with warp and weft threads and woven in looms.

Besides machinery for manufacturing lace, knitted, netted, and similar fabrics, the "dressing," "finishing," and "getting-up" of these fabrics are included, but not the manufacture of such goods into made up trimmings, articles, or shapes, &c., which will be found in "Wearing Apparel," 65 and 66. This last exclusion, however, does not apply to "seaming" lace together, or uniting the selvages or pieces of stockings or other similar or knitted fabrics, which is a process performed by the same manufactory as the knitting, and is necessary to complete that branch of manufacture.

Connected with some processes for finishing lace are a few inventions relating to imitation tulle or blonde, and the similar ornamentation of manufactured lace, by subsequently laying and cementing thereon floss, silk, threads, &c. Such have been included, but not inventions for making other so-called "imitation lace" (for instance, by printing, colouring, embossing, and stamping out), or "lace-paper," or articles of wearing apparel made to resemble lace, as collars, &c.; neither are woven ornamental fabrics included, of which it is only said that they "resemble lace in appearance."

Although knitted and similar looped fabrics, together with bobbin net lace, are included within the scope of this series, terry and other uncut pile fabrics *woven in looms* are excluded; nevertheless bobbin-net lace machines, stocking frames, and warp machines, when used for manufacturing any description of pile fabrics, will be found herein.

The word "lace" is technically used to denote several kinds of woven fabrics, as for example "coach-lace," a terry pile fabric used by coachmakers, &c. For inventions relating to such fabrics, see "Weaving," 20. Boot and shoe laces are included only when made by braiding or plaiting.

The terms plait, plaiting, and plaited (employed herein to signify that braiding motion by which "straw plait" is made) have also two other distinct technical meanings, namely, the doubling or folding of woven piece goods, and, secondly, the making of narrow longitudinal folds on the faces of fabrics (shirt-fronts for example), such folds being sometimes called plaits, but more generally pleats. For inventions relating to these latter processes see "Dressing and Finishing Woven Fabrics," 91, "Sewing and Embroidering," 2, "Weaving," 20, and "Wearing Apparel," 65 and 66.

The manufacture of candle-wicks (both plaited and twisted) being comprehended in the series entitled "Oils, &c.," 40, those inventions only which comprise special plaiting or braiding machinery for the production of candle-wicks are embraced in this series.

Several inventions under titles more or less suggestive of processes for manufacturing lace relate only to the preparation and use of raw fibrous materials and the spinning of threads therefrom. For such inventions refer to "Spinning," 28.

For embroidering done by sewing-machines and embroidering machines resembling sewing-machines, see "Sewing and Embroidering," 2; also, for brocaded and embroidered fabrics produced in looms, see "Weaving," 20.

Improvements in the Jacquard apparatus, tappets, and similar pattern-producing "surfaces," as well as stopping motions, taking-up and other apparatus which are included in "Weaving," 20, have been omitted from this series, except when especially intended to be used in a lace-making or knitting machine.

In order to comprise in one series the various kinds of fabrics rendered elastic by having interwoven therein strands or threads of india-rubber, all methods of producing such fabrics have been inserted.

Although the scope of the series, as above expressed, has been limited to the manufacture of fabrics from *spun threads*, it has been deemed advisable to make exceptions in favour of the plaiting and braiding of horsehair and straw, but not wirework, wickerwork, basket-making, mat-making, &c., all of which are excluded.

This series includes also the various methods of making chenille, whether by weaving, twisting, or otherwise, but not its subsequent use in the manufacture of other fabrics.

The manufacture of fringe has been similarly treated, but for attaching fringe, &c., or making fringe on the edge of a fabric by the use of sewing-machines, see "Sewing and Embroidering," 2.

30. Preparation and Combustion of Fuel, p. 56.

The scope of this series is defined by its title, the exact bearing of which should be borne in mind by a searcher who might at first sight expect to find here apparatus that should properly be looked for in the series relating to heating, or steam-engines, or iron and steel, or other cognate series. The specifications relating to the preparation of fuel and apparatus employed therein are evidently clearly defined, and stand alone by their very nature. This is not so much the case with the numerous kinds of furnaces used in the various arts, in which the actual mode of burning the fuel is sometimes only subsidiary to the other purposes of the apparatus. The searcher should bear in mind—in looking, *e.g.*, under the head of "Boiler Furnaces"—that regard has been had to the furnace only, and not to the construction of the boiler itself; which must be looked for in the series relating to Steam-engines. Inventions for the prevention or consumption of smoke are included unless those referring to steam-engines. The ventilation of fire-grates and furnaces generally is included; but the ventilation of fire-places is classed under "Ventilation," 52.

31. Raising, Lowering, and Weighing, p. 57.

This class includes inventions relating to raising sunken vessels and other bodies from the sea, and those improvements in hydraulic presses, fire-escapes, and raising and stacking straw and other agricultural produce, which are considered to have sufficient bearing upon the subject of this class. Hydraulic presses which are applicable to "presses" merely, and not in raising and lowering heavy bodies, are not included; while as regards apparatus for raising straw and other agricultural produce, the machines which relate simply to passing the straw from one part of the machine to another are excluded, and those only are inserted by which the straw or produce is raised from the machine into some other situation. A similar observation applies to fire-escapes.

Raising and lowering ships' boats will be found under "Masts, &c.," 73.

Warehouse platforms, lifts, hoists, cranes, windlasses, elevators, cages, man-engines, and other machines for raising and lowering men, goods, or materials are included, unless when they form part of a machine belonging to some other class. Inventions relating to drawing and raising minerals and men from mines are, however, excluded, being classed under "Mining, &c.," 71.

Excavators are also included, when not otherwise classified.

32. Hydraulics, p. 57.

This series relates to raising, forcing, storing, filtering, supplying, measuring, and regulating the flow of water; it also relates to irrigation and drainage, to apparatus for the employment of hydraulic motive power, and to the appliances for the domestic and sanitary use of water, such as joints for pipes, taps and cocks, fountains, baths, and water-closets; moreover, it includes improvements in the form or arrangement of sewers and drains designed to facilitate the flow of water, in flushing or otherwise removing obstructions; in trapping; in excavating or cutting trenches, ditches, and drains; but it is not intended to include materials for or methods of manufacturing or constructing sewers and drains—these will be found in the series of abridgments entitled "Drains and Sewers," 1; nor is it intended to include improvements in the collection or treatment of sewage—these will be found in the series of abridgments entitled "Manure," 3.

Hydrants and other street-watering appliances are included.

Pumps for elevating liquids in breweries, distilleries, &c., are also included.

For hydraulic lifts, which are excluded, see "Raising, &c.," 31.

33. Railways and Tramways, p. 57.

This class includes inventions which relate to the *construction and arrangement* of railways and tramways. The improvements that may properly be referred to the establishment of a line of railway or tramway—with the exception of the buildings, rolling-stock, and signals, which form the subject of other series—are intended to be comprehended within the scope of this series. It is true that, in some cases, improvements in signals are described, but these signals will invariably be found to be in combination with points, or to embody a principle common to both. Those bridges which are expressed or are obviously intended to be designed or used for railways are comprehended—(other bridges being included in the series "Bridges, Viaducts, and Aqueducts," 36)—and such adjuncts to the permanent way as fixed tanks, water cranes, and troughs (but not pumps), for supplying water to trains, &c. Improvements in rolling rails, moulding and casting chairs and sleepers, and in preserving wood for sleepers, &c. (see also "Timber," 96) will be found included, and also a few inventions relating to excavating machinery of expressed or implied utility in railway work. The inventions relating to the construction of tunnels do not, however, come within the scope of the series (see "Mining, &c.," 71). Abridgments of specifications relating to portable railways are classed in this series, but only when these railways are distinct from the carriage which travels over them. Those which are attached to and travel with the carriage constitute a separate series (see "Aids to Locomotion," 7.) Inventions relating to atmospheric railways are, of course, included, and, of necessity, others closely allied, for the conveyance of parcels, commonly known as the "Pneumatic Despatch." Elevated railways, wire-rope railways, wire and rope tramways, and all such contrivances are likewise included.

Electric railways and tramways in which the rails form part of the system are placed under "Electricity and Magnetism (Motors and Railways)," 15.

34. Saddlery, Harness, Stable-fittings, &c, p. 58.

The inventions in this class relate:—

1. To saddlery, comprising saddles and saddle-trees, pillions, pack-saddles, saddle-cloths, housings, gambadoes, girths, stirrups, stirrup-bars, stirrup-leathers, bridles, bits, rings, buckles, hooks, knee-caps, muzzles, and horse-boots.

2. To carriage and cart harness, including collars, harness, saddles, territs, buckles, and their substitutes, traces, tugs, bits, headgear, reins, and nosebags.
3. To whips and spurs.
4. To stable-fittings, namely, partitions, hay-racks, mangers, troughs, harness-brackets, and halters and apparatus for securing animals.
5. To stable utensils, including currycombs and brushes.
6. To contrivances for stopping runaway horses, and for instantaneously releasing horses from carriages in case of accident, when such contrivances form part of the harness.
7. To machines for sewing harness.

This series does not embrace the inventions for preparing skins and tanning leather for harness; these will be found in the series "Skins, Hides, and Leather," 55. Singeing-lamps are placed under "Farriery," 53.

35. Roads and Ways, p. 58.

This series embraces all inventions relating to the construction and maintenance of roads and ways, whether paved, macadamized, or formed by the use of asphalt, concrete, or the various other substances which have been proposed for road-making, including the employment of plates or bars of metal, blocks or planks of wood, and combinations of such or other materials. Some of the contrivances mentioned relate solely to the construction of roads, while others form part of inventions connected likewise with other subjects. The maintenance of roads embraces not only the repairing but also the cleansing of such roads; and therefore all inventions relating to sweeping, scraping, and otherwise maintaining the surfaces of roads and ways in proper order, are noticed, as well as certain inventions relating to the breaking of stone for the purpose of road-making. Apparatus for street-watering will be found under "Hydraulics," 32. Inventions relating to milestones, and tablets for distinguishing the names of roads and streets, are also included. Inventions relating to the construction of tessellated or mosaic pavements are not included, such pavements not being suitable for roads; while as regards tiles, which are chiefly adapted for floors, yards, and roofs, and the composition of cement and artificial stone, those inventions only are included which seem particularly applicable to the subject of this series.

36. Bridges, Viaducts, and Aqueducts, p. 58.

This class embraces all inventions relating to the construction of bridges, viaducts, and aqueducts, whether formed of wood, stone, brick, or metal, or of concrete or composition; and in addition to those inventions which are distinctly set forth as relating to such structures, certain other inventions are included, which, although not so distinctly mentioned with reference to this particular subject, must nevertheless be considered as having a sufficient connection therewith to require notice in this class. These embrace certain inventions relating to coffer-dams and other contrivances suitable for facilitating the construction of foundations under water, and also certain modes of forming arches, beams, and girders. Of these such only are included as appear to be adapted or meant for use in the construction of bridges and aqueducts, as well as other structures. The same observation applies to pile-driving and cylinder sinking, no invention relating to the latter being noticed except such as are specially mentioned with reference to the construction of bridges, viaducts, and aqueducts. It should be understood, indeed, that, in the compilation of these descriptions, it has not been thought necessary or desirable to include in each series every invention which might, by some possibility, be made available with reference to the subject of that series. Thus, there are a few inventions relating to concretes and cements which, although mentioned in the specification as being available in the construction of bridges, as well as other structures, are not included in this series, but will be found in the series "Bricks, &c.," 22, or "Stone, &c.," 92. So, likewise, as regards the manufacture of iron or steel plates, excavation for the foundations of bridges and other structures, and other inventions which, although relating in some degree to bridges and aqueducts, are more properly classed under the heads of the subjects to which they especially belong.

37. Writing Instruments and Materials, p. 58.

This class comprises specifications relating to ordinary writing instruments and materials, copying-presses, manifold-writers, multigraphs, and the various methods of copying, paper clips and files, paper-knives, appliances for teaching writing, instruments for affixing postage and other labels, ruling instruments, sealing-wax and wafers, metallic fastenings for envelopes and boxes, cards, &c., for leads and pens.

Portable writing-desks and cases are inserted, but convertible writing-desks, or rather writing-tables, are placed in "Furniture," 39.

Again, the manufacture of paper, and the subsequent operations of folding, cutting, &c., and the making and gumming of envelopes, form separate series. See "Paper, &c.," 11, and "Cutting, &c., Paper," 12.

But the enamelling of paper for writing-tablets, and the incorporation in paper of one or more of the ingredients of the ink to be used in writing thereon (for the prevention of fraudulent alterations), being connected with writing materials, such inventions have been admitted.

Writing Inks are included.

38. Railway Signals and Communicating Apparatus, p. 58.

This class comprises abridgments of specifications relating to railway signals and means of communicating such intelligence along lines of railway, and also along trains, and from train to line, and *vice versa*, on railways, as may be necessary for the correct working of the traffic thereon, but does not include signalling and telegraphing or communicating intelligence from place to place when unconnected with railway working. Among the inventions included in the series will be found those for securing simultaneous and sympathetic action between points, switches, and signals, for locking and unlocking signal and point levers, and generally for diminishing the sources of collision on railways and preventing the transmission of contradictory signals.

39. Furniture and Upholstery, p. 58.

In addition to ordinary articles relating to the above, there have been admitted such as refer to beds and hammocks of all descriptions, and to quilts, but not to blankets or sheets; to billiard tables which are convertible into dining and other tables; to invalid chairs, but not invalid carriages or bath chairs, unless they are convertible into chairs or couches; to indoor and Venetian blinds, but not to outside, sunshade, or shutter blinds; to hanging and drawing curtains, and to fabrics for blinds and curtains when made or ornamented especially for them, but not to fabrics equally applicable to other purposes. There have been included also such as describe picture and looking-glass frames, but not the manufacture or silvering of glass,—for which see "Glass, &c.," 93; handles and knobs for attachment to cabinet furniture, but not to locks; baths, when combined with articles of furniture; water-closets, but only when they are portable and serve as commodes. Again, although specifications concerning reading-desks and stands for holding music and books have been abridged in this series, those which relate to apparatus to be applied to stands or to pianofortes for turning over the leaves of music, &c., have been excluded, and will be found in "Music and Musical Instruments," 26.

40. Acids, Alkalies, Oxides, and Salts, p. 58.

Besides embracing inventions relating to the making or obtaining by any direct or indirect methods of acids, &c., this class includes inventions relating to the making or obtaining of several elementary bodies, among which are bromine, carbon, chlorine, fluorine, iodine, hydrogen, nitrogen, oxygen, and sulphur, and some compound substances or bodies, such as cyanogen, none of which of themselves possess either the property of an acid, alkali, oxide, or a salt, but which in the process of their production are accompanied very frequently by the formation of one, two, three, and even in many instances of all of these substances in one and the same invention.

Under these circumstances it was considered advisable that any inventions which might relate simply to the production of bromine, carbon, chlorine, fluorine, iodine, hydrogen, nitrogen, oxygen, sulphur, or cyanogen, should find a place in this series.

41. Aeronautics, p. 59.

This class comprises specifications that treat of balloons or other means of ascending in the air or of navigating the air, and it includes the application of balloons or kites for suspending, partially suspending, drawing, or other purposes.

The term "balloon" is applied in several specifications to vessels inflated with air or gas and immersed in water, but which only have an ascensional force whilst so immersed; these are not included unless they describe appliances equally applicable to aerial-balloons or other subjects treated of in this class. They are placed under "Raising, &c.," 31.

42. Preparation and Use of Tobacco, p. 59.

This class includes not only the manufacture of tobacco, snuff, cigars, cigarettes, but also that of pipes, cigar-holders, tobacco pouches and boxes, snuff-boxes, cigar-cases, fusee-cases, and fastenings for same.

All means of procuring light, specially applicable to cigars and pipes, have been admitted; consequently specifications relating to fusees, splints, and similar matches (when expressly intended for such purposes) will be found herein, and in order to render it as complete as possible, spittoons, and other matters of the kind, to which a few inventors have turned their attention, have been introduced.

43. Books, Portfolios, Card-cases, &c., p. 59.

This class comprises, in addition to abridgments which relate to the binding of books, pamphlets, and loose sheets, and to the manufacture of portfolios, memorandum and pocket books, and card-cases, all such as have been found to have any relation to albums; artificial leather and other materials for book-covers; book or reading stands, book slides, boxes for holding books and papers, book clasps, clips, and markers; copying-presses (but only when connected to book-covers), fastenings for pocket-books and portfolios; indexes for account and other books; knives and contrivances for cutting open the edges of books and papers; preparing skins, leather, and paper for book-binding, pocket protectors for pocket-books, and such markers for folding papers as are applicable to the folding of printed sheets for books or pamphlets. Sewing, stitching, and fastening machines for paper are included.

Paper-ruling is classed with "Cutting, &c., Paper, &c.," 12.

44. Lamps, Candlesticks, Chandeliers, and other Illuminating Apparatus; excluding Inventions for lighting by Gas or Electricity, p. 59.

This class relates to lamps and apparatus in which any combustible material except gas may be burned for the production of light; consequently those inventions are included which are intended for the consumption of essential and mineral oils, spirits, fat, &c., and also those in which oils are burned in the form of vapour.

In some specifications lamps are described as applicable for consuming either gas or oil; such have been admitted, as have likewise glass chimneys, globes, and shades, when they may be used with either gas lamps or oil lamps; the same observation applies to burners.

Appendages to lamps, candlesticks, and chandeliers, such as reflectors, lenses, snuffers, &c., also inventions relating to the cutting of glass for prisms, pyramids, &c., the manufacture of ornaments, and the methods of attaching them, when such articles are described as expressly intended for chandeliers or lustres, have been admitted.

Fixed lamps in mines are excluded, being placed under "Mining, &c.," 71.

For improvements in the manufacture of candles, see "Oils, &c.," 27.

Wax and other matches are included, except when specially designed for use with tobacco and cigars. Magnesium lights and lime lights, and other chemical lights, have been included, but inventions for producing light by means of electricity are omitted, for which see "Electricity and Magnetism," 15.

Daylight reflectors are also included.

Singing-lamps are under "Farriery," 53.

45. Needles and Pins, p. 60.

This series includes the inventions relating to needles for sewing by hand, needles for sewing-machines, crochet-needles, and knitting-needles for hand-knitting, but not the barbed needles employed in frame-work knitting or stocking-frame machinery. It also embraces improvements in the form and manufacture of ordinary pins and hair-pins, but not of breast-pins, brooches, or similar articles of jewellery. Safety-pins and dress-fasteners generally will be found under "Wearing Apparel (Dress-fastenings)," 68. Metallic or wooden pins to be used as substitute for nails, bolts, or like articles, are not included. Several inventions of machinery for the manufacture of nails and bolts are included, but only where the applications of such machinery to the manufacture of pins is obvious or is expressly claimed. Wrappers and cases to contain needles and pins for sale appear in this series, but not cases for the pocket and for work-boxes.

46. Carriages and other Vehicles for Railways and Tramways, p. 60.

This class embraces all inventions relating to the construction of railway carriages for the conveyance of passengers, waggons, and trucks; for the carriage of merchandise on railways; the tenders of locomotive engines; and vehicles with flanged wheels intended to travel on tramways or street railways. Thus, all inventions are noticed which relate to the bodies, framing, springs, axles, wheels, brakes, buffers, and other details of such carriages and other vehicles; and also to contrivances for preventing accidents, by arrangements or apparatus which may be connected with such vehicles, or with the engine of a train, and be acted upon by other apparatus placed on or near line of railway, so as to bring the brakes into action, in order to stop the progress of the train when desirable. As regards railway engines, all inventions are noticed which relate to the framework, springs, buffers, brakes, axles, and wheels of such engines, as also apparatus for removing obstructions from the rails, and otherwise preventing accidents; but the details of the engines themselves are not noticed here, as they are included in the series of abridgments relating to "Steam-engine," 49. In fact the propulsion of carriages or waggons does not form a part of the present subject, nor yet the aiding of the motion of engines or carriages by means of screws, racks, and wheels, or other contrivance, by which the ascent of inclines is facilitated; neither does this series include turntables or such arrangements for lifting or otherwise transferring engines or carriages from one line of rails to another, unless the invention described involves some important point relating to the construction of such vehicles; but it does include arrangements for the warming, lighting, or ventilating of railway vehicles.

It must also be observed that various inventions which have been patented relate in some degree to the construction of railway vehicles, but not sufficiently so to entitle them to a place in this class. These embrace improvements in the treatment of metals; the production of artificial leather and cloth (suitable among other purposes for the lining of carriages); and other matters which are more properly classed under the heads to which they immediately belong, and will be found in the series of abridgments containing such classes of subjects. Inventions relating to carriages for atmospheric railways are likewise included in this series, in cases in which the invention, or some part thereof, appears to be applicable not only to such carriages but also to those for ordinary railways. The class also embraces such carriages as run upon portable railways or upon endless rails connected with the vehicle; but the mode of propelling such latter vehicles is included under "Aids to Locomotion," 7.

47. Umbrellas, Parasols, and Walking-sticks; Awnings and Sunshades, p. 61.

This series, as the title implies, contains inventions relating to umbrellas, parasols, walking-sticks, and canes; also awnings outside, sunshades, and shutter blinds for houses.

Tent-umbrellas, or tents made on the same principle as umbrellas, stands for umbrellas, and fabrics specially intended for umbrella and parasol covers, have also been admitted.

These are about all the inventions beyond those obviously comprised in the title which it has seemed needful to include.

48. Sugar, p. 61.

This class embraces not only the inventions which relate to the making, purifying, and refining of all kinds of sugar commercially in use, but also those which relate to the preparation and revivification of animal charcoal and its substitutes. The apparatus required for nipping or otherwise breaking up sugar are likewise included in this series, but not inventions which relate to the use of sugar in manufacturing lozenges and other articles of confectionery, for which see "Cooking," 61, or for medicinal purposes, for which see "Medicine, &c.," 25.

49. Steam-engine, p. 61.

This class embraces the inventions relating to every description of motive-power engine actuated by steam alone or by steam commingled with other aeriform fluid, but not engines worked by air, gas, or vapour (other than steam), for which see "Air, Gas, and other Motive-power Engines," 62. It comprises all matters relating to steam-boilers and steam-generators, including every description of tubular and other apparatus for producing, superheating, or regenerating steam; inventions for preventing incrustation of boilers, apparatus for feeding furnaces with fuel, for supplying air to furnaces, for arresting sparks, for the prevention and consumption of smoke, and for cleaning flues, tubes, and boilers; safety-valves and safety apparatus; steam and water gauges; cocks and valves applicable to steam-engines; and (besides the gearing and mechanism of the steam-engine) indicators and all such attachments and separate instruments as are to be used in connection with steam-engines, whether locomotive, marine, or stationary. It has been found expedient to include in the present series steam-hammers and such like inventions wherein steam is the motive power acting in cylinders forming parts of these machines, as, for example, steam pile-drivers, stone-crushing machines, steam rams, presser-brakes for locomotive engines and railway carriages worked by steam, excavators, agricultural implements, cranes, &c.

50. Paints, Colours, and Varnishes, p. 62.

This class includes specifications not only relating to the compositions of paints, &c., but also to the ingredients employed in the same; consequently inventions respecting the making of carbonates, oxides, sulphates, &c., of certain metals, the methods of obtaining lamp-black and other blacks, and the treatment of oils and driers, of tar and oil of tar for varnishes and paints, and of turpentine, are included.

Mastics and coatings or compositions for the sides and bottoms of ships, for the outside and inside of houses, for preserving materials from decay, for protecting metals from oxidation, and for other similar purposes, have been admitted; but not coatings or compositions which are of a vitreous nature, or are intended to form a sort of enamel on the surface.

Coloured inks for printing have not been included; for these see "Typographic, Lithographic, and Plate Printing," 13.

Dyes and mordants have been excluded, but not compositions for staining wood and other substances.

It has been found difficult to distinguish in all cases between paints and dyes, many of the latter being available, though not generally used, for painting. As far as possible all such have been included, but dyes proper have been carefully kept out.

Any dyes suitable for painting that have been omitted will be found in "Bleaching, Dyeing, &c.," 14.

In the same way, it has not always been easy to decide what chemical salts should be considered as paints. The endeavour has been to include all such as have been or could be used for this purpose. If any have escaped notice, see "Acids, &c.," 40.

The series includes, of course, the various apparatus, erections, mills, &c., required for the manufacture of the foregoing.

Artists' colours and varnishes are excluded, being classed under "Artists' Instruments, &c.," 54.

51. Toys, Games, and Exercises, p. 63.

This class embraces various kinds of inventions relating to the amusement and recreation of children and adults.

Some inventions combine toys and games with apparatus for tuition, and others with articles of ornament and utility, including furniture; both these classes are inserted.

Apparatus in the form of toys for the exhibition of scientific phenomena, as well as pyrotechnic toys or fireworks, are included; but for improvements in rockets for military purposes, signalling, &c., see "Fire-arms and other Weapons," 10.

Gymnastic and other exercising apparatus, whether for the healthy or for invalids, are included. Velocipedes, bicycles, tricycles, &c., and perambulators have, however, been excluded, and will be found under "Carriages and other Vehicles for Common Roads," 94. Invalid chairs are also excluded, and placed under "Medicine, &c.," 25.

The following remarks apply to subjects allied to those included in the present series:—

Go-carriages for teaching children to walk are included, but apparatus for giving assistance to invalids are excluded, and will be found in "Medicine, &c.," 25.

Inventions relating directly or indirectly to such exercises as horse-riding, swimming, rowing, &c., are not included, but will be found in other series.

Many optical instruments not described as toys, but yet of a character closely allied to the optical toys contained in this series, will be found in series "Optical, Mathematical, &c.," 56.

52. Ventilation, p. 63.

Ventilation consists in the operation whereby the air in a building, room, or similar confined space, when vitiated by combustion, by the breath of man or animals, or by exhalations or vapours from organic bodies, or when charged with moisture or small particles of solid bodies, is *renewed* with purer air, or whereby the air when unduly heated or cooled is renewed with air of more suitable temperature. The term also necessarily comprises, in a subsidiary sense, treating or preparing the air—such as drying, moistening, heating, or purifying it—before its being thus applied.

While this definition covers the numerous modes of renewing the air for the purposes of animal life, it also embraces those cases in which it is renewed for storing purposes (in granaries for example), as most processes for keeping grain or similar organic substances consist in renewing the air surrounding them, and thereby conveying away the moisture that would otherwise ultimately conduce to their putrefaction. Many plans for drying articles and materials (such as textile fabrics) are carried on in large compartments or rooms wherein the air, as it becomes saturated with moisture, is withdrawn or allowed to escape, whilst a fresh supply of dry air is furnished in its place, and these also find a place in this series; but small machines in which currents of air are used for drying, as, *e.g.*, in some forms of centrifugal drying apparatus, are however excluded.

The mere technical use of the term ventilating does not give certain inventions a claim to come within the scope of this series; hence it does not embrace the well-known process of "ventilating" the buckets of certain kinds of water-wheels; nor the methods of "ventilating" fire-bars of furnaces; nor the plans for "ventilating" millstones; unless indeed a given process embodies the invention of ventilating the mill and freeing it, for the sake of the millers, of the fine stive so injurious to health. There are numerous instances of manufacturing operations in which it is necessary, for sanitary purposes, to get rid of vapours and effluvia (as in melting tallow), or of fine solid particles (as in the dry grinding of grain, cutlery, needles, or quartz) evolved from the substances under treatment. Cases like these come within this series, but not those in which air is injected or exhausted in order to be actually utilized in mechanical processes. Hence are excluded the processes of ventilating or fanning, for the purpose of separating substances of different densities or of different volumes, such as the very ancient plan for separating grain from the chaff, and the more modern processes for sorting charcoal, dust, or hair.

Inventions for ventilating goods and cargoes to prevent spontaneous combustion are placed under "Fire-engines, &c.," 88.

Inventions for preventing the contamination of the atmosphere by the escape of noxious vapours or gases, or the mingling of solid particles with the air, are not comprised in these series; nor are those inventions which relate to fumigation or to the use of deodorizers and disinfectants.

As with most other classes, reference has to be made to other series. Anemometers, hygrometers, barometers, and even thermometers, are instruments indispensable in ventilating operations on a large scale; but they should be looked for in the series "Optical, &c.," 76. Blowing engines are similarly sometimes used for ventilating, as well as for supplying furnaces and in metallurgical operations; but these engines and all apparatus for forcing, compressing, or exhausting air (except when it is stated that they are to be used in the operation of ventilation as defined in this description) are excluded from this series, and will be found in the series of abridgments containing such classes of subjects. Methods of supplying diving-bells and submarine boats with fresh air are included in the present series, but all other diving apparatus, including diving-dresses and methods of supplying air to divers and others working in situations requiring a similar supply of air, are classed under "Submarine, &c.," 101. Ventilating drains and sewers likewise is excluded, and will be found in the series "Drains and Sewers," 1. The open fireplace and chimney and the adjustable window-sashes of an ordinary English apartment constitute an efficient ventilating motor, with adjustable valves for the inlet of fresh air. The wards of St. Bartholomew's Hospital, one of the most important hospitals of London, are thoroughly ventilated by means of the constantly open top-sashes of the windows, and by means of the spacious fireplaces and stoves; inventions in such methods of ventilation, or in the means of increasing the draught of chimneys (such as improved cowles), might find a place in this series; but it is preferred to refer the searcher in the latter class to the series relating to the "Preparation and Combustion of Fuel," 30. When, however, fireplaces and stoves have ventilating apparatus applied to them, or when they form part of the proposed apparatus for ventilating, descriptions of them will appear in this series. Similarly, windows and doors, but only when specially fitted with ventilating apparatus, are included. The exhaust of an engine or machine working by compressed air necessarily has a ventilating action, as practically applied in boring the Mont Cenis Tunnel; but a description of such an engine or machine (*e.g.*, the pneumatic shuttle) could not for the sake of such an incidental action find a place in this series.

It may be well also to state that respirators and inhaling apparatus are not included in this series; nor are methods of supplying air to lamps; nor improvements in the special manufacture of waterproof and other fabrics for the purpose of permitting the passage of air; nor modes of ventilating garments, hats, gloves, boots, knapsacks, saddles, horse-collars, beds, mattresses, and similar articles.

53. Farriery, p. 63.

This class includes inventions relating to farriery, veterinary medicine, and the medical and surgical treatment of domesticated animals. Those connected with the manufacture or improvement of horse-shoes or horse-shoe nails form the staple of the class. Every surgical or medical appliance intended exclusively or specially for animals has been admitted. Inventions relating to clipping and singeing horses are of necessity included; and from the similarity of many of the inventions for clipping horses to those for shearing sheep, it has been thought desirable to make the series complete as regards the last-mentioned subject also. It should be stated that many of the inventions in this class intended for horse-clipping are also applicable, according to the specifications, to the clipping and shearing of animals generally. Improvements in harness, stable-fittings, or the grooming of horses, have not been included; they will be found in the series "Saddlery, Harness, Stable-fittings, &c.," 34. Medicated food is included.

Branding and ear-marking cattle and sheep, and cattle and sheep labels, are included.

54. Artists' Instruments and Materials, p. 63.

This class includes pencils, pencil-holders, crayons, crayon-holders, instruments for sharpening lead-pencils and crayons, brushes, palettes, palette-knives, colour boxes and cases, easels, contrivances for sketching, tracing, copying, and multiplying copies, such mathematical instruments as are used in linear drawing, and some optical instruments, as, for example, the kaleidoscope, the camera lucida, &c.

There are included also the manufacture of artists' colours and varnishes, as distinguished from colours and varnishes employed in house-painting, the preparation of canvas and other substances on which pictures may be painted (provided the specification states that the substances are applicable to such purpose), the colouring of photographs, methods of drawing and painting (by hand) on glass, china, and the like, and the processes of delineating and preparing panoramas, but not the mechanical means of displaying them or similar exhibitions.

Drawing and tracing papers and cloths are included.

The inventions relating to "ever-pointed pencils" are not included, but will be found in the series "Writing Instruments, &c.," 37.

Mounting, holding, and framing photographs, &c., are included; but not the making of picture or looking-glass frames, for which see "Furniture, &c.," 39.

55. Skins, Hides, and Leather, p. 63.

This class comprises inventions relating to tanning, shaving, splitting, cutting, hardening, dyeing, and colouring, preserving, and waterproofing skins and leather.

Inventions for gilding and embossing leather, for treating and dressing skins with the hair on, and machines for cutting the hair from skins are also included.

The inventions relating to the manufacture of boots and shoes, to the sewing or uniting of pieces of leather, to the manufacture of leather-cloth or imitation leather, and to the tanning of ropes and cordage, canvas, and other fabrics are excluded.

56. Preparing and Cutting Cork; Bottling Liquids; Securing, Opening, and Stopping Bottles, &c., p. 64.

This class contains specifications relating to machinery and processes for preparing and cutting cork into sheets, lengths, and squares, as well as into cylindrical and taper corks and bungs; for reducing cork to shavings and dust for stuffing, &c.; and for sharpening the cork-cutters.

It comprises also the manufacture of capsules; the various substitutes for corks; and the methods of securing capsules and stoppers to bottles, jars, and other similar vessels. Appliances for bottling and decanting liquids are included, consequently siphons, vent-pegs, funnels, and cork-screws will be found here, but *taps* are omitted; these (which are very numerous) belong more properly to "Hydraulics," 32. It has been thought advisable to admit methods of stoppering ink-stands, as many stoppers are on the same principle as ordinary bottle-stoppers. Aerated-water bottling and stoppering machines, bottles, and stoppers are included. For the making of bottles, generally, see "Glass and Glassware," 93.

57. Brushing and Sweeping, p. 64.

This class includes brooms and brushes of all kinds, mops, and sponges for guns; also apparatus for brushing and sweeping, either by rotary brushes or other means, but street-sweeping apparatus are not included, being classed under "Roads and Ways," 35. Paint-brushes are included.

Knife-cleaners, apparatus for dressing fruit, and machines for cleaning boots and shoes, plate, domestic utensils, and the like are included, where the process is performed by means of brushes.

- Knife and plate cleaners which act by means of leather pads or otherwise have been excluded.

Brushes for chimney-sweeping have been admitted, but not apparatus for cleaning chimneys by other means than sweeping.

Machine-brushes have only been admitted when some improvement is made in the brush itself, applicable to general purposes; or in the case of cloth-dressing machines, when it appeared that the apparatus might be used for general purposes of brushing, or for treating the finished and completed fabric.

For abridgments of specifications relating to machine-brushes reference must be made to the series devoted to each special class. Cloth-dressing machines will be found in series "Dressing and Finishing Woven Fabrics," 91.

Materials for brush-making have, of course, been admitted, as have also machines for drawing bristles for the manufacture of brushes.

Artists' brushes are under "Artists' Instruments, &c.," 54.

58. Nails, Rivets, Bolts, Screws, Nuts, and Washers, p. 64.

This class comprises inventions relating to the processes, machinery, and materials employed in the manufacture of nails, spikes, rivets, bolts, screws, nuts, washers, and treenails, including the various kinds of machines used in cutting nails, brads, &c., from the metal in its cold state, and machines adapted for cutting, forging, and shaping such articles out of heated plates, bars, and rods; also machines, apparatus, and appliances for cutting screws—forming screw-threads and screw-blanks—cutting off and beading rivets and bolts—forging, forming, and punching nuts and washers, railway spikes, pins, and bolts.

59. Hinges, Hinge-joints, and Door-springs, p. 64.

This class embraces hinges, joints that open and close in the manner of a hinge, and every kind of door-spring, or motive power by which doors are opened or closed. The latter subject comprises three important sets of apparatus besides that which acts upon a door to close it by the reaction of a metal spring, namely, descending weights, india-rubber springs, and self-acting apparatus by which gates are opened or closed at fitting times by the approach or departure of the person or thing in motion. The automatic opening and closing of railway gates is placed under "Railways and Tramways," 33.

Improvements in hinges for mathematical instruments are included, but the combination of scales or pointers with such hinges does not come within the scope of this series.

Joints in machinery, such as cup joints, ball and socket joints, or universal joints, are not included.

Joints of spectacles or eye-glasses must be sought for in the series "Optical Instruments, &c.," 76.

Stretcher joints of umbrellas, and joints for umbrella and parasol sticks, are placed under "Umbrellas, &c." 47.

Joints of artificial limbs are classed under "Medicine, &c.," 25.

If the "closing" of doors, &c., in a specification refers only to thereby excluding draughts, dust, &c., from the room to which the door is applied; the abridgment does not belong to this series, but to "Ventilation," 52.

60. Locks, Latches, Bolts, and Similar Fastenings, p. 64.

The locks comprise alarm, automatic, bank, bag, box, cabinet, changeable, combination, chest, desk, duplex, door, detector, defence, electro-magnetic, indicating, keyhole locks with curtains, locks with tumblers, levers, &c.; locks for special purposes, mortice, pad, portmanteau, piano, piston, prison, permutation, portable, pneumatic, puzzle, registering, rim, safe, stock, screw-tap, till, time, transparent, tubular, mortice, umbrella, vehicle, window, and many other kinds.

The keys embrace special makes, movable bits, peculiar action, divided, cast, detector, permutation, anti-dust, and screw.

The latches include catch, combination, door, drawback, indicator, lock, pendulum, and spring.

The bolts comprise floor, latch, lock, piston, sliding, spring, signal, screw, and wedge.

The fastenings include automatic, bag, box, cabinet, carriage, door, drawer, movable, pocket, portmanteau, purse, shutter, stair-rod, table, till, time, and window.

In many cases inventions, especially those relating to locks and latches, although generally applicable to all makes, are only described by the inventors with reference to one or two classes; it is therefore recommended to persons interested in searching, that, in addition to such classification, the lists under the headings of locks generally, latches generally, &c., be consulted.

61. Cooking, Bread-making, and the Preparation of Confectionery, p. 65.

This class includes:—

Cooking utensils.

Cooking stoves, grates, and oven and kitchen ranges; but gas stoves, &c., are excluded, and will be found under "Gas, &c.," 17.

Bakers' ovens and apparatus for bread-making.

Mincing meat, &c., and making sausages.

Paring, slicing, peeling, triturating, or washing fruit or vegetables.

Beating eggs.

Manufacture of macaroni and vermicelli.

Yeast and yeast powders or baking powders; but not separating beer from yeast, for which see "Brewing, &c.," 95.

Manufacture of jams, sweetmeats, and confectionery generally; but not confectionery ices and chocolate, which will be found in "Ice-making Machines, &c.," 85; and "Tea, Coffee, &c.," 87.

Such cooking as is incidental to the preparation of tinned meats, &c., is not dealt with in this series, but will be found in the "Preservation of Food, &c.," 4.

62. Air, Gas, and other Motive-power Engines, p. 65.

This class relates to all varieties of motive-power engines, except steam-engines, hydraulic engines and motors, and electric or magnetic engines, which will be found respectively in the series "Steam Engine," 49; "Hydraulics," 32; and "Electricity and Magnetism," 15. The main part of this series describes inventions for producing motive power through the agency of air, gas, and all elastic fluids except steam, by the expansion, contraction, generation, combustion, or explosion of any of these agents; also by the influence on machinery of currents of air artificially produced, or of the natural motion of the atmosphere. The other inventions comprised relate to projects for obtaining motive power by various means, and combinations of different forces, such as the elasticity of springs, force of gravitation, loss of equilibrium, use of floats and weights immersed in water or other liquid, ascension of receptacles inflated with air or gas under water, and different schemes (except hydraulic and magnetic) by which the attainment of "perpetual motion" has been attempted. In some specifications rotary and similar engines are described as capable of being worked by water, steam, gas, or any other vapour, fluid, or liquid; in others mention is not made of air, gas, or other elastic fluid than steam, hence engines have been omitted, although of similar construction to those which have been admitted on account of their claiming a wider use of motive agents. For such engines the reader is referred to the "Steam Engine," 49, and "Hydraulics," 32, series. Most fluid meters and rotary pumps are capable of being used as motive-power engines when worked by fluids under pressure; there are many of these which do not appear in this series as motive-power engines, but will be found in the series relating to "Gas," 17, and "Hydraulics," 32. Inventions relating to the use of reservoirs for compressed air for working locomotive or other engines are included; but methods of atmospheric or pneumatic railway propulsion which do not embrace a new or improved locomotive engine are excluded.

63. Water-closets, Earth-closets, Urinals, &c., p. 66.

Water-closets, earth-closets, latrines, urinals, commodes, privies, and cesspools, together with all their adjuncts and appurtenances, are included.

General division of the subjects:—

1. The water supply, involving cisterns, valves, and pipes.

2. The valve mechanism, consisting of levers, counterbalance weights, and movable seats or rods.

3. The discharge apparatus, with its valves, pumps, traps, siphons, and receiving vessels.

The series being circumscribed does not include the supply of water to lavatories, &c., which will be found in "Hydraulics," 32, nor improvements in sewers and drains, for which see "Drains, &c.," 1.

The following are also excluded, and are to be found in "Medicine, Surgery, and Dentistry," 25:—

Apparatus for the special use of invalids.

Hygienic and sanitary apparatus.

Deodorizers and disinfectants, either for particular or general use.

64. Safes, Strong Rooms, Tills, and similar Depositories, p. 66.

This class contains inventions relating to the construction of safes, strong rooms, tills, and similar depositories, window safes, key and other strong boxes, including the casting of safe bodies and doors in chills, preparing the moulds, and combining wrought and cast iron in the manufacture. It likewise embraces the various contrivances which have been devised to render the doors and bodies of safes and the doors of strong rooms burglar-proof, and also the several fire-resisting compounds, and non or slow heat-conducting substances employed to fill the circumventing cavities which are formed in the walls and doors of safes and strong rooms. Electrical and other signal and alarm apparatus, and all the other contrivances invented for the protection of safes, are contained in this series; but (with few exceptions) the series does not include the locks and lock bolts, which will severally be found in "Locks, Latches, &c.," 60.

The manufacture and preparation of angle and other iron, iron and steel plates, and plates of both metals combined, and the welding, uniting, case-hardening, and tempering of wrought metals, when specially claimed for the manufacture of safes, &c., is included.

65. Wearing Apparel—Head Coverings, p. 66.

This class relates to bonnets; women's caps; bonnet and cap fronts; hoods, hats, caps of all kinds for men's wear; helmets, and shakos.

It comprises the methods of making these articles; the preparation of felt, plush, straw, whalebone, and other materials used for the same, but not the manufacture of the materials, unless expressly intended for hat or cap making; the apparatus and machinery employed in the manufacture and the various processes invented for water-proofing and ventilating the articles.

Goffering machines and sewing machines for hats are included; also, inventions for fixing a mirror or an eye-glass in a hat.

66. Wearing Apparel—Body Coverings, p. 66.

This class embraces machinery or apparatus specially intended for the manufacture of articles for body coverings, as distinguished from fabrics generally (which are classed under "Weaving," 20), namely, machinery for cutting-out garments and gloves, for fastening buttons to garments, for manufacturing crinoline steel and wire, and for fixing eyelets.

There are included also such looms as are used for weaving particular fabrics and articles for dress (especially stays), and such stocking-frames or frame-work knitting machines as are chiefly intended for knitting gloves and mittens, and for shaping and repairing socks and stockings; but looms and stocking-frames generally must be looked for in "Weaving," 20, and "Lace-making, &c.," 29.

The same restriction has been observed as much as possible respecting the manufacture of shawls, veils, and fringes.

Railway and other wrappers will be found in this series. Inventions relating to the employment of new kinds of threads or yarns in the manufacture of hosiery are included.

Processes and apparatus for getting up hosiery for sale are admitted.

Warm stockings for invalids are included; but elastic stockings for surgical purposes, as well as other articles of apparel specially designed for surgical or medical purposes, and not for ordinary wear, are classed under "Medicine, &c.," 25.

Dresses used for prevention of drowning, or for protecting persons from injury by fire, are excluded, the former being placed under "Submarine, &c.," 101, and the latter under "Fire-engines, &c.," 88.

Some sewing machines have parts specially adapted for sewing gloves, button-holes, and trimmings for dresses; these and these only are included in this class.

Tailors' irons claim a place herein, but not apparatus for heating them, unless it forms part of the iron.

Tailors' and glovers' shears are included in the series relating to cutlery, for which see "Hardware, &c.," 104.

Modes of fastening gloves, stays, leggings, gaiters, trowser-straps, &c., will be found herein, but improvements in the fastenings themselves belong to "Wearing Apparel," 68.

Goffering or plaiting machines for quillings, ruches, &c., are under "Wearing Apparel," 65.

67. Wearing Apparel—Foot Coverings, p. 66.

This series comprises inventions relating to boots and shoes, slippers, clogs, pattens, goloshes, and overshoes. Besides these it includes boot-jacks, boot-hooks, boot trees and stretchers, boot-cleaning apparatus (not hard brushes), blacking, dubbing, waterproof preparations, and varnishes for boots, &c.; shields for preventing splashing in walking; sewing-machines specially constructed for sewing boots, &c., eyeletting machines that relate to foot coverings (the bulk of the eyeletting machines will be found in the previous class, and the manufacture of eyelets in the following class); ventilating, drying, and warming boots, &c.; riveting boots, &c. (improvements in the rivets themselves will be found in "Nails, Rivets, &c.," 58), pegging boots, &c., and pegs (not metal); sandals for protecting the feet of bathers, but not apparatus to be applied to the feet for facilitating swimming (for which see "Submarine, &c.," 101); elastic gussets for boots, &c., but not elastic fabrics that may be used for boots, &c. (which are under "Lace-making, &c.," 29), hammering leather for boot and shoe making, but not inventions for the preparation or dressing of leather, for which see "Skins, Hides, &c.," 55.

Inventions relating to artificial leather specially intended for uppers or soles, but not artificial leather generally, for which see "Artificial Leather, &c.," 80.

Spur boxes for heels are in the series "Saddlery," 34.

68. Wearing Apparel—Dress-fastenings and Jewellery, p. 67.

With regard to dress-fastenings, the series comprises belt-fasteners, clasps and buckles (including buckles other than those used for dresses), buttons, coat-links, sleeve-links, studs, hooks and eyes, eyelets, dress holders and suspenders, safety pins, methods of preventing robbery and loss from the person (including safety pockets; and pocket, watch- and watch-guard protectors), tags for laces, crinoline fasteners and clips, parasol-holders, carding and preparing for sale buttons, hooks and eyes, &c. For modes of fastening leggings, gaiters, stays, gloves, cravats, neck-ties, stocks, and garters, "Wearing Apparel (Body Coverings)," 66, must be consulted, as this class relates only to the improvements in the fastenings themselves.

The jewellery includes beads; watch-keys, when improved as ornaments; imitation stones; coral, ivory; jet, tortoise-shell, pearl, &c.; and cutting and polishing precious stones. Jewel cases or boxes have not been admitted into this series; they will be found in the series entitled "Trunks, Portmanteaus, &c.," 84.

But in jewellery the following articles are excluded, and will be found under "Chains, &c.," 90, viz. :—Ornamental chains, shackles, connecting links, swivels, swivel-hooks, &c.

69. Anchors, p. 67.

This series is devoted to improvements in the shape and manufacture of anchors. In deciding on the limits within which it should be comprised, it has seemed best to omit all inventions but those which have reference strictly to anchors. The various capstans, windlasses, &c., which are used for weighing the anchor will be found described in the series "Raising, Lowering, and Weighing," 31. For chain cables, reference must be made to "Chains, Chain Cables, &c.," 90. Hempen cables, in like manner, are dealt with in the series "Rope-making," 102.

It should be added that improvements in the treatment and preparation of iron for anchors, where such improvements have relation to iron manufacture generally, and not specially to the construction of anchors, have not been included, even in those cases in which anchors are incidentally mentioned. On the other hand, the series does contain those inventions for casting, forging, &c., of which anchors are the sole or the principal subject.

70. Metallic Pipes and Tubes, p. 67.

This series includes inventions relating to the manufacture of metallic pipes and tubes, and to alterations in their form ; it also comprises—

- Jointing or connecting metallic pipes.
- Screw-threading metallic pipes.
- Cutting metallic pipes.
- Manufacturing fittings, such as T-pieces, crosses, &c.

71. Mining, Quarrying, Tunnelling, Well-sinking, and Boring ; Mining Explosives and Blasting Appliances, p. 67.

This series includes inventions relating to drawing and raising minerals and men from mines, and to mine-bands, chains, and ropes ; but pumping machinery, apart from special arrangements, is excluded, being comprised in "Hydraulics," 32.

Special modes of ventilating mines and tunnels are inserted, but not apparatus for exhausting and blowing, and which are applicable to various uses, including the ventilation of houses, ships, mines, &c. These last will be found in "Ventilation," 52.

Where, however, a particular invention is chiefly known through its widest application in connection with the subjects of this series, the specification has been abridged here.

Similarly in a few cases where the improvements, though not specifically claimed as applicable to mining, &c., are still obviously capable of being used for such purpose, the specification has been inserted.

Methods of working mines and quarries, and apparatus for the purpose, are included, together with inventions relating to blasting, miners' fuses and cartridges, and explosive compounds for blasting ; but the treatment of the ore or stone after it has been won is not admitted.

The series comprises improvements in lighting mines by fixed arrangements of pipes and lamps (but not Davy or other portable lamps), and instruments for indicating the presence of gases, for communicating in mines, and for surveying and inspecting.

Machinery and tools for sinking wells and boring the earth generally are included, but not pumping apparatus.

Diamond and other drills, artesian well appliances, post-hole machines, and prospecting machines are of course included.

Tunnels are included, but not those having reference to culverts or sewers.

72. Milking, Churning, and Cheesemaking, p. 68.

The scope of this series is fully explained by its title. It embraces only the inventions relating to the processes of milking and manufacturing butter and cheese. Inventions merely dealing with the finished product, such as the employment of milk, butter, or cheese in cooking, have been excluded, and will be found in "Cooking, &c.," 61. Those referring to the manufacture of "artificial" milk and butter have been admitted, but not any in which processes or apparatus for the preservation of milk, &c., are described. The latter are treated of in "Preservation of Food," 4, or "Ice-making, &c.," 85.

73. Masts, Sails, Rigging, &c., p. 68.

This series embraces inventions relating to masts, yards, booms, bowsprits, and other spars ; rigging ; sails ; reefing and furling sails ; also raising and lowering ships' boats.

Improvements relating to the following subjects have not been included :—

- To the hull, &c. (*See* "Shipbuilding, Repairing, &c.," 21.)
- To windlasses, capstans, ships' riding bits, cable stoppers, and tackle blocks. (*See* "Raising, Lowering, and Weighing," 31.)
- To propelling vessels. (*See* "Marine Propulsion," 5.)
- To nautical instruments, logs, leads, &c. (*See* "Optical, Mathematical, &c.," 76.)
- To anchors. (*See* "Anchors," 69.)
- To rudders and other steering apparatus. (*See* "Steering and Manœuvring Vessels," 75.)
- To canvas generally. (*See* "Weaving," 20.)
- To ropes for standing rigging. (*See* "Rope-making," 102.)
- To chains and wire ropes for standing rigging. (*See* "Chains, &c.," 90.)

74. Casks and Barrels, p. 68.

This series contains the inventions relating to the manufacture of casks and barrels, as well as other similar vessels, whether constructed of wood, metal, glass, or plastic compounds, also the application to casks of pistons, flexible diaphragms, and loose linings.

Self-acting apparatus for closing the tap-holes of casks and the removal of the tap are included, but inventions relating to the manufacture of bungs and shives will be found in "Preparing and Cutting Cork, &c.," 56. Cask stands, self-tilting or otherwise, are included, but machines for cleansing casks are excluded, being classed under "Brewing, &c.," 95 ; vats, tuns, and similar vessels for storing liquors in the place of manufacture are also excluded, and placed under "Brewing."

75. Steering and Manœuvring Vessels, p. 69.

The inventions in this series may be classed under two heads :—

- 1st. Simply guiding the vessel's course.
- 2nd. Giving a new direction to it by propelling apparatus of any description.

The 1st head includes rudders, steering paddles, &c., as well as means for operating the same.

Under the 2nd are comprised transverse screws, paddle-wheels, &c., methods of turning the propeller from side to side, so as to cause it to act in a line at an angle with the line of keel ; means for driving paddle-wheels, &c., separately, so as to render them available for steering ; the use of two or more screws

or

or other propellers, jets of water, &c., and other similar inventions. In all these cases only that portion of the invention has been treated which refers to its use for steering and manœuvring. For descriptions of patented inventions dealing with the propulsion of vessels, see "Marine Propulsion," 5.

In addition to the above, it has seemed advisable to include in the series inventions treating of sliding keels and lee-boards. Though these are not actually steering apparatus, yet their uses in manœuvring the vessel so nearly approach to those of the rudder itself that it has been considered that their addition would render the series more complete.

It has not appeared necessary to refer to any of the numerous methods of signalling on board ship, even where such apparatus is specially used to convey signals to the helmsman, engineer, &c. All these applications are more fitly treated in one of the series specially dealing with the subject of signalling, most of them being under "Signalling," 99.

76. Optical, Mathematical, and other Philosophical Instruments; including Nautical, Astronomical, and Meteorological Instruments, p. 69.

The title of this series enumerates a list of the various classes of instruments included, which, however widely differing scientifically, are more or less closely connected together for practical purposes. The following paragraphs define the scope of the series:—

The manufacture of specula or reflectors for scientific purposes are included, but not the silvering of glass or other surfaces for mere ornamentation, nor the manufacture of mirrors or looking-glasses for domestic use. Reflectors for lamps or light-houses will be found in the series relating to "Lamps, Candlesticks, &c.," 44.

Improvements in telescopes, microscopes, and the manufacture of all kinds of lenses are included, but not the use of lenses in magic lanterns, and apparatus for producing scenic effects, apparitions, &c., which, together with panoramas, translucent advertisements, transparencies, and the lighting, arrangement, and construction of theatres, are classed under "Scenic Apparatus, &c.," 106. For lenses used in photographic cameras, the reader is advised to consult the series devoted to "Photography," 19.

Stereoscopes are included.

Sights for rifles and other firearms are excluded, excepting such as are in themselves instruments for measuring distances, and such as partake of the nature of telescopes or contain eye-glasses.

Certain inventions for drawing, obtaining the profile of figures, and assisting artists, are included partly as optical and partly as mathematical instruments; but these and similar apparatus will be found more extensively comprised in "Artists' Instruments and Materials," 54. Mathematical drawing instruments are however comprised in this series.

Dividing engines and sliding rules are included, as also instruments for the measurement of angles, together with all trigonometrical and land-surveying apparatus; but not instruments for measuring fabrics, measuring for garments, or measures of capacity, which are contained in either the series "Measuring, &c.," 100, or in the class to which they obviously belong.

Instruments for measuring the speed of engines, flow of currents, force of wind, dynamometers, &c., come within the scope of this series; but not steam-pressure gauges, for which see "Steam-engine," 49.

Thermometers, barometers, and other instruments employed in making meteorological observations are included; but not hydrometers (for which see the series relating to Distilling and Rectifying Spirits, 95) and similar instruments for ascertaining specific gravity or testing the strength of liquids (as, for example, lactometers, &c.), or other testing and assaying apparatus for various scientific purposes.

Planètariums, orreries, and globes, both celestial and terrestrial, are included, but not charts or maps.

Sun-dials are included, but not chronometers or other time-keepers, unless combined with some other nautical or philosophical instrument.

Sounding apparatus, ships' logs, and all magnetic compasses may be mentioned as comprised in this series, together with methods of lighting or illuminating the binnacle compass; but not any other kind of nautical lamp, which, together with all marine, signal, and light-house lamps and reflectors, will be found in the series entitled "Lamps, Candlesticks, &c.," 44.

There are other classes of instruments in this series which need not be enumerated, since they are plainly comprehended by the title, and form main heads in the Alphabetical Index of Subjects, p. 81.

Instruments for surveying and inspecting mines are under "Mining, &c.," 71.

77. Harbours, Docks, Canals, &c., p. 69.

This class embraces, in the first instance, inventions relating to harbours, breakwaters, piers, and all kinds of docks—wet, dry, or floating; including piles, pile-driving, pile-drawing, and pile-cutting machinery; cylindrical-piles and cylindrical-pile sinking; screw-piles and screw-pile driving; but not machines used for submarine construction, cofferdams, and caissons, diving-bells, or divers' dresses, for which see "Submarine, &c.," 101.

Dredging machines are contained in this series; but machines for raising embankments, and excavating machines (other than dredging) for making cuttings, are included only when mentioned as intended for canals, &c. A larger collection of the latter machines (excavators for general use) will be found in the series relating to "Raising, &c.," 31, but for such as are especially intended for railway-making, the reader should refer to "Railways and Tramways," 33.

The construction and mooring of buoys for harbours or for beacons are included; but buoys and "balloons" for recovering or raising submerged property are placed under "Raising, &c.," 31; life-buoys and pontoons, under "Submarine, &c.," 101.

Light-houses are included, but not lamps for the same; these will be found in "Lamps, &c.," 44.

Cranes for wharves and piers and hydraulic lifts are omitted, but will be found in "Raising, &c.," 31.

Neither the general preservation of marine structures by the use of cements, paints, and similar substances, nor the materials used for coating or preserving timber, iron, or stone, are included. For such see "Stone, Marble, Slate, and Cement," 92; "Paints, Colours, &c.," 50; "House-building," 97; "Timber,"

96; and "Ship Building, &c.," 21, to which latter series especially reference should be made for methods of sheathing and preventing or counteracting galvanic action on immersed iron structures, such as ships, buoys, graving docks, &c.

The construction of canals is included, and all inventions connected therewith, such as sluices, locks, &c., but not inventions relating to the propulsion of barges or boats on canals, for which see "Marine Propulsion," 5.

The embanking of water-courses and construction of reservoirs are likewise included; irrigation drainage, waterworks, and other large hydraulic operations are under "Hydraulics," 32.

78. Grinding Grain and Dressing Flour and Meal, p. 69.

This class embraces inventions comprising the construction of and mode of working the various kinds of mills and machines employed for grinding corn and other seeds, hulling grain, hulling and polishing rice, bolting flour and meal, crushing oats for oatmeal, preparing pearl barley, and the manufacture and dressing of millstones.

The motive-power engines (steam-engines, water-wheels, and windmills) employed for driving the mills and machines are not included, excepting only in cases where special applications of the driving power are described. These classes of inventions will be found in "Steam-engine," 49; "Hydraulics," 32; and "Air, &c., engines," 62.

The following subjects have been excluded, viz.:—Granaries and methods of storing grain, cleaning grain, treating damaged grain, bruising oats for horse and cattle food, and cleaning seeds for sowing. These will be found in "Agriculture," 82.

For inventions relating to crushing seeds for the extraction of oil, see "Oils, Fats, &c.," 27.

79. Purifying and Filtering Water; including Distilling Sea Water to produce Fresh Water, p. 69.

This series embraces all means, both mechanical and chemical, of purifying water for drinking and domestic purposes; whether by the use of filters, distilling apparatus, or chemical ingredients which cause a precipitation of extraneous matters held in solution or suspension.

The filters are restricted to those intended for purifying water. All other apparatus or processes, though often described as "filters" and "filtering," are omitted, as for example—sieves and other strainers for clearing infusions, decoctions, syrups, &c., from solid particles, or for separating and collecting the denser matter and allowing the more liquid to pass off. Such will be found in series relating to the special manufactures for which they are intended, as "Brewing, &c.," 95; "Cooking, &c.," 61; "Manure," 3 (filtration of sewage); "Pottery," 24 (filtering "slip"); "Medicine," 25 (medicinal tinctures and infusions); and others. The series relating to "Sugar," 48, contains the processes and apparatus for filtering syrups, and likewise comprehends the manufacture and use of animal charcoal and its substitutes employed for purposes of such filtration, consequently such inventions have as a rule been omitted from this series.

Another class of inventions which is included embraces all *chemical* methods of purifying water for drinking and domestic purposes, but methods of treating water so as to prevent incrustation or "furring" in boilers are excluded, and will be found in "Steam-engine," 49. Inventions for "softening water" for household use will be found herein, but for washing powders claiming to be used for softening water see "Bleaching, Dyeing, &c.," 14. Inventions relating to purifying sewage-water by precipitating matters held in suspension or solution are omitted, but are contained in "Manure," 3.

The other inventions inserted in this class describe apparatus for obtaining pure water by distillation from salt water or water containing mineral or other matter in solution or suspension, but inventions designed for feeding marine boilers with fresh water obtained by condensing waste steam or by distillation are excluded, and will be found in "Steam-engine," 49.

A few inventions are likewise included for rendering distilled or other unpalatable water less objectionable for drinking purposes, but not inventions for the manufacture of effervescent aerated waters, for which see "Unfermented Beverages, &c.," 86.

80. Artificial Leather, Floorcloth, Oilcloth, Oilskin, and other Waterproof Fabrics, p. 69.

This series contains inventions relating to such compositions and solutions only as are used in the waterproofing of textile fabrics, yarns, and felts; those which relate to the waterproofing or dyeing and staining of leather are excluded—for them see "Skins, Hides, and Leather," 55.

The manufacture and treatment of oils, paints, and varnishes, unless specially claimed for artificial leather, floor or oil cloth, and table-covers, will be found in "Oils, Fats, &c.," 27, or in "Paints, Colours, and Varnishes," 50.

Printing, embossing, and otherwise ornamenting leather for furniture, hangings, &c., are excluded, being placed under "Furniture, &c.," 39; but painting, printing, and producing patterns on artificial leather, floor and oil-cloth, are included. Artificial leather and other materials for book covers are under "Books, &c.," 43.

This series comprises likewise inventions relating to canvas for sail-cloth, fabrics for packing-wrappers, tarpaulin, rick, tent, and waggon covers, and the weaving of special fabrics for such articles and for artificial leather. It includes, moreover, the manufacture of waste leather into sheets for artificial leather, floor-cloth, &c., the application of gutta-percha and india-rubber to such articles, and the vulcanizing of waterproof goods; but it does not admit the making of cocoa-nut matting and similar substances, which will be found under "Spinning, &c.," 28.

81. Agriculture—Field Implements, &c.; including methods of Tilling and Irrigating Land, p. 69.

This class includes all inventions relating to the tillage of the land, and to the sowing or planting and treatment of the crop, as far as and including gathering it in. For further treatment of the gathered crop, its storage, and all such processes as thrashing, winnowing, cleaning grain, &c., see "Agriculture," 82. Prime movers used for agricultural purposes are also treated apart. The

The following inventions are included in this series :—

- Anchors and intermediate gear for ploughing, &c.
- Coating seed previous to sowing.
- Movable irrigators and machines for watering grass and other lands (but not pumps, siphons, &c., for which see "Hydraulics," 32).
- Clearing roots and stumps of trees from land.
- Fencing with wood or wire.
- The application of electricity for purposes of agriculture.
- Protectors for tobacco plants.
- Agricultural drains and ditches, and machines for forming them.
- Sickles and scythes have been admitted.

Inventions relating to the following subjects have *not* been included :—

- The manufacture of drain-tiles, &c. (See "Drains and Sewers," 1.)
- Manure and compounds for increasing crops. (See "Manure," 3.)
- Pumps, siphons, &c., for draining land. (See "Hydraulics," 32.)
- Lawn-mowing machines.
- Spades, spuds, hand-hoes, and hand-rakes (except a few special inventions), and hand-tools generally. See "Hardware, &c.," 104.
- Machinery for grinding and polishing various articles, amongst which scythes are mentioned.

82. Agriculture—Barn and Farmyard Implements; including the Cleansing, Drying, and Storing of Grain, p. 71.

This division of the agricultural series comprises all inventions relating to the treatment and storage of the gathered crops, and their preparation either for farm use or for the market. In addition to such obvious subjects as thrashing, winnowing, screening, and cleaning grain, &c., and cutting chaff, roots, &c., the series includes—

- Granaries, corn-bins, &c. ; but not elevators for granaries, nor elevators for raising grain into or out of ships, &c., for which see "Raising, &c.," 31.
- Straw elevators, for stacking, &c.
- Kilns for drying hops, grain, &c., but not malt-kilns, nor pocketing and bagging hops, for which see "Brewing, &c.," 95.
- Crushing gorse, oil-cake, grain, &c., and otherwise preparing cattle foods for use or sale, but medicated food is placed under "Farriery," 53.
- Feeding-troughs for field use as well as for farmyard use, but not water or horse troughs.
- Destroying weevils, &c., in corn.
- Treating cotton after it has been baled ; but not ginning cotton nor cleaning cotton-seed. For the former see "Spinning," 28 ; and for the latter see "Oils, &c.," 27.
- Cleaning and sorting roots, &c.
- Cleaning seeds for sowing.
- Cleaning and preparing barley, but not pearl barley, for which see "Grinding Grain, &c.," 78.
- Weighing and measuring grain.
- All processes for preparing rice for the market, viz., thrashing and winnowing, milling, screening, and polishing.
- Sack-fasteners and sack-holders.
- Horse-gear and intermediate gearing for barn implements, &c.
- Steam-engines and other motors for barn implements, &c., are excluded.
- For inventions relating to firing and curing tea, and pulping, milling, and curing coffee, see "Tea, &c.," 87.
- Station appliances generally will be found under "Wool," 103.

83. Agriculture—Traction Engines, p. 71.

This class includes locomotive engines for road or field used for agricultural purposes, but not stationary engines for driving agricultural machinery and forming part thereof, which will be found under "Steam Culture," 8 ; nor stationary steam-engines applied to miscellaneous agricultural purposes, which are placed under "Steam-engine," 49.

84. Trunks, Portmanteaus, Boxes, and Bags, p. 71.

This class contains inventions relating to boxes, cases, chests, portmanteaus, and trunks for travellers and emigrants, also to baskets, caddies, travelling bags, hat and bonnet boxes, ladies' bags or reticules, work-boxes, cases for holding coin, instruments, jewellery, &c., despatch-boxes, dressing-cases, hampers, crates, and packing-cases. Inventions relating to the following subjects have not been included :—

- Writing desks. (See "Writing Instruments, &c.," 37.)
- Sacks and bags. (See "Weaving," 20.)
- Safes, tills, and fire-proof boxes. (See "Safes, &c.," 64.)
- Tobacco and snuff boxes. (See "Tobacco, &c.," 42.)
- Cartridge pouches and soldiers' knapsacks. (See "Fire-arms, &c.," 10.)
- Boxes for containing artists' colours. (See "Artists' Instruments," 54.)
- Pill-boxes. (See "Medicine," 25.)
- Cases for holding gun-powder. (See "Fire-arms, &c.," 10.)
- Paper bags. (See "Cutting, Folding, &c., Paper," 12.)
- Card-cases. (See "Books, &c.," 43.)
- The manufacture of artificial leather, to be afterwards used in the making of trunks, &c. (See "Artificial Leather," 80.)
- Methods of compressing cotton, tobacco, &c., into small parcels, as well as special cases for holding same.
- The locks and fastenings of trunks, bags, &c.

85. Ice-making, Ice Safes, Ice Houses; Cooling, Chilling, Refrigerating; and Use of Cold as a preservative agent, including the Transportation of Substances at low temperatures, p. 71.

This series includes, in addition to the manufacture of ordinary ice, the making of confectionery ices, and the use of ice and freezing mixtures in pickling and currying meat, and in freezing, cooling, and preserving alimentary substances.

Freezing-mixtures; ice breakers or choppers; and non-conducting materials for ice-safes, ice-houses, &c., are admitted; also refrigerators in the nature of ice-safes and wine-coolers, but refrigerators used by brewers, distillers, and wine-makers will be found in "Brewing, Wine-making, and Distilling Alcoholic Liquids," 95.

Freezing, cooling, and refrigerating apparatus and chambers, for treating alimentary and other substances while in course of transportation by land or sea, are also included.

86. Unfermented Beverages, Aerated Liquids, Mineral Waters, Perfumes, Extracts, &c., p. 73.

This class comprises methods of and apparatus for preparing unconcentrated or potable infusions; extracts or decoctions of tea, coffee, and chicory and unconcentrated infusions, &c., generally and for making drinks from chocolate, cocoa, &c. In order to make the series complete in preparing drinks from tea and coffee, one or two inventions relating to fermented decoctions have been admitted. Concentrated extracts, &c., of tea, coffee, &c., will be found in the series, "Tea, Coffee, Chicory, &c," 87. Although this series includes improvements in tea-pots, urns, &c., yet it does not embrace the process of their manufacture in metal or pottery. Slightly fermented beverages of the nature of ginger-beer, liqueurs, and other preparations unfermented themselves but with alcohol added, syrups for drinks, and fruit-squeezers, are admitted. In regard to aerated and effervescent liquids, mineral waters, &c., this class deals with their manufacture and preparation only. Inventions relating to bottling, stoppering, &c, will be found in the series "Preparing and Cutting Cork, &c.," 56. The manufacture and utilization of carbonic acid gas for aerated liquids is included. Aerating water in the sense of restoring oxygen to distilled water is of course excluded; it forms part of the series "Purifying and Filtering Water," 79. Perfumes and extracts generally are included.

87. Tea, Coffee, Chicory, Chocolate, Cocoa, &c. (comprising their manufacture, but not the preparation of drinks therefrom), p. 73.

This class comprises the various processes relating to the manufacture of tea, coffee, chocolate, cocoa, and their substitutes, beginning at the period after the plucking of the leaf or fruit, and stopping short at the preparation of drinks therefrom.

Thus, concentrated extracts, infusions, or decoctions of tea, &c., either alone or in combination with concentrated milk, will be found in this series, but potable or unconcentrated extracts must be looked for in "Unfermented Beverages, &c.," 86.

Measuring tea is included in the series "Measuring, &c.," 100.

88. Fire-engines, Extinguishers, Escapes, Alarms, &c., including Fire-proof Dresses and Fabrics, p. 73.

The following subjects are such as are included in this series:—Fire-engines of all kinds, whether worked by manual or steam power, and whether portable or otherwise; likewise all forms of pumps adapted for throwing a continuous stream of water, to extinguish fires, by being furnished with air-vessels.

Fixed ramifying arrangements of pipes and channels in houses, buildings, ships, &c., designed for extinguishing fires in such structures by water or steam.

Chemical substances, compounds, and solutions, as well as apparatus employed therewith, for generating carbonic acid or other stifling gases or smothering fumes, for suppressing or extinguishing fire. Fire-escapes of all descriptions, whether portable or fixed to buildings. Apparatus for indicating, by audible or visible signals, and started by self-acting means, for giving alarms in case of fires. Fire-proof dresses, fire-proof fabrics for making the same, and the accoutrements and equipments for protecting firemen whilst engaged in rescuing life and property from fire. The manufacture of hose-pipes of leather or other substances, and all kinds of flexible tubing designed for conveying water; likewise fire-buckets and cisterns of similar materials, and methods of waterproofing the same.

The means of ventilating goods in store-houses, cargoes in ships' holds, &c., for the purpose of preventing spontaneous combustion.

Inventions relating to the following subjects are excluded:—

Fire-proof building materials, fire-proof cements, preserving and fire-proofing timber.

The construction of fire-proof buildings and fire-proof safes—the former being included in the class "House-building," 97; the latter being included in the series "Safes, &c.," 64.

The construction of ships in fire-proof compartments, fire-proof railway vans, or any other fire-proof structures, all of which are described in series relating respectively to such subjects.

Hydrants, stand-pipes, water-plugs, &c., for the general supply of water; all such will be found in "Hydraulics," 32.

Fire-guards and all preventive apparatus connected with stoves, fire-places, and flues; also fire-grates adapted for extinguishing, when required, the burning fuel they contain. For these latter see "Cooking, &c.," 61.

89. Washing and Wringing Machines, p. 73.

This series embraces machines for cleansing textile or similar goods by washing operations, also wringing machines for expressing moisture after washing or rinsing, but not other machines for using in dry mangling or pressing, whether hot or cold.

Washing machines for textile or similar fabrics, small or large, whether in lengths or made up into garments; &c., as well as machines for domestic laundry work and small articles generally, are included; but the washing of rags or other material for paper-making, and of wool or other fibres preparatory to spinning, is omitted; and will be found, the former in "Manufacture of Paper," 11; and the latter in "Wool," 103.

Machines,

Machines, however, for washing spun threads or yarn (also used for washing woven goods, &c.) are included, except when they are linked with beaming, sizing, printing, dyeing, or bleaching, in which cases they should be looked for in "Weaving," 20, and "Bleaching, Dyeing, &c.," 14.

Dash wheels are excluded from this series of washing machines when not described in connection with general washing or laundry work, and will be found in the series relating to "Bleaching, &c.," 14. Unless claimed for domestic or similar washing, "bucking" or "bowking" apparatus, coppers, heating and steeping vessels, or boiling vessels with or without fixed or removable fittings to create a circulation of the water, are not included. Inventions thus omitted will be found in series embracing some of the other numerous different processes wherein such apparatus are generally employed.

Inventions referring to certain named machines, such as sifting, mixing, and churning machines, but also capable of very general application, are not included unless their connection with washing and wringing machines is claimed, and is of such a nature as to place the inventions within the scope of this series. This series does not comprise inventions relating to independent gearing, or to motive engines for rocking, rotating, &c., even though the working of washing-machines be included amongst the purposes indicated.

The cleansing of fabrics, as treated of in this class, is restricted to the removal of dirt by a washing operation, and not by mechanical means, such as beating or brushing (for which see "Dressing and Finishing, &c.," 91) and does not include the removal, otherwise than by washing, of grease spots or stains, which operations belong to the series of "Bleaching, &c.," 14.

The last-mentioned series of "Bleaching, &c.," should also be referred to, and not this class, for the treatment of newly woven piece goods and yarns, when such treatment merely embraces the alternative processes of cleansing, immersing, rinsing, and wringing, as ordinarily performed at bleaching and dyeing works, or at successive stages in processes of dyeing.

Similarly, the series devoted to dressing and finishing woven fabrics should alone be consulted for the fulling, milling, and scouring of newly woven materials for the purpose of finishing the same.

The manufacture of soap is not included in this series, but in that of "Oils, Fats, &c.," 27; whilst washing and cleansing powders, resembling bleaching agents, are contained in "Bleaching, &c.," 14.

Although wringing apparatus are included, mangles, when not also described as wringing-machines, are omitted, and will be found, together with presses and ironing, in "Dressing and Finishing, &c.," 91. The same distinction has been observed respecting pressing, squeezing, or expressing rollers, which will be found in the latter series when designed for treating dry fabrics, but in this series when designed for treating wet fabrics, as for expressing moisture or wringing.

Bluing, in connection with washing and apparatus used therewith, is included in this class, the series of "Dressing and Finishing, &c.," 91, treating only of this subject when connected with the "starching" and "getting-up" of articles after they have been washed.

In short, to comprehend a good general idea of its scope, the present class should be looked upon as supplemental to the two companion classes, "Bleaching, &c.," 14, and "Dressing and Finishing, &c.," 91, its main object being, whilst furnishing a separate series devoted to domestic washing-machines, to associate therewith all such classes of similar inventions as would escape adequate or complete notice in either one or the other above-mentioned classes. The manufacturing of bluing, starching, sizing, stiffening, and gumming materials is placed under "Stone blue, &c.," 105. Wool-washing is under "Wool," 103.

90. Chains, Chain Cables, &c., p. 73.

This class includes, in addition to ordinary chains and chain cables, chains and ropes for standing rigging, wire rope, gearing chains, jewellery and ornamental chains, and shackles or connecting links, swivels and swivel-hooks, including those for jewellery.

It also comprises apparatus for testing or proving chains and chain cables.

Pit chains and chain bands are placed under "Mining, &c.," 71.

Links and hooks for coupling railway carriages are under "Carriages and other Vehicles for Railways, &c.," 46.

Chains for suspension bridges only are under "Bridges, &c.," 36. This distinction has been made in consequence of such inventions involving no improvements in the construction of chains for general purposes, but simply a modification in the construction of suspension bridges.

91. Dressing and Finishing Woven Fabrics, and Manufacturing Felted Fabrics; including Folding, Winding, Measuring, and Packing, p. 74.

With regard to dressing and finishing woven fabrics, this series includes gig-mills, brushing machines, shearing machines, tentering machines, stretching and drying machines, also machines for giving elastic finish to fabrics.

Fulling, beetling, and so-called "felting" woven fabrics are likewise included; but of processes often more or less linked therewith, and having for their object the scouring and cleansing of fabrics, this series is limited to such as have some connection with the dressing and finishing of newly-woven materials, as roll boiling and steaming.

This series in no way treats of domestic and general washing and wringing machines, for which see "Washing and Wringing Machines," 89.

In addition to the "shearing," "shaving," or "cropping" of woollen and other cloth, apparatus for cutting and opening the pile of cut-pile fabric are included, when such operations are performed after the woven fabric has left the loom.

Besides the "fulling" and "felting" of woven fabrics, this series contains the manufacture of felt in general, and also the inventions relating to wadding; but not the manufacture of hats, for which see "Wearing Apparel," 65.

Inventions relating to the use of felt subsequent to its manufacture (as for example, the treatment of felt with tar or similar substance with the object of using the same as materials for protecting ships' bottoms, roofing houses, and covering floors) are excluded, although sometimes alluded to in the specifications, under such terms as suggest the "manufacture of felt"; for such inventions see "Shipbuilding, &c.," 21; "House-building," 97; and "Floor-cloths, &c.," 80.

Only fabrics composed of a layer of interlocked animal hair or wool are understood here by the term "felt." The manufacture of coarse paper-like tissues of vegetable fibres is not included.

Waterproofing,

Waterproofing, fireproofing, and preserving fabrics from the effects of damp, mildew, &c., are included only when the processes form part of the "finishing" of the fabrics, or "getting up" thereof for sale.

The manufacture of "stone blue," starch (including fire-proof starch), size, and other stiffening and gumming materials, forms the subject of a separate series, entitled "Stone Blue, &c.," 105; but apparatus for and processes of "getting up" and finishing fabrics with the aid of such materials are included. Compound fabrics made of two or more fabrics cemented together are *not* included; neither are cemented fabrics formed by attaching flock, feathers, fur, or similar substances to a ground fabric.

Respecting lace and hosiery, the scope of the series "Lace-making, &c.," 29, embraces the "dressing," "getting up," measuring, folding, and "finishing" such fabrics; hence they have been omitted from this series. Nevertheless, apparatus for removing the down from cotton and woven fabrics by "singeing" are included, as well as the "gassing" of all kinds of fabrics.

Apparatus for rolling up or folding piece goods, and presses specially claimed for finishing, hot-pressing, and packing bales of cloth are included, but not presses generally, nor the manufacture of bale-iron for securing or binding bales of compressed merchandise.

Mangles and smoothing irons are included, but not stoves for heating irons; nor are goffering, crimping, fluting, and quilting machines included; for these latter see "Wearing Apparel," 65.

92. Stone, Marble, Slate, and Cement, p. 74.

This class embraces all inventions relating to dressing and finishing stone, marble, and slate, but not those relating to quarrying or winning the same, which are placed under "Mining, &c.," 71. Cement in the shape of powder (including hydraulic cement), is included. Liquid cement is classed under "Stone Blue, &c.," 105. Concrete and building blocks, and also cement in a solidified form, are classed under "Bricks, &c.," 22. Stone-breaking and cubing machines are included, unless those used for preparing stone for road-making purposes, which are placed under "Roads, &c.," 35.

93. Glass and Glassware, p. 74.

This class includes the manufacture of glass used in construction and for mirrors; window-glass; plate-glass, rough and ground or polished; toughened glass; chemical and pharmaceutical glassware; vials and bottles; and decorative glassware. Glass chimneys and globes for lamps are excluded, and will be found under "Lamps, &c.," 44, or "Gas, &c.," 17. The silvering of glass is included, except the silvering of specula or reflectors for scientific purposes. Inventions relating to glass stoppers and to bottles constructed with necks of peculiar conformation for stoppering purposes will be found under "Cutting Cork, &c.," 56. Glass instruments and glass used in the arts and manufactures will be found in the classes to which they obviously belong. Glass painted, stained, or artificially decorated, table glass, and glass knobs and handles for cabinet furniture, are classed under "Furniture, &c.," 39. Glass pendants, prisms, &c., for chandeliers, are placed under "Lamps, &c.," 44; and those for gas fittings, under "Gas," 17. Furnaces, moulds, and blow-pipes for making glass and glassware, and machines and processes for dressing and ornamenting glass, are included. Bottle glass, when peculiarly conformed for stopping purposes, is placed under "Preparing and cutting cork, &c.," 56.

94. Carriages and other Vehicles for Common Roads, p. 74.

This series comprises inventions relating to the general construction of carriages for common roads, whether such carriages be drawn or propelled by animal, steam, or other power. It also embraces inventions in near relation to wheeled carriages for common roads, as, for example, hand barrows, sack trucks, and some machines used for agricultural purposes.

Some carriages for tram roads are included, though much relating to this head of the subject will be found in the series relating to "Carriages and other Vehicles for Railways and Tramways," 46.

A large number of the specifications relating to wheels, tires, axles, axle-boxes, springs, and brake and skidding apparatus, do not specially claim any application to either common road or railway purposes. Such inventions will be found included in the series of "Carriages and other Vehicles for Railways, &c.," 46. Where, however, special mention is made of a common road use, the abridgment has been repeated in this series.

Inventions relating to traction engines also form part of this series, but prominence is given to the running gear and special features fitting the engine for running on roads, rather than to the construction of the boiler and propelling engine itself. For these subjects the series entitled "Aids to Locomotion," 7, "Preparation and Combustion of Fuel," 30, and "Steam-engine," 49, respectively, should be referred to.

Of the details of carriages the following, among others, will be found noticed herein:—Apparatus for showing distance travelled by vehicles, for counting passengers, and for indicating fares; apparatus for lubricating wheels; compositions and materials specially claimed for the construction of panels and carriage bodies, and for covering vehicles, and the seats, aprons, and dashers thereof; springs, and other means of suspension; axles and axle-trees; whip-sockets and rein-holders; windows, blinds, and shutters; lamp irons; and guards and couplings.

Special modes of ventilating carriages are treated in the series entitled "Ventilation," 52. Lamps are included in the series entitled "Lamps, Candlesticks, Chandeliers, and other Illuminating Apparatus," 44. Specifications relating to lubricants for axles,—gun-carriages,—steam pumping apparatus for cleaning carriages, &c.,—mine trucks and carriages,—will be found abridged in the series, entitled respectively "Oils, Fats, Lubricants, &c.," 27; "Firearms and other Weapons, Ammunition, and Accoutrements," 10; "Hydraulics," 32; and "Mining, Quarrying, Tunnelling, and Well-sinking," 71. Fire-engines will be found in the series "Fire-engines, Extinguishers, Escapes, Alarms, &c.," 88.

It is obvious that many inventions relating to railway carriages are equally applicable to common road purposes, and *vice versa*. Strictly speaking, therefore, this series and the series of "Carriages and other Vehicles for Railways," 46, ought to be regarded as supplemental the one to the other. 95.

95. Brewing, Wine-making, and Distilling Alcoholic Liquids, p. 74.

In addition to the inventions obviously relating to brewing, wine-making, and distilling alcoholic liquids, the following are included:—

The manufacture of all alcoholically fermented liquors, but not unfermented drinks (such as liqueurs) to which alcohol is added. For those liqueurs, see the series "Unfermented Beverages, &c.," 86.

Vats, tuns, and similar vessels used for storing liquors in the place of manufacture, but not casks in which the liquor is to be sent out for consumption. For these, see "Casks and Barrels," 74.

Cleansing casks, gauging, expressing liquids from yeast, spent grains, hops, &c.

Yeast and leaven of every description, except yeast powders or baking powders, which are under "Cooking, &c.," 61.

Hydrometers, saccharometers, and areometers.

Apparatus for measuring and sampling spirits as it runs from the still.

Malting and drying, roasting, sifting, and measuring malt.

Cutting, tearing, drying, screening, and packing hops.

Pumps for elevating liquids in breweries, distilleries, &c., are excluded. They will be found in series "Hydraulics," 32.

96. Timber, p. 74.

Under this class will be found all inventions relating to wood, both before and after the tree is felled, and to the preparation of wood for constructive purposes. Inventions for stumping and clearing ground are excluded, and will be found under "Agriculture (Field Implements)," 81. Inventions dealing with the application of timber to the great industries are classed under the headings to which they respectively refer; as, for instance, timber for railway purposes, under "Railways and Tramways," 33; timber for shipbuilding, under "Shipbuilding," 21; carpenters' tools and implements and machines for working and dressing timber for building purposes will be found under "House-building," 97; cabinet-making, carving, &c., appliances will be found under "Hardware, Edge-tools, and Cutlery," 104. The preservation of timber generally is under this class, but its preservation for any specific purpose is treated of under the class appropriate to such purpose.

97. House-building, p. 74.

This class includes all inventions relating to building operations and buildings, including tools, implements, and machinery used by the building trades and not included in any other class. Builders' ironmongery is excluded, and will be found under "Hardware, &c.," 104. The building and equipment of theatres is excluded, being placed under "Scenic, &c.," 106.

98. Machine Belts and Bands, p. 74.

This class includes all belts and bands, of whatever material, used for driving machinery, except chain bands, which are classed under "Chains, &c.," 90, and pit bands, which will be found under "Mining, &c.," 71.

99. Signalling, p. 75.

Under this class are collected all inventions for semaphore and other signalling which are capable of general application and cannot be placed in specific classes. The following are therefore excluded:—Railway signals, for which see "Railway Signals, &c.," 38; electric signals, for which see "Electricity, &c.," 15; military signals, for which see "Fire-arms, &c.," 10; signal and alarm apparatus for safes and similar repositories, for which see "Safes, &c.," 64; instruments for communicating in mines, for which see "Mining, &c.," 71.

The various methods of signalling on board ship, whether to other ships or the shore, or to different parts of the same ship, are included, unless when they obviously belong to some other class.

100. Measuring, Counting, Indicating, and Registering; including Tell-tales and Devices for Recording the arrival of Workmen, p. 75.

This series includes all instruments for measuring, counting, indicating, and registering, excepting those included under the following headings:—Horological instruments, which are classed under "Watches, &c.," 9; optical, nautical, and mathematical, astronomical, meteorological, and other philosophical instruments, which will be found under "Optical, &c.," 76. Instruments for measuring fabrics, which are for the most part placed under "Dressing Fabrics, &c.," 91; arrangements for weighing and measuring grain, which are described under "Agriculture," 82; and many inventions of a like description that are more closely allied to other classes than to this class, such as steam indicators ("Steam-engine," 49) and electric indicators ("Electricity, &c.," 15). Measuring liquids is classed under "Hydraulics," 32; measuring gas, under "Gas," 17; indicating distance travelled by vehicles, counting passengers, indicating fares, under "Common Road Vehicles," 94; measuring and sampling spirits and measuring malt, under "Brewing, &c.," 95.

101. Submarine and Pneumatic; also Dresses and Appliances for prevention of Drowning, and Natatory appliances, p. 75.

This class includes machines used for submarine construction; coffer-dams, caissons, diving-bells, submarine boats, and other appliances for working under water, but not the means of supplying the same with fresh air, for which see "Ventilation," 52. It also includes diving apparatus, diving-dresses, and the means of supplying air to divers and others in similar situations; likewise apparatus for forcing, compressing, or exhausting air, when the same is not referable to any special class. It includes, moreover, dresses and other appliances for prevention of drowning, such as life-buoys and life-belts; also swimming apparatus. Inventions for preventing shipwreck, &c., are not included; they will be found under "Shipbuilding, &c.," 21. Pontoons are included.

SCHEME OF CLASSIFICATION,

ADAPTED FROM ABRIDGMENTS OF IMPERIAL PATENTS.

[The pages given in the headings refer to the Abridgments in this book; the numbers in the text, to the Classes.]

1. Drains and Sewers; including the manufacture of Drain-tiles and Drain-pipes, p. 45.

This series comprises the inventions relating to the construction of sewers, house drains, and land or agricultural drains, including the construction of the pipes and other conduits for these purposes, as well as the machinery employed for excavating the ground to receive them.

Metal pipes when specifically claimed, and gutters, as well as most pipes made of clay and other plastic materials, are included, together with the machinery for making them; but kilns for drying and firing, and methods of ornamenting them, are excluded. See "Bricks and Tiles," 22; "Pottery," 24; "Fuel, &c.," 30.

Methods of pulverizing clay preparatory to making "bricks, tiles, and pipes," are not included in this series, nor are machines for making bricks, unless they are claimed as applicable to pipe or drain tile making; but to this latter rule one or two exceptions have been made, when certain machines have been shown as obviously capable of application, and no doubt intended to have been applied, to these specific purposes. For these see "Bricks and Tiles," 22, and "Pottery," 24.

Specifications descriptive of methods of utilizing sewage and generally disposing of it do not appertain to the present series, except where there are additions to or alterations in the form or construction of the sewers. The excluded specifications will be found in "Manure," 3.

Siphons for delivering water are only included in this series when their application to draining is stated; other siphons are classed under "Hydraulics," 32.

2. Sewing and Embroidering, p. 45.

This series includes inventions relating to sewing and embroidering by hand or machinery, except inventions classed under "Saddlery, &c.," 34; "Books, &c.," 43; and "Wearing Apparel: Head Coverings, 65, Body Coverings, 66, and Foot Coverings, 67".

New and improved forms of needles are included; but for the manufacture of needles the reader is referred to the heading "Needles and Pins," 45.

Inventions relating to needle-cases, thimbles, and what are known as "Ladies' Companions," are embodied in this series, with the view of rendering it complete.

Certain novel fabrics are also described, as well as improved methods of manufacturing others, some process of sewing or embroidering being in each case associated with them. The inventions relating to embroidery are not restricted to those in which a needle or some process of sewing is used,—any methods of producing similar embroidery, whether by weaving or otherwise, being comprehended.

The preparation of canvas patterns, and also of imitation embroidery, forms a branch of this series.

3. Manure, p. 45.

This class comprises those inventions in which different substances, whether animal, vegetable, or mineral, are either chemically or mechanically treated for subsequent use as manures. The inventions principally consist of the following:—

1. The precipitation of sewage through filtering tanks.
2. The separation of solid from liquid sewage by machinery.
3. The preparation of bones and similar fertilizing substances by grinding and crushing; and the dissolution of such materials by chemical agents, as well as by heat, either in retorts, furnaces, or steam apparatus.
4. Deodorizers and disinfectants which are claimed as being capable of fixing certain valuable properties in manures, at the same time that they render the substances less noxious.

Disinfectants and deodorizers generally will be found in the series "Medicine, Surgery, and Dentistry," 25.

Modes of constructing drains and sewers, whereby the solid portion of the sewage is collected and the more fluid portion passes away, have been omitted from the present series. For these, see "Drains and Sewers," 1.

Pumping apparatus for raising sewage has also been omitted, for which see "Hydraulics," 32.

4. Preservation of Animal and Vegetable Substances (without the use of Cold); also, Preparation of same for Market, p. 45.

This series includes not only the apparatus and processes employed in the preservation of food (other than freezing agents, for which see "Ice-making, &c.," 85), but also the means of keeping such food after it has undergone a preservative process. It also includes the preservation of substances which are not of the alimentary class, and which are not referable to any other class; and it includes the tinning, labelling, or other processes incidental to the preparation of such commodities for market, where such is not otherwise

otherwise provided for in the different classes. It may be mentioned likewise that, although in this series an endeavour has been made to include all the inventions bearing upon the preservation of grain and such like substances, yet the inventions relating to the processes or means for the preparation of corn-flour and analogous matters have been purposely omitted, for which see "Grinding Grain, &c.," 78.

Preserving skins, hides, and leather is classed under "Skins, &c.," 55, unless when freezing agents are employed; then they are placed under "Ice-making, &c.," 85.

5. Marine Propulsion, p. 46.

This class comprehends all inventions which have reference to the propulsion of ships and other vessels through the water, except those in which the vessel is propelled by means of sails. Marine engines, steam and other, have consequently been included, as also have all the apparatus for the production of motive power, when such power is to be applied to the propulsion of vessels. Oars, paddles, and propellers of various sorts, whether worked by manual or other power, are also included in the series. Apparatus for steering, when such apparatus acts by giving actual motion to the vessel (whether by ejecting jets of water, steam, air, or other fluid or aeriform matter, or by special paddle or screw), has been admitted; but steering mechanism which merely guides without moving the vessel has not. For this series, see "Steering, &c.," 75. Paddles for swimmers, and means for propelling the human body in the water, attached to a life-belt or otherwise, have been excluded. In some inventions the power of the wind upon sails resembling those of a windmill has been utilized; these will of course be included. The inventions of which the subject is connected with propulsion by means of sails, or with the rudders and rigging of ships, will be found under "Masts, Sails, &c.," 73. Those which treat of the construction of the hull must be looked for in the series "Ship-building, &c.," 21.

6. Manufacture of Iron and Steel, p. 46.

The scope of this series comprises all processes for the manufacture of cast-iron, steel, and malleable iron, as well as the preparation of special qualities of metal; also the production by rolling of sheets, plates, rails, rods, bars, angle-iron, &c. The production of metal, other than iron and steel, is given in another series, entitled "Metals and Alloys," 18. This latter is designed to embrace all inventions of general application for obtaining and manufacturing various metals, some of which may be applicable to the treatment of iron ores and iron as well as other ores and metals.

Under this class are placed all furnaces and kilns, particularly those applicable to the production of iron and steel, excepting when the inventions are restricted to methods of effecting combustion, utilizing waste heat, or economizing fuel, which have been reserved for the series relating to the combustion of fuel and to the construction of furnaces in general, for which see "Fuel, &c.," 30. Furnaces and kilns for calcining, smelting, and treating ores and metals other than iron and steel have been omitted, excepting where some reason, such as special applicability, appeared to render their insertion desirable. For these, see "Metals and Alloys," 18. With reference to the rolling of sheets, plates, rails, bars, &c., it should be explained that inventions for rolling metals generally, although the specifications do not state that such inventions are applicable to iron or steel, have been inserted under this heading; but those which are stated to relate only to other specified metals are omitted; the rolling of manufactured rods, tubes, and plates for purposes of ornamentation is likewise omitted. These are all placed under "Metals and Alloys," 18.

The manufacture of articles of finished iron is excluded, as well as the work of the smithy and of the engineer's shop, even when such work is restricted to the making in the rough state articles of special qualities of metal; as, for example, the piling and welding of iron for axles, or the casting of railway wheel tires. Some of these are included in the division "Shaping and Working," under "Metals and Alloys," 18, others under "Hardware, &c.," 104. The casting of solid ingots is contained in this series, together with various inventions relating to the subject of casting; but the production of useful or ornamental casting is omitted.

Blowing engines or machines for producing a blast of air are omitted, see "Ventilation," 52; "Metals and Alloys," 18; "Fuel, &c.," 30; but apparatus for heating the blast and conveying it into the fire are included.

Steam-hammers are, as far as possible, excluded; but shingling machines generally, and special machines for working the heavy balls obtained in certain mechanical puddling processes, will be found under this head. Hand tools for working the metal in process of manufacture are also included.

Alloys employed in iron and steel making, and metals which are regarded as mere varieties of iron and steel, are comprised in this series.

Tempering, annealing, and case-hardening processes for general applications are included, except for ironwork included in the manufacture of safes, &c.; see "Safes, &c.," 64.

7. Aids to Locomotion, p. 46.

This series includes inventions relating to broad wheels and rollers. Endless travelling railways are also included, when they comprise endless chains or rollers, endless chains or connected series of short rails, series of rails or supporting pieces applied separately to the wheel but acting as a continuous railway, or circular rails. Wheels with spikes, projections, or ribs on their tires, to give them a firm hold upon the ground; wheels with teeth to gear into fixed racks, for the purpose of more easily ascending railway inclines, &c.; endless series of claws or feet, for catching hold of the earth in succession and impelling the carriage; impelling legs or levers, which, by repeated backward strokes, force the carriage onward; supporting legs by which the carriage or implement is converted into a walking machine; wheels without tires, or with divided peripheries; wheels made with elastic or flexible peripheries, whereby a larger surface is caused to bear upon the ground or rail, and the bite of the wheel is increased,—are all placed in this class. It likewise includes inventions relating to fitting carriages or implements with a single broad wheel or roller; constructing vehicles of cylindrical and spherical forms; wheels having tires inlaid with wood, horn, india-rubber, gutta-percha, hide, leather, &c.; screw propellers to act against stationary points of resistance and impel the carriage or implement; and substitutes for supporting wheels and rollers.

8. Steam Culture, p. 46.

Steam Culture comprises not only the inventions which have for their object the employment of steam power for cultivating the soil or performing the field operations of agriculture, but also those inventions which are indirectly connected with the subject; the working of agricultural implements by electricity, explosive agents, heated air, compressed air, wind, atmospheric pressure, or water-power are excluded, and will be found under the classes referring to these subjects respectively; also the various plans of communicating motion to carriages or agricultural implements which have been subsequently adopted in steam culture, as by grooved pulleys travelling along or in contact with fixed or slowly moving ropes or chains, propelling screws, differential pulleys, winding up ropes or chains, &c., are included; likewise such improved forms of implements or machines as might be or have been adapted to till the soil by the agency of steam, as revolving harrows, cultivators, and clod-crushers, portable or travelling agricultural engines, digging machines, &c.

9. Watches, Clocks, and other Time-keepers, p. 46.

This class contains those inventions in which clockwork is employed to indicate time, either by visible or audible means, or in which horological apparatus is actuated by other means than clockwork.

Compound instruments, in part of which is a watch or clock (for instance where a barometer, compass, thermometer, and clock are placed together for facility of reference), have been admitted; but not mathematical instruments used in conjunction with a stop-watch, for the registrations of certain times or isolated periods of time, in order to ascertain speed or for similar purposes, which are placed under "Measuring, &c.," 100. Inventions relating to all the following subjects are included:—

The separate parts of a watch or clock, and the tools for making the same.

Scales for a new division of time.

Time teachers.

Toy watches.

Swivels, bows, pendants, or knobs, when intended to form part of a watch or watch-key; but not when described only as part of a chain, watch-guard, or property-protector, for which see "Wearing Apparel—Dress Fastenings and Jewellery," 68, "Chains, &c.," 90.

Inventions relating to the following subjects are excluded (excepting a few which also belong to some of the above included classes):—

Tell-tales and indicators for recording the arrival of workmen, &c., for which see "Measuring, &c.," 100.

Nautical and astronomical instruments by which time can be ascertained through celestial observations, which will be found under "Optical, &c.," 76.

Clockwork mechanism as a part of various machines, when it has not reference to the separate and distinct indication of time horologically, but is used mainly as a motive power moving by means of regulating apparatus at a determined and uniform speed, for instance in electric telegraph transmitting or receiving machines, musical instruments, and machines performing certain actions at fixed intervals—often styled "automatic."

10. Firearms and other Weapons, Ammunition and Accoutrements, p. 46.

The contents of this class being quite obvious, need not be particularized.

11. Paper: Manufacture of Paper, Pasteboard, Papier Mâché, &c., p. 46.

This series of abridgments contains inventions relating to the machinery, apparatus, processes, materials, and chemicals employed in making pulp for the manufacture of paper, pasteboard, and papier mâché, and the subsequent manufacture of pulps into paper, pasteboard, &c., including the finishing processes of drying, hot-pressing, glazing, and winding on the drum, but not such subsequent operations as cutting into sheets, folding or forming into special forms or shapes as envelopes, bags, &c.; these latter operations forming the subject of the series entitled "Cutting, &c., Paper," 12. The series also contains processes for treating waste and spent materials for their recovery or re-use in the manufacture.

"Pearl-hardening," "doughing," and other "loading," "filling," or thickening ingredients or compositions, as well as sizing materials, are included when mention is made of their applicability to paper-making. Likewise some waterproofing compositions are included, when such are to be blended with the paper during its manufacture; but not waterproofing or other compositions which are applied to the paper as a coating after its manufacture. Such inventions, together with staining, colouring, ruling, ornamenting paper, making paperhangings, &c., are to be found in the series "Cutting, Folding, and Ornamenting Paper, &c.," 12, which is devoted to the general treatment of paper subsequent to its manufacture.

For a wider collection of inventions relating to the various chemicals used in the different processes and stages of paper-making, the reader should refer to the series "Acids, &c.," 40; likewise to the series relating to "Starch, Gum, Size, and other Stiffening Materials," 105, which has a more extended scope than this series respecting sizing and loading compositions in general.

Preparing paper for use in electric telegraph printing machines, by submitting it to the action of chemical agents, will be found in the series devoted to "Electricity and Magnetism," 40. Treating paper for special use in connection with peculiar writing inks should be searched for in "Writing Instruments and Materials," 37. Similarly, other special processes for treating paper for particular purposes will be found in the series embracing the manufactures or arts for which such prepared papers are made. For instance, drawing and tracing papers are placed under "Artists' Instruments, &c.," 54; cigarette paper under "Tobacco," 42.

With respect to papier mâché, several inventions relating to compositions called by that name, by the inventors, nevertheless contain little or nothing of the nature of paper or pulp, whilst other compositions more nearly resembling the original papier mâché are merely denominated substitutes for that material; consequently it has been deemed advisable to include these latter substitutes, as well as the so-called papier mâché inventions; but all similar compositions, as artificial ivory, wood, leather, and other plastic compositions for moulding into various articles, are excluded.—See "India-rubber, &c.," 16.

12. Cutting, Folding, and Ornamenting Paper; including Envelopes, Cards, Paper-hangings, &c., p. 46.

The range of subjects allotted to this class comprises the general treatment of paper after its manufacture, in the way of preparing it for subsequent use, as *paper* (*viz.*, stationery, paper-hangings, linings, bindings, tickets, &c.) in contradistinction to the application of paper to the manufacture of shaped articles (such as boxes, book-covers, paper collars, &c.) other than envelopes and paper bags, which latter subjects are included in this series. It therefore includes the application of waterproofing or other compositions to paper, and staining, colouring, ruling, ornamenting, and otherwise treating paper after its manufacture.

Electric ruling machines are under "Electricity and Magnetism," 15.

13. Typographic, Lithographic, and Plate Printing (excluding Electro-telegraphic and Photographic Printing); also, Advertising, p. 46.

Besides the actual processes of printing on paper from types, stereotypes, blocks, plates, stones, dies, and stencil-plates, this series embraces the operations of casting type, stereotyping, engraving plates, cutting blocks, and the manufacture and preparation of all printing surfaces other than those included in "Photography, &c.," 19.

Electrotyping is placed under "Electricity, &c.," 15.

The manufacture of printing and lithographic inks is likewise included, but not ordinary oil or water colours, for which see "Paints, &c.," 50, nor writing inks, for which see "Writing Instruments, &c.," 37.

With regard to presses, only such are contained in this series as claim to be used for printing purposes.

Dies and embossing machines, for embossing either words or ornamentations, are included, unless intended for articles such as book-covers, picture mounts, paper collars, &c., in which cases they should be looked for in series embracing such subjects.

Chased cylinders, used for embossing sheets of paper for ornamental uses, are omitted. See "Cutting, Folding, &c., Paper," 12, where also will be found embossed paper lace.

Perforating, slotting, and punching sheets of stamps, cheques, counterfoils, &c., for facilitating detachment or for cancelling, and marking with perforated letters, dates, &c., are included; but not the perforation of paper or cardboard for fancy work, paper-lace, &c., which is included only in "Cutting, Folding, &c., Paper," 12.

Apparatus for obliterating postage stamps, or other stamps, and cheques, for dating tickets and stamping dates, and for printing consecutive numbers, are included in this series, as also are rubber stamps.

Printing for decorative purposes, in successive colours or shades, and in two or more colours simultaneously, is not included in this series, when such productions are intended for subsequent use as ornamental papers (as, for instance, wall-papers, book-covers, linings, &c.), these subjects being included in "Cutting, Folding, &c.," Paper, 12, which series embraces all processes of manufacturing paper-hangings.

The series, however, contains inventions for the production of engravings, prints, and pictures on paper not intended to be applied in the manner indicated in the preceding sentence (as, for instance, playing cards, chromographic pictures resembling oil or water-colour paintings, and art engravings or prints from plates, blocks, stone, &c.)

The folding of printed sheets is contained in this series, but not any further making of the same in book form, nor the planing or ploughing of the edges of leaves, which subjects will be found in series relating respectively to "Books, Portfolios, &c.," 43 (for printed and stitched sheets), and "Cutting, Folding, &c., Paper," 12, for quires and packets of unprinted papers).

Electric Telegraph Printing-machines (whether printing by type-wheels or otherwise) are excluded, and will be found in the series relating to "Electricity and Magnetism," 15.

Inventions for producing pictures by the aid of light or photography are excluded, as also are the processes of preparing, by the aid of light, printing surfaces in metal, stone, or other material from which impressions in permanent ink may be obtained. All such inventions will be found under "Photography, &c.," 19. Advertising devices generally are included.

14. Bleaching, Dyeing, and Printing Calico and other Fabrics and Yarns, p. 47.

This series includes the engraving and manufacture of printing rollers, the preparation of drugs, and other processes. Besides embracing inventions relating to the subjects above enumerated, it includes the making of such substitutes for soap (washing or cleansing powders) as possess some affinity to bleaching powders and liquors, though soap itself is excluded, being placed under "Oils, &c.," 27.

The manufacture and application of special drugs (dyes, mordants, &c.) are included, with the exception of the manufacture of such generally used chemicals as are comprehended within the series "Acids, &c.," 40. Compounded preparations of chemicals for dyeing or bleaching purposes which would not occur in the last named series are included.

Paints, pigments, varnishes, and inks are excluded, with the exception of matters specially intended for printing calico and other fabrics and yarns.

The bleaching, dyeing, and printing referred to in the title are entirely restricted to the treatment of textile fabrics and yarns. Printing on paper or other non-woven fabrics (as, for instance, on certain descriptions of floor-cloth) is excluded, as also is printing on the prepared face of American cloth, oil-cloth, or any similar fabric with a woven body or backing; likewise inventions for printing with other material than moist or liquid matter (such as inks, thick or thin paint, mordants, &c.) are excluded, as are, for example, most inventions relating to printing with flock, foil, and metallic or other powder, which mainly refer to the ornamentation of paper-hangings and other fabrics not treated of in this class. The classes of inventions mentioned in this paragraph as excluded will be found in "Artificial Leather, &c.," 80; "Books, &c.," 43; "Skins, Hides, &c.," 55; and "Cutting, Folding, &c., Paper," 12.

Inventions relating to bleaching and the similar treatment of unmanufactured fibrous materials, omitted from the present class, will be found in the series respectively devoted to "Spinning," 28, and "Manufacture of Paper, &c.," 11, according to the class of invention to which they claim to be preparatory processes.

Engraving and preparing surfaces (rollers or blocks for printing) on textile fabrics, &c., are included, but not the manufacture of printing or embossing surfaces for general use. "Washing

"Washing and Wringing Machines" constitute a separate series, 89, and are only included in this class when specially identified with bleaching or dyeing processes.

The series of washing and wringing machines contains rollers for wringing and expressing moisture from fabrics, whilst another series—"Dressing and Finishing, &c.," 91—comprehends the roller applied to mangling, finishing, or similar treatment of dry fabrics. The above-mentioned series, "Washing and Wringing Machines," however, has but a limited scope respecting vessels indiscriminately applicable to such operations as washing, bleaching, scouring, dyeing, steeping, rinsing, and general boiling; consequently, vats, tanks, bucking or bowking apparatus, and apparatus adapted to boil materials or articles with or without pressure, whether the vessels be closed or open, and adapted or not to create a circulation of the contained liquid, should be looked for in this class when described in connection with the processes treated of herein.

The series of abridgments devoted to inventions for "Dressing, &c.," comprehends drying and damping, mangling, smoothing, and ironing, including also apparatus used in the getting up of fabrics and goods for sale, as well as in domestic laundry work, with the exception only of washing and wringing machines.

15. Electricity and Magnetism, their generation and applications, p. 47.

The following rules have been adopted in deciding which specifications belong to this series of inventions:—

- 1st. To include all specifications in which mention is made of electric or magnetic force as applicable in carrying out the invention.
- 2nd. To include all which depend on electric or magnetic science, whether such dependence is mentioned or not.
- 3rd. To exclude those in which no mention is made of their application to electric or magnetic purposes, although it may be somewhat evident that such application might be made. For instance, as in the Specifications of Letters Patent, No. 6,896 (old law), no mention is distinctly and directly made of the application of gutta-percha to the coating or covering of wire for electrical purposes, it is not included in this series, although such an application of the invention is evident.
- 4th. To exclude all those in which no other allusion to electric or magnetic science is made than the word "galvanized," as applied to the ordinary process of zincing iron.

In all cases in which a reasonable doubt exists as to whether an invention is to be included in this series or not, the abridgment is included, and the cause of doubt stated. In making the abridgments of specifications of mechanical applications of electricity and magnetism, the rule of tracing their operation from the prime mover to the result has been observed when possible. A similar rule has been observed with reference to electro-chemical processes. The course of the electric current from one battery pole to the other, through the work to be done, has been traced in all cases in which such a method of treating the subject could tend to clearness of description. When the complicated nature of the subject requires it, each description is begun by a short summary of the whole action of the machine or process treated of.

In the title and in the abridgments the word generation is employed as the equivalent of the various expressions, "producing," "exciting," "inducing," or "developing."

Under the word "electricity" is included statical, frictional, or tension electricity, steam electricity, or hydro-electricity, galvanic or voltaic electricity, thermo-electricity, magneto-electricity, that induced in electro-dynamic coils by secondary currents, or by their movement across the lines of magnetic force, that evolved from heated substances, as tourmaline, talc, &c., pyro-electricity, and from electric fish, as the torpedo, gymnotus, electricus, &c., animal electricity, and other sources of less note.

Under the word "magnetism," that of permanent, induced, or electro-magnets, under whatever form they may be set forth, is included.

Applications of electricity or magnetism forming part of an apparatus in any other class are placed in such class.

This series contains also some inventions that relate to the protection of ships' bottoms from fouling and from corrosion. In cases where electric force is *prevented*, in order to ensure non-corrosion, the invention is not included; but when, by means of the corrosion, electric force is *called into action*, and the corrosion of the ship's bottom is thereby obviated, the invention is included in the present series.

The inventions registered in this Colony are arranged under the following divisions:—

1. Generation of electricity and magnetism.
2. Conducting and insulating.
3. Electric and magnetic telegraphy—signalling, transmitting, receiving, or recording apparatus.
4. Instruments for exhibiting electric effects.
5. Electric lighting, igniting, and heating.—This division, as its title implies, relates to lamps or instruments for giving light by electricity, and to apparatus for igniting or causing combustion, as well as for generating heat in various materials by an electric current; but the division does not contain the engines or instruments for producing the electric currents used in lighting, igniting, and heating, which will be found in Div. 1, nor the means of conducting the electricity to the lamps or other instruments or apparatus, which will be found in Div. 11. Apparatus for experimenting with electric light are included. Methods of using the electric current for causing combustion, both in those cases where the ignition of gas or other light is desired, or where an instantaneous firing for explosive purposes is required, are also included. The division also embraces inventions connected with gas-burners and taps which combine mechanism for turning the gas on or off or with an electrically-heated wire for igniting the gas when turned on; and in several of these inventions the electric current furnishes the motive power or actuating force for turning on or off the gas-valve, tap, or cock connected with the burner.
6. Electro-deposition and electrolysis.
7. Dynamo or magneto electric machines and electric motors and railways.
8. Electric apparatus for transmitting, recording, or reproducing sounds.
9. Measuring the electric current.
10. Electric printing (other than telegraphic), writing, and ruling apparatus.
11. Miscellaneous applications of electricity.

16. Preparation of India-rubber, Gutta-percha, Vulcanite, Ebonite, Celluloid, &c., p. 51.

This series comprises inventions relating to machines or apparatus for preparing, cleansing, cutting, masticating, vulcanizing, hardening, and moulding, or otherwise treating india-rubber or gutta-percha, or compounds thereof; it also contains the processes, mechanical and chemical, for preparing, cleaning, bleaching, vulcanizing, hardening, deodorizing, re-vulcanizing, re-covering, or otherwise treating the same, and likewise methods of producing the materials used in some of the above processes; and it further includes the preparation and recovery of some of the solvents employed in the treatment or manipulation of the foregoing substances.

The application of india-rubber and gutta-percha to a great variety of uses is excluded, as well as inventions for the manufacture of india-rubber or gutta-percha, or their compounds, into articles of any description, unless there appears to be an improvement in the mode of vulcanizing or treating the manufactured articles.

The subject of waterproofs is included in "Artificial Leather, &c.," 80, or "Skins, &c.," 55.

Elastic fabrics are classed under "Lace-making, &c.," 29.

The preparation of vulcanite, ebonite, artificial ivory, and such other plastic compositions for moulding into various articles, is included; but the articles manufactured therefrom are placed in the classes to which they respectively belong.

17. Production and Applications of Gas, p. 52.

This series embraces the inventions relating to the generation, purification, measurement, supply, and use of gas (excepting as applied to the production of motive power in gas-engines), which will be found under "Air, Gas, &c., Engines, 62." The manufacture and enrichment of gases by the use of hydro-carbon liquids, and the applications thereof, are included. Gas stoves, and gas, cooking, and heating apparatus are also included. Inventions relating to glass chimneys, shades, and globes generally, will be found in "Lamps, Candlesticks, &c.," 44, and those only are contained in this series which are described in the specifications as intended especially for gas-burners. Improvements in the production of chemical salts, dye colours, and other products of commercial value, from the refuse of gasworks, are not included in this series, unless they relate to some process in the manufacture of gas, for instance, the purification of gas. Such inventions will be found in "Acids, Alkalies, &c.," 40; "Bleaching, Dyeing, &c.," 14; "Manure," 3.

Instruments for indicating the presence of gases in mines are included in "Mining, &c.," 71.

Ordinary iron pipes and metal tubing are excluded, being placed under "Metallic Pipes, &c.," 70; but pipes specially adapted for gas, as well as flexible gas tubing and joints for gas-pipes, are included, so also are the tools used in making and fixing gas-fittings, and the apparatus for operating on gas mains. Exhausting apparatus employed in the manufacture of gas for illumination are included; but apparatus used for exhausting and forcing gases, air, and vapours or fumes, for other purposes, are omitted, and classed under "Ventilation," 52.

18. Metals and Alloys, p. 52.

This series comprises abridgments of specifications relating to metals and their mode of manufacture and treatment, and to the alloys formed by mixing various metals together. For the specifications relating to iron and steel, however, see "Manufacture of Iron and Steel," 6.

The specifications are arranged under the following divisions (but many of the inventions are equally applicable to two or more of these divisions):—

1. Alloys—Antimony—Bismuth—Copper, &c.
2. Gold, &c. (Alluvium, &c.)
3. Do. (Gold.)
4. Do. (Gold, silver.)
5. Do. (Gold, silver, other metals, precious stones.)
6. Do. (Quartz, &c.)
7. Minerals and other substances.
8. Nickel.
9. Ores, minerals, metals, &c.
10. Quartz, &c.
11. Shaping and working metals.
12. Silver, &c.
13. Sulphurets, amalgam, &c.
14. Tin, &c.

19. Photography, Photo-lithography, and Photo-mechanical Printing, p. 55.

To afford a more precise idea of the scope of the present series of abridgments than can be conveyed by the short title, the following definition is offered of the word "photography": the art of copying designs, figures, or images by the chemical or actinic action of light upon surfaces prepared to receive that action.

With respect to the printing of pictures obtained partly or wholly by photographic means, it has been found advisable to include also all successive processes for transferring or copying such pictures, and all subsequent printing of copies of the same in permanent inks or colours.

Optical and philosophical instruments not used directly in the process of photography are excluded from this series, being classed under "Optical, &c.," 76.

It should be particularly observed, in connection with the preceding paragraph, that all stereoscopes are so classed.

Improvements in books or albums for containing photographs or pictures should be looked for in "Books, &c.," 43; whilst improvements in mounting, holding, and framing photographs, &c., will be found in "Artists' Instruments, &c.," 54.

Inventions relating to the application of photographic pictures to such ornamental objects as jewellery, or to the embellishment of boxes, furniture, other articles, and surfaces of all kinds, are not contained in this series, unless some novelty in producing the picture is described or claimed. 20.

20. Weaving, p. 55.

In this series are included not only the inventions relating to looms, but also the apparatus for sizing, warping, and beaming yarns, likewise inventions for producing woven fabrics of novel structure, new materials or new combinations of materials. Fabrics having interwoven therein strands or threads of india-rubber are excluded, being classed under "Lace-making, &c.," 29. Inventions for producing chenille by weaving, twisting, or otherwise, will be found in the same abridgments. Machines for winding pirns as a preparatory operation to weaving are in this series, but inventions relating to the production of pirns or cops in the process of spinning and doubling are not included.

Machines for winding yarns generally are placed in "Spinning, &c.," 28, and excluded from this series, except where the abridgment has a necessary connection with inventions strictly belonging to "Weaving."

Canvas generally is included, but canvas for sail-making is placed under "Artificial Leather," 80.

21. Ship Building, Repairing, Sheathing, Launching, &c., p. 55.

This series relates to the above subjects, and also includes painting, lighting, ventilating, and extinguishing fires (excepting improvements in fire engines and pumps for which see "Fire-engines, &c.," 88), and also the means of preventing shipwrecks and other casualties.

Abridgments relating to steering and manœuvring vessels are inserted under "Steering, &c., Vessels," 75.

Armour, and the modes of attaching and fastening it, are included, but not the modes of manufacturing such armour.

Inventions relating to anchors, cables, masts, and sails, and to rigging and navigating vessels, are placed in distinct classes, though some of these subjects form part of the inventions included in this series.

22. Bricks and Tiles, Artificial Stone and Concrete, p. 55.

This class comprises inventions relating to the different varieties of bricks and tiles, together with those referring to the materials from which they are manufactured, the methods of forming them, and the various contrivances for drying and burning them; it also includes inventions for manufacturing artificial stone and building blocks of various forms and dimensions. Inventions for indurating or protecting the face of bricks or tiles are included. Inventions relating to the manufacture of drain tiles are excluded, being placed in the series "Drains and Sewers," 1. A limited number of this class of abridgments mainly relate to improvements in building contrivances or materials, and to other inventions forming the subjects of distinct series. They have been, however, included because some portion of them refers to bricks or tiles.

23. Plating or Coating Metals with Metals, p. 55.

This series comprises only those specifications that relate to processes for coating metals with metals.

Applications in which processes have not been expressly stated are omitted, but whenever any reasonable doubt exists as to whether a specification should be embraced by the series or not, its abridgment is included; thus the title "plating or coating," &c., has been strictly adhered to. All inventions that specifically relate to pickling or otherwise preparing metals to be coated with metals are included in this series. These abridgments also comprise inventions that relate to combining metals that are intended for coating other metals.

Specifications that relate to electrotyping are not included in this series, but in "Electricity, &c.," 15. Only those electro depositing patents which refer to coating metals permanently with metals are comprised in this series; the rest are under electro-deposition and electrolysis, for which see "Electricity," 15.

Specifications that relate to coating iron with steel by case-hardening the iron are not included in this series, but in "Iron and Steel," 6.

24. Pottery, p. 55.

This series comprises inventions relating to the preparing of the various materials employed in the manufacture of earthenware, stoneware, porcelain, and other ceramic wares, likewise the machinery and methods of manipulation adopted throughout the various branches of manufacture, together with the processes for enamelling, glazing, painting, printing, drying, burning, and otherwise finishing the work. The series also includes the application to various purposes of the materials employed in the above manufacture. Drain tiles and drain pipes are included in "Drains and Sewers," 1; tiles and blocks of pottery, under "Bricks and Tiles," 22.

25. Medicine, Surgery, and Dentistry, p. 56.

This series consists chiefly of inventions relating to surgical instruments, medical baths, invalid beds and bedsteads, ambulances and invalid carriages, compound medicines, disinfectants, deodorizers, lollies, ointments, and artificial limbs and teeth. The inventions relating to the manufacture of sulphate of magnesia (Epsom salts) and such other salts, as well as alkalis and acids which, although employed in medicine, are principally used for industrial purposes, will be found in "Acids, &c.," 40. Veterinary medicines, and instruments for the surgical treatment of domesticated animals, must be looked for in the series "Farriery," 53.

26. Music and Musical Instruments, p. 56.

With respect to musical instruments, this series includes not only inventions relating to the construction, but such as are in any way connected therewith, consequently it contains abridgments of specifications which describe motive power engines specially constructed for working the bellows of organs, &c.; the applications of electro-magnetic apparatus to playing organs or pianofortes, and of glass and india-rubber to certain parts of instruments; casting and hanging church and musical bells (house bells excepted, for which see "House-building," 97); insulating, stranding, and tuning; means for cutting the fronts of pianofortes and other keyboard instruments, and materials for the foregoing purposes.

With

With-regard to music, the inventions admitted are such as have reference to the construction of scales; to methods of teaching music and singing, of teaching the blind to read music, of teaching the principles of music, and of transposing music; to manifold writers and pens for writing music; to plates for engraving music on; to portfolios, clips, files, &c., for holding music; to ruling music paper; to printing and writing music; and to registering and printing musical notes as played on the instrument.

The other inventions connected with the subjects of the series, and abridged in it, are all that relate to apparatus for exercising and strengthening the fingers and hands, and for practising upon, such as dumb pianos; to castors, friction-joints, and hinges for keyboard instruments; to leaf-turners; to methods of conveying sound to a distance; to music desks, stands, and stools; to pallets, pistons, and valves for musical instruments; and to metronomes or timekeepers.

27. Oils, Fats, Lubricants, Candles, and Soap, p. 56.

This class comprises inventions for producing or treating animal, vegetable, or mineral oils, fats, lubricants, candles, and soap, also for the production or treatment of tar, but only where oils or fats are with the tar which is produced or result from its treatment.

Inventions relating to wax tapers are included, but not those relating to wax matches, for which see "Lamps, &c.," 44, and "Tobacco," 42. Crushing seeds for the extraction of oil is included.

28. Spinning; including the Preparation of Fibrous Materials and the Doubling of Yarns and Threads, p. 56.

This class embraces not only all the inventions relating to the preparing and spinning of fibrous materials, but also those relating to the doubling or twisting together of yarns and threads, and to the winding, reeling, gassing, and polishing of such yarns and threads.

All inventions relating to wool in the fleece, and some that are applicable to other fibres in their natural state, are classed under "Wool," 103; but not inventions relating to sheep-washing and shearing, for which see "Farriery," 53.

29. Lace-making, Knitting, Netting, Braiding, and Plaiting; including the Manufacture of Fringe and Chenille, p. 56.

This series includes the manufacture of a great diversity of fabrics from spun threads, by twisting, interlooping, knotting, and plaiting, as distinguishable from textile fabrics made with warp and weft threads and woven in looms.

Besides machinery for manufacturing lace, knitted, netted, and similar fabrics, the "dressing," "finishing," and "getting-up" of these fabrics are included, but not the manufacture of such goods into made up trimmings, articles, or shapes, &c., which will be found in "Wearing Apparel," 65 and 66. This last exclusion, however, does not apply to "seaming" lace together, or uniting the selvages or pieces of stockings or other similar or knitted fabrics, which is a process performed by the same manufactory as the knitting, and is necessary to complete that branch of manufacture.

Connected with some processes for finishing lace are a few inventions relating to imitation tulle or blonde, and the similar ornamentation of manufactured lace, by subsequently laying and cementing thereon floss, silk, threads, &c. Such have been included, but not inventions for making other so-called "imitation lace" (for instance, by printing, colouring, embossing, and stamping out), or "lace-paper," or articles of wearing apparel made to resemble lace, as collars, &c.; neither are woven ornamental fabrics included, of which it is only said that they "resemble lace in appearance."

Although knitted and similar looped fabrics, together with bobbin net lace, are included within the scope of this series, terry and other uncut pile fabrics *woven in looms* are excluded; nevertheless bobbin-net lace machines, stocking frames, and warp machines, when used for manufacturing any description of pile fabrics, will be found herein.

The word "lace" is technically used to denote several kinds of woven fabrics, as for example "coach-lace," a terry pile fabric used by coachmakers, &c. For inventions relating to such fabrics, see "Weaving," 20. Boot and shoe laces are included only when made by braiding or plaiting.

The terms plait, plaiting, and plaited (employed herein to signify that braiding motion by which "straw plait" is made) have also two other distinct technical meanings, namely, the doubling or folding of woven piece goods, and, secondly, the making of narrow longitudinal folds on the faces of fabrics (shirt-fronts for example), such folds being sometimes called plaits, but more generally pleats. For inventions relating to these latter processes see "Dressing and Finishing Woven Fabrics," 91, "Sewing and Embroidering," 2, "Weaving," 20, and "Wearing Apparel," 65 and 66.

The manufacture of candle-wicks (both plaited and twisted) being comprehended in the series entitled "Oils, &c.," 40, those inventions only which comprise special plaiting or braiding machinery for the production of candle-wicks are embraced in this series.

Several inventions under titles more or less suggestive of processes for manufacturing lace relate only to the preparation and use of raw fibrous materials and the spinning of threads therefrom. For such inventions refer to "Spinning," 28.

For embroidering done by sewing-machines and embroidering machines resembling sewing-machines, see "Sewing and Embroidering," 2; also, for brocaded and embroidered fabrics produced in looms, see "Weaving," 20.

Improvements in the Jacquard apparatus, tappets, and similar pattern-producing "surfaces," as well as stopping motions, taking-up and other apparatus which are included in "Weaving," 20, have been omitted from this series, except when especially intended to be used in a lace-making or knitting machine.

In order to comprise in one series the various kinds of fabrics rendered elastic by having interwoven therein strands or threads of india-rubber, all methods of producing such fabrics have been inserted.

Although the scope of the series, as above expressed, has been limited to the manufacture of fabrics from *spun threads*, it has been deemed advisable to make exceptions in favour of the plaiting and braiding of horsehair and straw, but not wirework, wickerwork, basket-making, mat-making, &c., all of which are excluded.

This

This series includes also the various methods of making chenille, whether by weaving, twisting, or otherwise, but not its subsequent use in the manufacture of other fabrics.

The manufacture of fringe has been similarly treated, but for attaching fringe, &c., or making fringe on the edge of a fabric by the use of sewing-machines, see "Sewing and Embroidering," 2.

30. Preparation and Combustion of Fuel, p. 56.

The scope of this series is defined by its title, the exact bearing of which should be borne in mind by a searcher who might at first sight expect to find here apparatus that should properly be looked for in the series relating to heating, or steam-engines, or iron and steel, or other cognate series. The specifications relating to the preparation of fuel and apparatus employed therein are evidently clearly defined, and stand alone by their very nature. This is not so much the case with the numerous kinds of furnaces used in the various arts, in which the actual mode of burning the fuel is sometimes only subsidiary to the other purposes of the apparatus. The searcher should bear in mind—in looking, *e.g.*, under the head of "Boiler Furnaces"—that regard has been had to the furnace only, and not to the construction of the boiler itself; which must be looked for in the series relating to Steam-engines. Inventions for the prevention or consumption of smoke are included unless those referring to steam-engines. The ventilation of fire-grates and furnaces generally is included; but the ventilation of fire-places is classed under "Ventilation," 52.

31. Raising, Lowering, and Weighing, p. 57.

This class includes inventions relating to raising sunken vessels and other bodies from the sea, and those improvements in hydraulic presses, fire-escapes, and raising and stacking straw and other agricultural produce, which are considered to have sufficient bearing upon the subject of this class. Hydraulic presses which are applicable to "presses" merely, and not in raising and lowering heavy bodies, are not included; while as regards apparatus for raising straw and other agricultural produce, the machines which relate simply to passing the straw from one part of the machine to another are excluded, and those only are inserted by which the straw or produce is raised from the machine into some other situation. A similar observation applies to fire-escapes.

Raising and lowering ships' boats will be found under "Masts, &c.," 73.

Warehouse platforms, lifts, hoists, cranes, windlasses, elevators, cages, man-engines, and other machines for raising and lowering men, goods, or materials are included, unless when they form part of a machine belonging to some other class. Inventions relating to drawing and raising minerals and men from mines are, however, excluded, being classed under "Mining, &c.," 71.

Excavators are also included, when not otherwise classified.

32. Hydraulics, p. 57.

This series relates to raising, forcing, storing, filtering, supplying, measuring, and regulating the flow of water; it also relates to irrigation and drainage, to apparatus for the employment of hydraulic motive power, and to the appliances for the domestic and sanitary use of water, such as joints for pipes, taps and cocks, fountains, baths, and water-closets; moreover, it includes improvements in the form or arrangement of sewers and drains designed to facilitate the flow of water, in flushing or otherwise removing obstructions; in trapping; in excavating or cutting trenches, ditches, and drains; but it is not intended to include materials for or methods of manufacturing or constructing sewers and drains—these will be found in the series of abridgments entitled "Drains and Sewers," 1; nor is it intended to include improvements in the collection or treatment of sewage—these will be found in the series of abridgments entitled "Manure," 3.

Hydrants and other street-watering appliances are included.

Pumps for elevating liquids in breweries, distilleries, &c., are also included.

For hydraulic lifts, which are excluded, see "Raising, &c.," 31.

33. Railways and Tramways, p. 57.

This class includes inventions which relate to the *construction and arrangement* of railways and tramways. The improvements that may properly be referred to the establishment of a line of railway or tramway—with the exception of the buildings, rolling-stock, and signals, which form the subject of other series—are intended to be comprehended within the scope of this series. It is true that, in some cases, improvements in signals are described, but these signals will invariably be found to be in combination with points, or to embody a principle common to both. Those bridges which are expressed or are obviously intended to be designed or used for railways are comprehended—(other bridges being included in the series "Bridges, Viaducts, and Aqueducts," 36)—and such adjuncts to the permanent way as fixed tanks, water cranes, and troughs (but not pumps), for supplying water to trains, &c. Improvements in rolling rails, moulding and casting chairs and sleepers, and in preserving wood for sleepers, &c. (see also "Timber," 96) will be found included, and also a few inventions relating to excavating machinery of expressed or implied utility in railway work. The inventions relating to the construction of tunnels do not, however, come within the scope of the series (see "Mining, &c.," 71). Abridgments of specifications relating to portable railways are classed in this series, but only when these railways are distinct from the carriage which travels over them. Those which are attached to and travel with the carriage constitute a separate series (see "Aids to Locomotion," 7.) Inventions relating to atmospheric railways are, of course, included, and, of necessity, others closely allied, for the conveyance of parcels, commonly known as the "Pneumatic Despatch." Elevated railways, wire-rope railways, wire and rope tramways, and all such contrivances are likewise included.

Electric railways and tramways in which the rails form part of the system are placed under "Electricity and Magnetism (Motors and Railways)," 15.

34. Saddlery, Harness, Stable-fittings, &c, p. 58.

The inventions in this class relate:—

1. To saddlery, comprising saddles and saddle-trees, pillions, pack-saddles, saddle-cloths, housings, gambadoes, girths, stirrups, stirrup-bars, stirrup-leathers, bridles, bits, rings, buckles, hooks, knee-caps, muzzles, and horse-boots.

2. To carriage and cart harness, including collars, harness, saddles, territs, buckles, and their substitutes, traces, tugs, bits, headgear, reins, and nosebags.
3. To whips and spurs.
4. To stable-fittings, namely, partitions, hay-racks, mangers, troughs, harness-brackets, and halters and apparatus for securing animals.
5. To stable utensils, including currycombs and brushes.
6. To contrivances for stopping runaway horses, and for instantaneously releasing horses from carriages in case of accident, when such contrivances form part of the harness.
7. To machines for sewing harness.

This series does not embrace the inventions for preparing skins and tanning leather for harness ; these will be found in the series "Skins, Hides, and Leather," 55. Singeing-lamps are placed under "Farriery," 53.

35. Roads and Ways, p. 58.

This series embraces all inventions relating to the construction and maintenance of roads and ways, whether paved, macadamized, or formed by the use of asphalt, concrete, or the various other substances which have been proposed for road-making, including the employment of plates or bars of metal, blocks or planks of wood, and combinations of such or other materials. Some of the contrivances mentioned relate solely to the construction of roads, while others form part of inventions connected likewise with other subjects. The maintenance of roads embraces not only the repairing but also the cleansing of such roads ; and therefore all inventions relating to sweeping, scraping, and otherwise maintaining the surfaces of roads and ways in proper order, are noticed, as well as certain inventions relating to the breaking of stone for the purpose of road-making. Apparatus for street-watering will be found under "Hydraulics," 32. Inventions relating to milestones, and tablets for distinguishing the names of roads and streets, are also included. Inventions relating to the construction of tessellated or mosaic pavements are not included, such pavements not being suitable for roads ; while as regards tiles, which are chiefly adapted for floors, yards, and roofs, and the composition of cement and artificial stone, those inventions only are included which seem particularly applicable to the subject of this series.

36. Bridges, Viaducts, and Aqueducts, p. 58.

This class embraces all inventions relating to the construction of bridges, viaducts, and aqueducts, whether formed of wood, stone, brick, or metal, or of concrete or composition ; and in addition to those inventions which are distinctly set forth as relating to such structures, certain other inventions are included, which, although not so distinctly mentioned with reference to this particular subject, must nevertheless be considered as having a sufficient connection therewith to require notice in this class. These embrace certain inventions relating to coffer-dams and other contrivances suitable for facilitating the construction of foundations under water, and also certain modes of forming arches, beams, and girders. Of these such only are included as appear to be adapted or meant for use in the construction of bridges and aqueducts, as well as other structures. The same observation applies to pile-driving and cylinder sinking, no invention relating to the latter being noticed except such as are specially mentioned with reference to the construction of bridges, viaducts, and aqueducts. It should be understood, indeed, that, in the compilation of these descriptions, it has not been thought necessary or desirable to include in each series every invention which might, by some possibility, be made available with reference to the subject of that series. Thus, there are a few inventions relating to concretes and cements which, although mentioned in the specification as being available in the construction of bridges, as well as other structures, are not included in this series, but will be found in the series "Bricks, &c.," 22, or "Stone, &c.," 92. So, likewise, as regards the manufacture of iron or steel plates, excavation for the foundations of bridges and other structures, and other inventions which, although relating in some degree to bridges and aqueducts, are more properly classed under the heads of the subjects to which they especially belong.

37. Writing Instruments and Materials, p. 58.

This class comprises specifications relating to ordinary writing instruments and materials, copying-presses, manifold-writers, multigraphs, and the various methods of copying, paper clips and files, paper-knives, appliances for teaching writing, instruments for affixing postage and other labels, ruling instruments, sealing-wax and wafers, metallic fastenings for envelopes and boxes, cards, &c., for leads and pens.

Portable writing-desks and cases are inserted, but convertible writing-desks, or rather writing-tables, are placed in "Furniture," 39.

Again, the manufacture of paper, and the subsequent operations of folding, cutting, &c., and the making and gumming of envelopes, form separate series. See "Paper, &c.," 11, and "Cutting, &c., Paper," 12.

But the enamelling of paper for writing-tablets, and the incorporation in paper of one or more of the ingredients of the ink to be used in writing thereon (for the prevention of fraudulent alterations), being connected with writing materials, such inventions have been admitted.

Writing Inks are included.

38. Railway Signals and Communicating Apparatus, p. 58.

This class comprises abridgments of specifications relating to railway signals and means of communicating such intelligence along lines of railway, and also along trains, and from train to line, and *vice versa*, on railways, as may be necessary for the correct working of the traffic thereon, but does not include signalling and telegraphing or communicating intelligence from place to place when unconnected with railway working. Among the inventions included in the series will be found those for securing simultaneous and sympathetic action between points, switches, and signals, for locking and unlocking signal and point levers, and generally for diminishing the sources of collision on railways and preventing the transmission of contradictory signals.

39. Furniture and Upholstery, p. 58.

In addition to ordinary articles relating to the above, there have been admitted such as refer to beds and hammocks of all descriptions, and to quilts, but not to blankets or sheets; to billiard tables which are convertible into dining and other tables; to invalid chairs, but not invalid carriages or bath chairs, unless they are convertible into chairs or couches; to indoor and Venetian blinds, but not to outside, sunshade, or shutter blinds; to hanging and drawing curtains, and to fabrics for blinds and curtains when made or ornamented especially for them, but not to fabrics equally applicable to other purposes. There have been included also such as describe picture and looking-glass frames, but not the manufacture or silvering of glass,—for which see "Glass, &c.," 93; handles and knobs for attachment to cabinet furniture, but not to locks; baths, when combined with articles of furniture; water-closets, but only when they are portable and serve as commodes. Again, although specifications concerning reading-desks and stands for holding music and books have been abridged in this series, those which relate to apparatus to be applied to stands or to pianofortes for turning over the leaves of music, &c., have been excluded, and will be found in "Music and Musical Instruments," 26.

40. Acids, Alkalies, Oxides, and Salts, p. 58.

Besides embracing inventions relating to the making or obtaining by any direct or indirect methods of acids, &c., this class includes inventions relating to the making or obtaining of several elementary bodies, among which are bromine, carbon, chlorine, fluorine, iodine, hydrogen, nitrogen, oxygen, and sulphur, and some compound substances or bodies, such as cyanogen, none of which of themselves possess either the property of an acid, alkali, oxide, or a salt, but which in the process of their production are accompanied very frequently by the formation of one, two, three, and even in many instances of all of these substances in one and the same invention.

Under these circumstances it was considered advisable that any inventions which might relate simply to the production of bromine, carbon, chlorine, fluorine, iodine, hydrogen, nitrogen, oxygen, sulphur, or cyanogen, should find a place in this series.

41. Aeronautics, p. 59.

This class comprises specifications that treat of balloons or other means of ascending in the air or of navigating the air, and it includes the application of balloons or kites for suspending, partially suspending, drawing, or other purposes.

The term "balloon" is applied in several specifications to vessels inflated with air or gas and immersed in water, but which only have an ascensional force whilst so immersed; these are not included unless they describe appliances equally applicable to aerial-balloons or other subjects treated of in this class. They are placed under "Raising, &c.," 31.

42. Preparation and Use of Tobacco, p. 59.

This class includes not only the manufacture of tobacco, snuff, cigars, cigarettes, but also that of pipes, cigar-holders, tobacco pouches and boxes, snuff-boxes, cigar-cases, fusee-cases, and fastenings for same.

All means of procuring light, specially applicable to cigars and pipes, have been admitted; consequently specifications relating to fusees, splints, and similar matches (when expressly intended for such purposes) will be found herein, and in order to render it as complete as possible, spittoons, and other matters of the kind, to which a few inventors have turned their attention, have been introduced.

43. Books, Portfolios, Card-cases, &c., p. 59.

This class comprises, in addition to abridgments which relate to the binding of books, pamphlets, and loose sheets, and to the manufacture of portfolios, memorandum and pocket books, and card-cases, all such as have been found to have any relation to albums; artificial leather and other materials for book-covers; book or reading stands, book slides, boxes for holding books and papers, book clasps, clips, and markers; copying-presses (but only when connected to book-covers), fastenings for pocket-books and portfolios, indexes for account and other books; knives and contrivances for cutting open the edges of books and papers; preparing skins, leather, and paper for book-binding, pocket protectors for pocket-books, and such markers for folding papers as are applicable to the folding of printed sheets for books or pamphlets. Sewing, stitching, and fastening machines for paper are included.

Paper-ruling is classed with "Cutting, &c., Paper, &c.," 12.

44. Lamps, Candlesticks, Chandeliers, and other Illuminating Apparatus; excluding Inventions for lighting by Gas or Electricity, p. 59.

This class relates to lamps and apparatus in which any combustible material except gas may be burned for the production of light; consequently those inventions are included which are intended for the consumption of essential and mineral oils, spirits, fat, &c., and also those in which oils are burned in the form of vapour.

In some specifications lamps are described as applicable for consuming either gas or oil; such have been admitted, as have likewise glass chimneys, globes, and shades, when they may be used with either gas lamps or oil lamps; the same observation applies to burners.

Appendages to lamps, candlesticks, and chandeliers, such as reflectors, lenses, snuffers, &c., also inventions relating to the cutting of glass for prisms, pyramids, &c., the manufacture of ornaments, and the methods of attaching them, when such articles are described as expressly intended for chandeliers or lustres, have been admitted.

Fixed lamps in mines are excluded, being placed under "Mining, &c.," 71.

For improvements in the manufacture of candles, see "Oils, &c.," 27.

Wax and other matches are included, except when specially designed for use with tobacco and cigars.

Magnesium lights and lime lights, and other chemical lights, have been included, but inventions for producing light by means of electricity are omitted, for which see "Electricity and Magnetism," 15.

Daylight reflectors are also included.

Singeing-lamps are under "Farriery," 53.

45. Needles and Pins, p. 60.

This series includes the inventions relating to needles for sewing by hand, needles for sewing-machines, crochet-needles, and knitting-needles for hand-knitting, but not the barbed needles employed in frame-work knitting or stocking-frame machinery. It also embraces improvements in the form and manufacture of ordinary pins and hair-pins, but not of breast-pins, brooches, or similar articles of jewellery. Safety-pins and dress-fasteners generally will be found under "Wearing Apparel (Dress-fastenings)," 68. Metallic or wooden pins to be used as substitute for nails, bolts, or like articles, are not included. Several inventions of machinery for the manufacture of nails and bolts are included, but only where the applications of such machinery to the manufacture of pins is obvious or is expressly claimed. Wrappers and cases to contain needles and pins for sale appear in this series, but not cases for the pocket and for work-boxes.

46. Carriages and other Vehicles for Railways and Tramways, p. 60.

This class embraces all inventions relating to the construction of railway carriages for the conveyance of passengers, waggons, and trucks; for the carriage of merchandise on railways; the tenders of locomotive engines; and vehicles with flanged wheels intended to travel on tramways or street railways. Thus, all inventions are noticed which relate to the bodies, framing, springs, axles, wheels, brakes, buffers, and other details of such carriages and other vehicles; and also to contrivances for preventing accidents, by arrangements or apparatus which may be connected with such vehicles, or with the engine of a train, and be acted upon by other apparatus placed on or near line of railway, so as to bring the brakes into action, in order to stop the progress of the train when desirable. As regards railway engines, all inventions are noticed which relate to the framework, springs, buffers, brakes, axles, and wheels of such engines, as also apparatus for removing obstructions from the rails, and otherwise preventing accidents; but the details of the engines themselves are not noticed here, as they are included in the series of abridgments relating to "Steam-engine," 49. In fact the propulsion of carriages or waggons does not form a part of the present subject, nor yet the aiding of the motion of engines or carriages by means of screws, racks, and wheels, or other contrivance, by which the ascent of inclines is facilitated; neither does this series include turntables or such arrangements for lifting or otherwise transferring engines or carriages from one line of rails to another, unless the invention described involves some important point relating to the construction of such vehicles; but it does include arrangements for the warming, lighting, or ventilating of railway vehicles.

It must also be observed that various inventions which have been patented relate in some degree to the construction of railway vehicles, but not sufficiently so to entitle them to a place in this class. These embrace improvements in the treatment of metals; the production of artificial leather and cloth (suitable among other purposes for the lining of carriages); and other matters which are more properly classed under the heads to which they immediately belong, and will be found in the series of abridgments containing such classes of subjects. Inventions relating to carriages for atmospheric railways are likewise included in this series, in cases in which the invention, or some part thereof, appears to be applicable not only to such carriages but also to those for ordinary railways. The class also embraces such carriages as run upon portable railways or upon endless rails connected with the vehicle; but the mode of propelling such latter vehicles is included under "Aids to Locomotion," 7.

47. Umbrellas, Parasols, and Walking-sticks; Awnings and Sunshades, p. 61.

This series, as the title implies, contains inventions relating to umbrellas, parasols, walking-sticks, and canes; also awnings outside, sunshades, and shutter blinds for houses.

Tent-umbrellas, or tents made on the same principle as umbrellas, stands for umbrellas, and fabrics specially intended for umbrella and parasol covers, have also been admitted.

These are about all the inventions beyond those obviously comprised in the title which it has seemed needful to include.

48. Sugar, p. 61.

This class embraces not only the inventions which relate to the making, purifying, and refining of all kinds of sugar commercially in use, but also those which relate to the preparation and revivification of animal charcoal and its substitutes. The apparatus required for nipping or otherwise breaking up sugar are likewise included in this series, but not inventions which relate to the use of sugar in manufacturing lozenges and other articles of confectionery, for which see "Cooking," 61, or for medicinal purposes, for which see "Medicine, &c.," 25.

49. Steam-engine, p. 61.

This class embraces the inventions relating to every description of motive-power engine actuated by steam alone or by steam commingled with other aeriform fluid, but not engines worked by air, gas, or vapour (other than steam), for which see "Air, Gas, and other Motive-power Engines," 62. It comprises all matters relating to steam-boilers and steam-generators, including every description of tubular and other apparatus for producing, superheating, or regenerating steam; inventions for preventing incrustation of boilers, apparatus for feeding furnaces with fuel, for supplying air to furnaces, for arresting sparks, for the prevention and consumption of smoke, and for cleaning flues, tubes, and boilers; safety-valves and safety apparatus; steam and water gauges; cocks and valves applicable to steam-engines; and (besides the gearing and mechanism of the steam-engine) indicators and all such attachments and separate instruments as are to be used in connection with steam-engines, whether locomotive, marine, or stationary. It has been found expedient to include in the present series steam-hammers and such like inventions wherein steam is the motive power acting in cylinders forming parts of these machines, as, for example, steam pile-drivers, stone-crushing machines, steam rams, presser-brakes for locomotive engines and railway carriages worked by steam, excavators, agricultural implements, cranes, &c.

50. Paints, Colours, and Varnishes, p. 62.

This class includes specifications not only relating to the compositions of paints, &c., but also to the ingredients employed in the same; consequently inventions respecting the making of carbonates, oxides, sulphates, &c., of certain metals, the methods of obtaining lamp-black and other blacks, and the treatment of oils and driers, of tar and oil of tar for varnishes and paints, and of turpentine, are included.

Mastics and coatings or compositions for the sides and bottoms of ships, for the outside and inside of houses, for preserving materials from decay, for protecting metals from oxidation, and for other similar purposes, have been admitted; but not coatings or compositions which are of a vitreous nature, or are intended to form a sort of enamel on the surface.

Coloured inks for printing have not been included; for these see "Typographic, Lithographic, and Plate Printing," 13.

Dyes and mordants have been excluded, but not compositions for staining wood and other substances.

It has been found difficult to distinguish in all cases between paints and dyes, many of the latter being available, though not generally used, for painting. As far as possible all such have been included, but dyes proper have been carefully kept out.

Any dyes suitable for painting that have been omitted will be found in "Bleaching, Dyeing, &c.," 14.

In the same way, it has not always been easy to decide what chemical salts should be considered as paints. The endeavour has been to include all such as have been or could be used for this purpose. If any have escaped notice, see "Acids, &c.," 40.

The series includes, of course, the various apparatus, erections, mills, &c., required for the manufacture of the foregoing.

Artists' colours and varnishes are excluded, being classed under "Artists' Instruments, &c.," 54.

51. Toys, Games, and Exercises, p. 63.

This class embraces various kinds of inventions relating to the amusement and recreation of children and adults.

Some inventions combine toys and games with apparatus for tuition, and others with articles of ornament and utility, including furniture; both these classes are inserted.

Apparatus in the form of toys for the exhibition of scientific phenomena, as well as pyrotechnic toys or fireworks, are included; but for improvements in rockets for military purposes, signalling, &c., see "Fire-arms and other Weapons," 10.

Gymnastic and other exercising apparatus, whether for the healthy or for invalids, are included. Velocipedes, bicycles, tricycles, &c., and perambulators have, however, been excluded, and will be found under "Carriages and other Vehicles for Common Roads," 94. Invalid chairs are also excluded, and placed under "Medicine, &c.," 25.

The following remarks apply to subjects allied to those included in the present series:—

Go-carriages for teaching children to walk are included, but apparatus for giving assistance to invalids are excluded, and will be found in "Medicine, &c.," 25.

Inventions relating directly or indirectly to such exercises as horse-riding, swimming, rowing, &c., are not included, but will be found in other series.

Many optical instruments not described as toys, but yet of a character closely allied to the optical toys contained in this series, will be found in series "Optical, Mathematical, &c.," 56.

52. Ventilation, p. 63.

Ventilation consists in the operation whereby the air in a building, room, or similar confined space, when vitiated by combustion, by the breath of man or animals, or by exhalations or vapours from organic bodies, or when charged with moisture or small particles of solid bodies, is renewed with purer air, or whereby the air when unduly heated or cooled is renewed with air of more suitable temperature. The term also necessarily comprises, in a subsidiary sense, treating or preparing the air—such as drying, moistening, heating, or purifying it—before its being thus applied.

While this definition covers the numerous modes of renewing the air for the purposes of animal life, it also embraces those cases in which it is renewed for storing purposes (in granaries for example), as most processes for keeping grain or similar organic substances consist in renewing the air surrounding them, and thereby conveying away the moisture that would otherwise ultimately conduce to their putrefaction. Many plans for drying articles and materials (such as textile fabrics) are carried on in large compartments or rooms wherein the air, as it becomes saturated with moisture, is withdrawn or allowed to escape, whilst a fresh supply of dry air is furnished in its place, and these also find a place in this series; but small machines in which currents of air are used for drying, as, e.g., in some forms of centrifugal drying apparatus, are however excluded.

The mere technical use of the term ventilating does not give certain inventions a claim to come within the scope of this series; hence it does not embrace the well-known process of "ventilating" the buckets of certain kinds of water-wheels; nor the methods of "ventilating" fire-bars of furnaces; nor the plans for "ventilating" millstones; unless indeed a given process embodies the invention of ventilating the mill and freeing it, for the sake of the millers, of the fine stive so injurious to health. There are numerous instances of manufacturing operations in which it is necessary, for sanitary purposes, to get rid of vapours and effluvia (as in melting tallow), or of fine solid particles (as in the dry grinding of grain, cutlery, needles, or quartz) evolved from the substances under treatment. Cases like these come within this series, but not those in which air is injected or exhausted in order to be actually utilized in mechanical processes. Hence are excluded the processes of ventilating or fanning, for the purpose of separating substances of different densities or of different volumes, such as the very ancient plan for separating grain from the chaff, and the more modern processes for sorting charcoal, dust, or hair.

Inventions for ventilating goods and cargoes to prevent spontaneous combustion are placed under "Fire-engines, &c.," 88.

Inventions for preventing the contamination of the atmosphere by the escape of noxious vapours or gases, or the mingling of solid particles with the air, are not comprised in these series; nor are those inventions which relate to fumigation or to the use of deodorizers and disinfectants.

As with most other classes, reference has to be made to other series. Anemometers, hygrometers, barometers, and even thermometers, are instruments indispensable in ventilating operations on a large scale; but they should be looked for in the series "Optical, &c.," 76. Blowing engines are similarly sometimes used for ventilating, as well as for supplying furnaces and in metallurgical operations; but these engines and all apparatus for forcing, compressing, or exhausting air (except when it is stated that they are to be used in the operation of ventilation as defined in this description) are excluded from this series, and will be found in the series of abridgments containing such classes of subjects. Methods of supplying diving-bells and submarine boats with fresh air are included in the present series, but all other diving apparatus, including diving-dresses and methods of supplying air to divers and others working in situations requiring a similar supply of air, are classed under "Submarine, &c.," 101. Ventilating drains and sewers likewise is excluded, and will be found in the series "Drains and Sewers," 1. The open fireplace and chimney and the adjustable window-sashes of an ordinary English apartment constitute an efficient ventilating motor, with adjustable valves for the inlet of fresh air. The wards of St. Bartholomew's Hospital, one of the most important hospitals of London, are thoroughly ventilated by means of the constantly open top-sashes of the windows, and by means of the spacious fireplaces and stoves; inventions in such methods of ventilation, or in the means of increasing the draught of chimneys (such as improved cowles), might find a place in this series; but it is preferred to refer the searcher in the latter class to the series relating to the "Preparation and Combustion of Fuel," 30. When, however, fireplaces and stoves have ventilating apparatus applied to them, or when they form part of the proposed apparatus for ventilating, descriptions of them will appear in this series. Similarly, windows and doors, but only when specially fitted with ventilating apparatus, are included. The exhaust of an engine or machine working by compressed air necessarily has a ventilating action, as practically applied in boring the Mont Cenis Tunnel; but a description of such an engine or machine (*e.g.*, the pneumatic shuttle) could not for the sake of such an incidental action find a place in this series.

It may be well also to state that respirators and inhaling apparatus are not included in this series; nor are methods of supplying air to lamps; nor improvements in the special manufacture of waterproof and other fabrics for the purpose of permitting the passage of air; nor modes of ventilating garments, hats, gloves, boots, knapsacks, saddles, horse-collars, beds, mattresses, and similar articles.

53. Farriery, p. 63.

This class includes inventions relating to farriery, veterinary medicine, and the medical and surgical treatment of domesticated animals. Those connected with the manufacture or improvement of horse-shoes or horse-shoe nails form the staple of the class. Every surgical or medical appliance intended exclusively or specially for animals has been admitted. Inventions relating to clipping and singeing horses are of necessity included; and from the similarity of many of the inventions for clipping horses to those for shearing sheep, it has been thought desirable to make the series complete as regards the last-mentioned subject also. It should be stated that many of the inventions in this class intended for horse-clipping are also applicable, according to the specifications, to the clipping and shearing of animals generally. Improvements in harness, stable-fittings, or the grooming of horses, have not been included; they will be found in the series "Saddlery, Harness, Stable-fittings, &c.," 34. Medicated food is included.

Branding and ear-marking cattle and sheep, and cattle and sheep labels, are included.

54. Artists' Instruments and Materials, p. 63.

This class includes pencils, pencil-holders, crayons, crayon-holders, instruments for sharpening lead-pencils and crayons, brushes, palettes, palette-knives, colour boxes and cases, easels, contrivances for sketching, tracing, copying, and multiplying copies, such mathematical instruments as are used in linear drawing, and some optical instruments, as, for example, the kaleidoscope, the camera lucida, &c.

There are included also the manufacture of artists' colours and varnishes, as distinguished from colours and varnishes employed in house-painting, the preparation of canvas and other substances on which pictures may be painted (provided the specification states that the substances are applicable to such purpose), the colouring of photographs, methods of drawing and painting (by hand) on glass, china, and the like, and the processes of delineating and preparing panoramas, but not the mechanical means of displaying them or similar exhibitions.

Drawing and tracing papers and cloths are included.

The inventions relating to "ever-pointed pencils" are not included, but will be found in the series "Writing Instruments, &c.," 37.

Mounting, holding, and framing photographs, &c., are included; but not the making of picture or looking-glass frames, for which see "Furniture, &c.," 39.

55. Skins, Hides, and Leather, p. 63.

This class comprises inventions relating to tanning, shaving, splitting, cutting, hardening, dyeing, and colouring, preserving, and waterproofing skins and leather.

Inventions for gilding and embossing leather, for treating and dressing skins with the hair on, and machines for cutting the hair from skins are also included.

The inventions relating to the manufacture of boots and shoes, to the sewing or uniting of pieces of leather, to the manufacture of leather-cloth or imitation leather, and to the tanning of ropes and cordage, canvas, and other fabrics are excluded.

56. Preparing and Cutting Cork; Bottling Liquids; Securing, Opening, and Stoppering Bottles, &c., p. 64.

This class contains specifications relating to machinery and processes for preparing and cutting cork into sheets, lengths, and squares, as well as into cylindrical and taper corks and bungs; for reducing cork to shavings and dust for stuffing, &c.; and for sharpening the cork-cutters.

It

It comprises also the manufacture of capsules; the various substitutes for corks; and the methods of securing capsules and stoppers to bottles, jars, and other similar vessels. Appliances for bottling and decanting liquids are included, consequently siphons, vent-pegs, funnels, and cork-screws will be found here, but *taps are omitted*; these (which are very numerous) belong more properly to "Hydraulics," 32. It has been thought advisable to admit methods of stoppering ink-stands, as many stoppers are on the same principle as ordinary bottle-stoppers. Aerated-water bottling and stoppering machines, bottles, and stoppers are included. For the making of bottles, generally, see "Glass and Glassware," 93.

57. Brushing and Sweeping, p. 64.

This class includes brooms and brushes of all kinds, mops, and sponges for guns; also apparatus for brushing and sweeping, either by rotary brushes or other means, but street-sweeping apparatus are not included, being classed under "Roads and Ways," 35. Paint-brushes are included.

Knife-cleaners, apparatus for dressing fruit, and machines for cleaning boots and shoes, plate, domestic utensils, and the like are included, where the process is performed by means of brushes.

Knife and plate cleaners which act by means of leather pads or otherwise have been excluded.

Brushes for chimney-sweeping have been admitted, but not apparatus for cleaning chimneys by other means than sweeping.

Machine-brushes have only been admitted when some improvement is made in the brush itself, applicable to general purposes; or in the case of cloth-dressing machines, when it appeared that the apparatus might be used for general purposes of brushing, or for treating the finished and completed fabric.

For abridgments of specifications relating to machine-brushes reference must be made to the series devoted to each special class. Cloth-dressing machines will be found in series "Dressing and Finishing Woven Fabrics," 91.

Materials for brush-making have, of course, been admitted, as have also machines for drawing bristles for the manufacture of brushes.

Artists' brushes are under "Artists' Instruments, &c.," 54.

58. Nails, Rivets, Bolts, Screws, Nuts, and Washers, p. 64.

This class comprises inventions relating to the processes, machinery, and materials employed in the manufacture of nails, spikes, rivets, bolts, screws, nuts, washers, and treenails, including the various kinds of machines used in cutting nails, brads, &c., from the metal in its cold state, and machines adapted for cutting, forging, and shaping such articles out of heated plates, bars, and rods; also machines, apparatus, and appliances for cutting screws—forming screw-threads and screw-blanks—cutting off and beading rivets and bolts—forging, forming, and punching nuts and washers, railway spikes, pins, and bolts.

59. Hinges, Hinge-joints, and Door-springs, p. 64.

This class embraces hinges, joints that open and close in the manner of a hinge, and every kind of door-spring, or motive power by which doors are opened or closed. The latter subject comprises three important sets of apparatus besides that which acts upon a door to close it by the reaction of a metal spring, namely, descending weights, india-rubber springs, and self-acting apparatus by which gates are opened or closed at fitting times by the approach or departure of the person or thing in motion. The automatic opening and closing of railway gates is placed under "Railways and Tramways," 33.

Improvements in hinges for mathematical instruments are included, but the combination of scales or pointers with such hinges does not come within the scope of this series.

Joints in machinery, such as cup joints, ball and socket joints, or universal joints, are not included.

Joints of spectacles or eye-glasses must be sought for in the series "Optical Instruments, &c.," 76.

Stretcher joints of umbrellas, and joints for umbrella and parasol sticks, are placed under "Umbrellas, &c." 47.

Joints of artificial limbs are classed under "Medicine, &c.," 25.

If the "closing" of doors, &c., in a specification refers only to thereby excluding draughts, dust, &c., from the room to which the door is applied, the abridgment does not belong to this series, but to "Ventilation," 52.

60. Locks, Latches, Bolts, and Similar Fastenings, p. 64.

The locks comprise alarm, automatic, bank, bag, box, cabinet, changeable, combination, chest, desk, duplex, door, detector, defence, electro-magnetic, indicating, keyhole locks with curtains, locks with tumblers, levers, &c.; locks for special purposes, mortice, pad, portmanteau, piano, piston, prison, permutation, portable, pneumatic, puzzle, registering, rim, safe, stock, screw-tap, till, time, transparent, tubular, mortice, umbrella, vehicle, window, and many other kinds.

The keys embrace special makes, movable bits, peculiar action, divided, cast, detector, permutation, anti-dust, and screw.

The latches include catch, combination, door, drawback, indicator, lock, pendulum, and spring.

The bolts comprise floor, latch, lock, piston, sliding, spring, signal, screw, and wedge.

The fastenings include automatic, bag, box, cabinet, carriage, door, drawer, movable, pocket, portmanteau, purse, shutter, stair-rod, table, till, time, and window.

In many cases inventions, especially those relating to locks and latches, although generally applicable to all makes, are only described by the inventors with reference to one or two classes; it is therefore recommended to persons interested in searching, that, in addition to such classification, the lists under the headings of locks generally, latches generally, &c., be consulted.

61. Cooking, Bread-making, and the Preparation of Confectionery, p. 65.

This class includes :—

Cooking utensils.

Cooking stoves, grates, and oven and kitchen ranges ; but gas stoves, &c., are excluded, and will be found under "Gas, &c.," 17.

Bakers' ovens and apparatus for bread-making.

Mincing meat, &c., and making sausages.

Paring, slicing, peeling, triturating, or washing fruit or vegetables.

Beating eggs.

Manufacture of macaroni and vermicelli.

Yeast and yeast powders or baking powders ; but not separating beer from yeast, for which see "Brewing, &c.," 95.

Manufacture of jams, sweetmeats, and confectionery generally ; but not confectionery ices and chocolate, which will be found in "Ice-making Machines, &c.," 85 ; and "Tea, Coffee, &c.," 87.

Such cooking as is incidental to the preparation of tinned meats, &c., is not dealt with in this series, but will be found in the "Preservation of Food, &c.," 4.

62. Air, Gas, and other Motive-power Engines, p. 65.

This class relates to all varieties of motive-power engines, except steam-engines, hydraulic engines and motors, and electric or magnetic engines, which will be found respectively in the series "Steam Engine," 49 ; "Hydraulics," 32 ; and "Electricity and Magnetism," 15. The main part of this series describes inventions for producing motive power through the agency of air, gas, and all elastic fluids except steam, by the expansion, contraction, generation, combustion, or explosion of any of these agents ; also by the influence on machinery of currents of air artificially produced, or of the natural motion of the atmosphere. The other inventions comprised relate to projects for obtaining motive power by various means, and combinations of different forces, such as the elasticity of springs, force of gravitation, loss of equilibrium, use of floats and weights immersed in water or other liquid, ascension of receptacles inflated with air or gas under water, and different schemes (except hydraulic and magnetic) by which the attainment of "perpetual motion" has been attempted. In some specifications rotary and similar engines are described as capable of being worked by water, steam, gas, or any other vapour, fluid, or liquid ; in others mention is not made of air, gas, or other elastic fluid than steam, hence engines have been omitted, although of similar construction to those which have been admitted on account of their claiming a wider use of motive agents. For such engines the reader is referred to the "Steam Engine," 49, and "Hydraulics," 32, series. Most fluid meters and rotary pumps are capable of being used as motive-power engines when worked by fluids under pressure ; there are many of these which do not appear in this series as motive-power engines, but will be found in the series relating to "Gas," 17, and "Hydraulics," 32. Inventions relating to the use of reservoirs for compressed air for working locomotive or other engines are included ; but methods of atmospheric or pneumatic railway propulsion which do not embrace a new or improved locomotive engine are excluded.

63. Water-closets, Earth-closets, Urinals, &c., p. 66.

Water-closets, earth-closets, latrines, urinals, commodes, privies, and cesspools, together with all their adjuncts and appurtenances, are included.

General division of the subjects :—

1. The water supply, involving cisterns, valves, and pipes.

2. The valve mechanism, consisting of levers, counterbalance weights, and movable seats or rods.

3. The discharge apparatus, with its valves, pumps, traps, siphons, and receiving vessels.

The series being circumscribed does not include the supply of water to lavatories, &c., which will be found in "Hydraulics," 32, nor improvements in sewers and drains, for which see "Drains, &c.," 1.

The following are also excluded, and are to be found in "Medicine, Surgery, and Dentistry," 25 :—

Apparatus for the special use of invalids.

Hygienic and sanitary apparatus.

Deodorizers and disinfectants, either for particular or general use.

64. Safes, Strong Rooms, Tills, and similar Depositories, p. 66.

This class contains inventions relating to the construction of safes, strong rooms, tills, and similar depositories, window safes, key and other strong boxes, including the casting of safe bodies and doors in chills, preparing the moulds, and combining wrought and cast iron in the manufacture. It likewise embraces the various contrivances which have been devised to render the doors and bodies of safes and the doors of strong rooms burglar-proof, and also the several fire-resisting compounds, and non or slow heat-conducting substances employed to fill the circumventing cavities which are formed in the walls and doors of safes and strong rooms. Electrical and other signal and alarm apparatus, and all the other contrivances invented for the protection of safes, are contained in this series ; but (with few exceptions) the series does not include the locks and lock bolts, which will severally be found in "Locks, Latches, &c.," 60.

The manufacture and preparation of angle and other iron, iron and steel plates, and plates of both metals combined, and the welding, uniting, case-hardening, and tempering of wrought metals, when specially claimed for the manufacture of safes, &c., is included.

65. Wearing Apparel—Head Coverings, p. 66.

This class relates to bonnets ; women's caps ; bonnet and cap fronts ; hoods, hats, caps of all kinds for men's wear ; helmets, and shakos.

It comprises the methods of making these articles ; the preparation of felt, plush, straw, whalebone, and other materials used for the same, but not the manufacture of the materials, unless expressly intended for hat or cap making ; the apparatus and machinery employed in the manufacture and the various processes invented for water-proofing and ventilating the articles.

Goffering machines and sewing machines for hats are included ; also, inventions for fixing a mirror or an eye-glass in a hat.

66. Wearing Apparel—Body Coverings, p. 66.

This class embraces machinery or apparatus specially intended for the manufacture of articles for body coverings, as distinguished from fabrics generally (which are classed under "Weaving," 20), namely, machinery for cutting-out garments and gloves, for fastening buttons to garments, for manufacturing crinoline steel and wire, and for fixing eyelets.

There are included also such looms as are used for weaving particular fabrics and articles for dress (especially stays), and such stocking-frames or frame-work knitting machines as are chiefly intended for knitting gloves and mittens, and for shaping and repairing socks and stockings; but looms and stocking-frames generally must be looked for in "Weaving," 20, and "Lace-making, &c.," 29.

The same restriction has been observed as much as possible respecting the manufacture of shawls, veils, and fringes.

Railway and other wrappers will be found in this series. Inventions relating to the employment of new kinds of threads or yarns in the manufacture of hosiery are included.

Processes and apparatus for getting up hosiery for sale are admitted.

Warm stockings for invalids are included; but elastic stockings for surgical purposes, as well as other articles of apparel specially designed for surgical or medical purposes, and not for ordinary wear, are classed under "Medicine, &c.," 25.

Dresses used for prevention of drowning, or for protecting persons from injury by fire, are excluded, the former being placed under "Submarine, &c.," 101, and the latter under "Fire-engines, &c.," 88.

Some sewing machines have parts specially adapted for sewing gloves, button-holes, and trimmings for dresses; these and these only are included in this class.

Tailors' irons claim a place herein, but not apparatus for heating them, unless it forms part of the iron. Tailors' and glovers' shears are included in the series relating to cutlery, for which see "Hardware, &c.," 104.

Modes of fastening gloves, stays, leggings, gaiters, trowser-straps, &c., will be found herein, but improvements in the fastenings themselves belong to "Wearing Apparel," 68.

Goffering or plaiting machines for quillings, ruches, &c., are under "Wearing Apparel," 65.

67. Wearing Apparel—Foot Coverings, p. 66.

This series comprises inventions relating to boots and shoes, slippers, clogs, pattens, goloshes, and over-shoes. Besides these it includes boot-jacks, boot-hooks, boot trees and stretchers, boot-cleaning apparatus (not hard brushes), blacking, dubbing, waterproof preparations, and varnishes for boots, &c.; shields for preventing splashing in walking; sewing-machines specially constructed for sewing boots, &c., eyeletting machines that relate to foot coverings (the bulk of the eyeletting machines will be found in the previous class, and the manufacture of eyelets in the following class); ventilating, drying, and warming boots, &c.; riveting boots, &c. (improvements in the rivets themselves will be found in "Nails, Rivets, &c.," 58), pegging boots, &c., and pegs (not metal); sandals for protecting the feet of bathers, but not apparatus to be applied to the feet for facilitating swimming (for which see "Submarine, &c.," 101); elastic gussets for boots, &c., but not elastic fabrics that may be used for boots, &c. (which are under "Lace-making, &c.," 29), hammering leather for boot and shoe making, but not inventions for the preparation or dressing of leather, for which see "Skins, Hides, &c.," 55.

Inventions relating to artificial leather specially intended for uppers or soles, but not artificial leather generally, for which see "Artificial Leather, &c.," 80.

Spur boxes for heels are in the series "Saddlery," 34.

68. Wearing Apparel—Dress-fastenings and Jewellery, p. 67.

With regard to dress-fastenings, the series comprises belt-fasteners, clasps and buckles (including buckles other than those used for dresses), buttons, coat-links, sleeve-links, studs, hooks and eyes, eyelets, dress holders and suspenders, safety pins, methods of preventing robbery and loss from the person (including safety pockets; and pocket, watch- and watch-guard protectors), tags for laces, crinoline fasteners and clips, parasol-holders, carding and preparing for sale buttons, hooks and eyes, &c. For modes of fastening leggings, gaiters, stays, gloves, cravats, neck-ties, stocks, and garters, "Wearing Apparel (Body Coverings)," 66, must be consulted, as this class relates only to the improvements in the fastenings themselves.

The jewellery includes beads; watch-keys, when improved as ornaments; imitation stones; coral, ivory; jet, tortoise-shell, pearl, &c.; and cutting and polishing precious stones. Jewel cases or boxes have not been admitted into this series; they will be found in the series entitled "Trunks, Portmanteaus, &c.," 84.

But in jewellery the following articles are excluded, and will be found under "Chains, &c.," 90, viz. :—Ornamental chains, shackles, connecting links, swivels, swivel-hooks, &c.

69. Anchors, p. 67.

This series is devoted to improvements in the shape and manufacture of anchors. In deciding on the limits within which it should be comprised, it has seemed best to omit all inventions but those which have reference strictly to anchors. The various capstans, windlasses, &c., which are used for weighing the anchor will be found described in the series "Raising, Lowering, and Weighing," 31. For chain cables, reference must be made to "Chains, Chain Cables, &c.," 90. Hempen cables, in like manner, are dealt with in the series "Rope-making," 102.

It should be added that improvements in the treatment and preparation of iron for anchors, where such improvements have relation to iron manufacture generally, and not specially to the construction of anchors, have not been included, even in those cases in which anchors are incidentally mentioned. On the other hand, the series does contain those inventions for casting, forging, &c., of which anchors are the sole or the principal subject.

70. Metallic Pipes and Tubes, p. 67.

This series includes inventions relating to the manufacture of metallic pipes and tubes, and to alterations in their form; it also comprises—

- Jointing or connecting metallic pipes.
- Screw-threading metallic pipes.
- Cutting metallic pipes.
- Manufacturing fittings, such as T-pieces, crosses, &c.

71. Mining, Quarrying, Tunnelling, Well-sinking, and Boring; Mining Explosives and Blasting Appliances, p. 67.

This series includes inventions relating to drawing and raising minerals and men from mines, and to mine-bands, chains, and ropes; but pumping machinery, apart from special arrangements, is excluded, being comprised in "Hydraulics," 32.

Special modes of ventilating mines and tunnels are inserted, but not apparatus for exhausting and blowing, and which are applicable to various uses, including the ventilation of houses, ships, mines, &c. These last will be found in "Ventilation," 52.

Where, however, a particular invention is chiefly known through its widest application in connection with the subjects of this series, the specification has been abridged here.

Similarly in a few cases where the improvements, though not specifically claimed as applicable to mining, &c., are still obviously capable of being used for such purpose, the specification has been inserted.

Methods of working mines and quarries, and apparatus for the purpose, are included, together with inventions relating to blasting, miners' fuses and cartridges, and explosive compounds for blasting; but the treatment of the ore or stone after it has been won is not admitted.

The series comprises improvements in lighting mines by fixed arrangements of pipes and lamps (but not Davy or other portable lamps), and instruments for indicating the presence of gases, for communicating in mines, and for surveying and inspecting.

Machinery and tools for sinking wells and boring the earth generally are included, but not pumping apparatus.

Diamond and other drills, artesian well appliances, post-hole machines, and prospecting machines are of course included.

Tunnels are included, but not those having reference to culverts or sewers.

72. Milking, Churning, and Cheesemaking, p. 68.

The scope of this series is fully explained by its title. It embraces only the inventions relating to the processes of milking and manufacturing butter and cheese. Inventions merely dealing with the finished product, such as the employment of milk, butter, or cheese in cooking, have been excluded, and will be found in "Cooking, &c.," 61. Those referring to the manufacture of "artificial" milk and butter have been admitted, but not any in which processes or apparatus for the preservation of milk, &c., are described. The latter are treated of in "Preservation of Food," 4, or "Ice-making, &c.," 85.

73. Masts, Sails, Rigging, &c., p. 68.

This series embraces inventions relating to masts, yards, booms, bowsprits, and other spars; rigging; sails; reefing and furling sails; also raising and lowering ships' boats.

Improvements relating to the following subjects have not been included:—

- To the hull, &c. (See "Shipbuilding, Repairing, &c.," 21.)
- To windlasses, capstans, ships' riding bits, cable stoppers, and tackle blocks. (See "Raising, Lowering, and Weighing," 31.)
- To propelling vessels. (See "Marine Propulsion," 5.)
- To nautical instruments, logs, leads, &c. (See "Optical, Mathematical, &c.," 76.)
- To anchors. (See "Anchors," 69.)
- To rudders and other steering apparatus. (See "Steering and Manœuvring Vessels," 75.)
- To canvas generally. (See "Weaving," 20.)
- To ropes for standing rigging. (See "Rope-making," 102.)
- To chains and wire ropes for standing rigging. (See "Chains, &c.," 90.)

74. Casks and Barrels, p. 68.

This series contains the inventions relating to the manufacture of casks and barrels, as well as other similar vessels, whether constructed of wood, metal, glass, or plastic compounds, also the application to casks of pistons, flexible diaphragms, and loose linings.

Self-acting apparatus for closing the tap-holes of casks and the removal of the tap are included, but inventions relating to the manufacture of bungs and shives will be found in "Preparing and Cutting Cork, &c.," 56. Cask stands, self-tilting or otherwise, are included, but machines for cleansing casks are excluded, being classed under "Brewing, &c.," 95; vats, tuns, and similar vessels for storing liquors in the place of manufacture are also excluded, and placed under "Brewing."

75. Steering and Manœuvring Vessels, p. 69.

The inventions in this series may be classed under two heads:—

- 1st. Simply guiding the vessel's course.
- 2nd. Giving a new direction to it by propelling apparatus of any description.

The 1st head includes rudders, steering paddles, &c., as well as means for operating the same.

Under the 2nd are comprised transverse screws, paddle-wheels, &c., methods of driving the propeller from side to side, so as to cause it to act in a line at an angle with the line of keel; means for driving paddle-wheels, &c., separately, so as to render them available for steering; the use of two or more screws

or

or other propellers, jets of water, &c., and other similar inventions. In all these cases only that portion of the invention has been treated which refers to its use for steering and manœuvring. For descriptions of patented inventions dealing with the propulsion of vessels, see "Marine Propulsion," 5.

In addition to the above, it has seemed advisable to include in the series inventions treating of sliding keels and lee-boards. Though these are not actually steering apparatus, yet their uses in manœuvring the vessel so nearly approach to those of the rudder itself that it has been considered that their addition would render the series more complete.

It has not appeared necessary to refer to any of the numerous methods of signalling on board ship, even where such apparatus is specially used to convey signals to the helmsman, engineer, &c. All these applications are more fitly treated in one of the series specially dealing with the subject of signalling, most of them being under "Signalling," 99.

76. Optical, Mathematical, and other Philosophical Instruments; including Nautical, Astronomical, and Meteorological Instruments, p. 69.

The title of this series enumerates a list of the various classes of instruments included, which, however widely differing scientifically, are more or less closely connected together for practical purposes. The following paragraphs define the scope of the series:—

The manufacture of specula or reflectors for scientific purposes are included, but not the silvering of glass or other surfaces for mere ornamentation, nor the manufacture of mirrors or looking-glasses for domestic use. Reflectors for lamps or light-houses will be found in the series relating to "Lamps, Candlesticks, &c.," 44.

Improvements in telescopes, microscopes, and the manufacture of all kinds of lenses are included, but not the use of lenses in magic lanterns, and apparatus for producing scenic effects, apparitions, &c., which, together with panoramas, translucent advertisements, transparencies, and the lighting, arrangement, and construction of theatres, are classed under "Scenic Apparatus, &c.," 106. For lenses used in photographic cameras, the reader is advised to consult the series devoted to "Photography," 19.

Stereoscopes are included.

Sights for rifles and other firearms are excluded, excepting such as are in themselves instruments for measuring distances, and such as partake of the nature of telescopes or contain eye-glasses.

Certain inventions for drawing, obtaining the profile of figures, and assisting artists, are included partly as optical and partly as mathematical instruments; but these and similar apparatus will be found more extensively comprised in "Artists' Instruments and Materials," 54. Mathematical drawing instruments are however comprised in this series.

Dividing engines and sliding rule are included, as also instruments for the measurement of angles, together with all trigonometrical and land-surveying apparatus; but not instruments for measuring fabrics, measuring for garments, or measures of capacity, which are contained in either the series "Measuring, &c.," 100, or in the class to which they obviously belong.

Instruments for measuring the speed of engines, flow of currents, force of wind, dynamometers, &c., come within the scope of this series; but not steam-pressure gauges, for which see "Steam-engine," 49.

Thermometers, barometers, and other instruments employed in making meteorological observations are included; but not hydrometers (for which see the series relating to Distilling and Rectifying Spirits, 95) and similar instruments for ascertaining specific gravity or testing the strength of liquids (as, for example, lactometers, &c.), or other testing and assaying apparatus for various scientific purposes.

Planetariums, orreries, and globes, both celestial and terrestrial, are included, but not charts or maps.

Sun-dials are included, but not chronometers or other time-keepers, unless combined with some other nautical or philosophical instrument.

Surveying apparatus, ships' logs, and all magnetic compasses may be mentioned as comprised in this series, together with methods of lighting or illuminating the binnacle compass; but not any other kind of nautical lamp, which, together with all marine, signal, and light-house lamps and reflectors, will be found in the series entitled "Lamps, Candlesticks, &c.," 44.

There are other classes of instruments in this series which need not be enumerated, since they are plainly comprehended by the title, and form main heads in the Alphabetical Index of Subjects, p. 81.

Instruments for surveying and inspecting mines are under "Mining, &c.," 71.

77. Harbours, Docks, Canals, &c., p. 69.

This class embraces, in the first instance, inventions relating to harbours, breakwaters, piers, and all kinds of docks—wet, dry, or floating; including piles, pile-driving, pile-drawing, and pile-cutting machinery; cylindrical-piles and cylindrical-pile sinking; screw-piles and screw-pile driving; but not machines used for submarine construction, cofferdams, and caissons, diving-bells, or divers' dresses, for which see "Submarine, &c.," 101.

Dredging machines are contained in this series; but machines for raising embankments, and excavating machines (other than dredging) for making cuttings, are included only when mentioned as intended for canals, &c. A larger collection of the latter machines (excavators for general use) will be found in the series relating to "Raising, &c.," 31, but for such as are especially intended for railway-making, the reader should refer to "Railways and Tramways," 33.

The construction and mooring of buoys for harbours or for beacons are included; but buoys and "balloons" for recovering or raising submerged property are placed under "Raising, &c.," 31; life-buoys and pontoons, under "Submarine, &c.," 101.

Light-houses are included, but not lamps for the same; these will be found in "Lamps, &c.," 44.

Cranes for wharves and piers and hydraulic lifts are omitted, but will be found in "Raising, &c.," 31.

Neither the general preservation of marine structures by the use of cements, paints, and similar substances, nor the materials used for coating or preserving timber, iron, or stone, are included. For such see "Stone, Marble, Slate, and Cement," 92; "Paints, Colours, &c.," 50; "House-building," 97; "Timber," 96.

96; and "Ship Building, &c.," 21, to which latter series especially reference should be made for methods of sheathing and preventing or counteracting galvanic action on immersed iron structures, such as ships, buoys, graving docks, &c.

The construction of canals is included, and all inventions connected therewith, such as sluices, locks, &c., but not inventions relating to the propulsion of barges or boats on canals, for which see "Marine Propulsion," 5.

The embanking of water-courses and construction of reservoirs are likewise included; irrigation drainage, waterworks, and other large hydraulic operations are under "Hydraulics," 32.

78. Grinding Grain and Dressing Flour and Meal, p. 69.

This class embraces inventions comprising the construction of and mode of working the various kinds of mills and machines employed for grinding corn and other seeds, hulling grain, hulling and polishing rice, bolting flour and meal, crushing oats for oatmeal, preparing pearl barley, and the manufacture and dressing of millstones.

The motive-power engines (steam-engines, water-wheels, and windmills) employed for driving the mills and machines are not included, excepting only in cases where special applications of the driving power are described. These classes of inventions will be found in "Steam-engine," 49; "Hydraulics," 32; and "Air, &c., engines," 62.

The following subjects have been excluded, viz.:—Granaries and methods of storing grain, cleaning grain, treating damaged grain, bruising oats for horse and cattle food, and cleaning seeds for sowing. These will be found in "Agriculture," 82.

For inventions relating to crushing seeds for the extraction of oil, see "Oils, Fats, &c.," 27.

79. Purifying and Filtering Water; including Distilling Sea Water to produce Fresh Water, p. 69.

This series embraces all means, both mechanical and chemical, of purifying water for drinking and domestic purposes; whether by the use of filters, distilling apparatus, or chemical ingredients which cause a precipitation of extraneous matters held in solution or suspension.

The filters are restricted to those intended for purifying water. All other apparatus or processes, though often described as "filters" and "filtering," are omitted, as for example—sieves and other strainers for clearing infusions, decoctions, syrups, &c., from solid particles, or for separating and collecting the denser matter and allowing the more liquid to pass off. Such will be found in series relating to the special manufactures for which they are intended, as "Brewing, &c.," 95; "Cooking, &c.," 61; "Manure," 3 (filtration of sewage); "Pottery," 24 (filtering "slip"); "Medicine," 25 (medicinal tinctures and infusions); and others. The series relating to "Sugar," 48, contains the processes and apparatus for filtering syrups, and likewise comprehends the manufacture and use of animal charcoal and its substitutes employed for purposes of such filtration, consequently such inventions have as a rule been omitted from this series.

Another class of inventions which is included embraces all *chemical* methods of purifying water for drinking and domestic purposes, but methods of treating water so as to prevent incrustation or "furring" in boilers are excluded, and will be found in "Steam-engine," 49. Inventions for "softening water" for household use will be found herein, but for washing powders claiming to be used for softening water see "Bleaching, Dyeing, &c.," 14. Inventions relating to purifying sewage-water by precipitating matters held in suspension or solution are omitted, but are contained in "Manure," 3.

The other inventions inserted in this class describe apparatus for obtaining pure water by distillation from salt water or water containing mineral or other matter in solution or suspension, but inventions designed for feeding marine boilers with fresh water obtained by condensing waste steam or by distillation are excluded, and will be found in "Steam-engine," 49.

A few inventions are likewise included for rendering distilled or other unpalatable water less objectionable for drinking purposes, but not inventions for the manufacture of effervescent aerated waters, for which see "Unfermented Beverages, &c.," 86.

80. Artificial Leather, Floorcloth, Oilcloth, Oilskin, and other Waterproof Fabrics, p. 69.

This series contains inventions relating to such compositions and solutions only as are used in the waterproofing of textile fabrics, yarns, and felts; those which relate to the waterproofing or dyeing and staining of leather are excluded—for them see "Skins, Hides, and Leather," 55.

The manufacture and treatment of oils, paints, and varnishes, unless specially claimed for artificial leather, floor or oil cloth, and table-covers, will be found in "Oils, Fats, &c.," 27, or in "Paints, Colours, and Varnishes," 50.

Printing, embossing, and otherwise ornamenting leather for furniture, hangings, &c., are excluded, being placed under "Furniture, &c.," 39; but painting, printing, and producing patterns on artificial leather, floor and oil-cloth, are included. Artificial leather and other materials for book covers are under "Books, &c.," 43.

This series comprises likewise inventions relating to canvas for sail-cloth, fabrics for packing-wrappers, tarpaulin, rick, tent, and waggon covers, and the weaving of special fabrics for such articles and for artificial leather. It includes, moreover, the manufacture of waste leather into sheets for artificial leather, floor-cloth, &c., the application of gutta-percha and india-rubber to such articles, and the vulcanizing of waterproof goods; but it does not admit the making of cocoa-nut matting and similar substances, which will be found under "Spinning, &c.," 28.

81. Agriculture—Field Implements, &c.; including methods of Tilling and Irrigating Land, p. 69.

This class includes all inventions relating to the tillage of the land, and to the sowing or planting and treatment of the crop, as far as and including gathering it in. For further treatment of the gathered crop, its storage, and all such processes as thrashing, winnowing, cleaning grain, &c., see "Agriculture," 82. Prime movers used for agricultural purposes are also treated apart. The

The following inventions are included in this series :—

- Anchors and intermediate gear for ploughing, &c.
 - Coating seed previous to sowing.
 - Movable irrigators and machines for watering grass and other lands (but not pumps, siphons, &c.; for which see "Hydraulics," 32).
 - Clearing roots and stumps of trees from land.
 - Fencing with wood or wire.
 - The application of electricity for purposes of agriculture.
 - Protectors for tobacco plants.
 - Agricultural drains and ditches, and machines for forming them.
 - Sickles and scythes have been admitted.
- Inventions relating to the following subjects have *not* been included :—
- The manufacture of drain-tiles, &c. (See "Drains and Sewers," 1.)
 - Manure and compounds for increasing crops. (See "Manure," 3.)
 - Pumps, siphons, &c., for draining land. (See "Hydraulics," 32.)
 - Lawn-mowing machines.
 - Spades, spuds, hand-hoes, and hand-rakes (except a few special inventions), and hand-tools generally. See "Hardware, &c.," 104.
 - Machinery for grinding and polishing various articles, amongst which scythes are mentioned.

82. Agriculture—Barn and Farmyard Implements; including the Cleansing, Drying, and Storing of Grain, p. 71.

This division of the agricultural series comprises all inventions relating to the treatment and storage of the gathered crops, and their preparation either for farm use or for the market. In addition to such obvious subjects as thrashing, winnowing, screening, and cleaning grain, &c., and cutting chaff, roots, &c., the series includes—

- Granaries, corn-bins, &c.; but not elevators for granaries, nor elevators for raising grain into or out of ships, &c., for which see "Raising, &c.," 31.
- Straw elevators, for stacking, &c.
- Kilns for drying hops, grain, &c., but not malt-kilns, nor pocketing and bagging hops, for which see "Brewing, &c.," 95.
- Crushing gorse, oil-cake, grain, &c., and otherwise preparing cattle foods for use or sale, but medicated food is placed under "Farriery," 53.
- Feeding-troughs for field use as well as for farmyard use, but not water or horse troughs.
- Destroying weevils, &c., in corn.
- Treating cotton after it has been baled; but not ginning cotton nor cleaning cotton-seed. For the former see "Spinning," 28; and for the latter see "Oils, &c.," 27.
- Cleaning and sorting roots, &c.
- Cleaning seeds for sowing.
- Cleaning and preparing barley, but not pearl barley, for which see "Grinding Grain, &c.," 78.
- Weighing and measuring grain.
- All processes for preparing rice for the market, viz., thrashing and winnowing, milling, screening, and polishing.
- Sack-fasteners and sack-holders.
- Horse-gear and intermediate gearing for barn implements, &c.
- Steam-engines and other motors for barn implements, &c., are excluded.
- For inventions relating to firing and curing tea, and pulping, milling, and curing coffee, see "Tea, &c.," 87.
- Station appliances generally will be found under "Wool," 103.

83. Agriculture—Traction Engines, p. 71.

This class includes locomotive engines for road or field used for agricultural purposes, but not stationary engines for driving agricultural machinery and forming part thereof, which will be found under "Steam Culture," 8; nor stationary steam-engines applied to miscellaneous agricultural purposes, which are placed under "Steam-engine," 49.

84. Trunks, Portmanteaus, Boxes, and Bags, p. 71.

This class contains inventions relating to boxes, cases, chests, portmanteaus, and trunks for travellers and emigrants, also to baskets, caddies, travelling bags, hat and bonnet boxes, ladies' bags or reticules, work-boxes, cases for holding coin, instruments, jewellery, &c., despatch-boxes, dressing-cases, hampers, crates, and packing-cases. Inventions relating to the following subjects have not been included :—

- Writing desks. (See "Writing Instruments, &c.," 37.)
- Sacks and bags. (See "Weaving," 20.)
- Safes, tills, and fire-proof boxes. (See "Safes, &c.," 64.)
- Tobacco and snuff boxes. (See "Tobacco, &c.," 42.)
- Cartridge pouches and soldiers' knapsacks. (See "Fire-arms, &c.," 10.)
- Boxes for containing artists' colours. (See "Artists' Instruments," 54.)
- Pill-boxes. (See "Medicine," 25.)
- Cases for holding gun-powder. (See "Fire-arms, &c.," 10.)
- Paper bags. (See "Cutting, Folding, &c., Paper," 12.)
- Card-cases. (See "Books, &c.," 43.)
- The manufacture of artificial leather, to be afterwards used in the making of trunks, &c. (See "Artificial Leather," 80.)
- Methods of compressing cotton, tobacco, &c., into small parcels, as well as special cases for holding same.
- The locks and fastenings of trunks, bags, &c.

85. Ice-making, Ice Safes, Ice Houses ; Cooling, Chilling, Refrigerating ; and Use of Cold as a preservative agent, including the Transportation of Substances at low temperatures, p. 71.

This series includes, in addition to the manufacture of ordinary ice, the making of confectionery ices, and the use of ice and freezing mixtures in pickling and currying meat, and in freezing, cooling, and preserving alimentary substances.

Freezing-mixtures ; ice breakers or choppers ; and non-conducting materials for ice-safes, ice-houses, &c., are admitted ; also refrigerators in the nature of ice-safes and wine-coolers, but refrigerators used by brewers, distillers, and wine-makers will be found in "Brewing, Wine-making, and Distilling Alcoholic Liquids," 95.

Freezing, cooling, and refrigerating apparatus and chambers, for treating alimentary and other substances while in course of transportation by land or sea, are also included.

86. Unfermented Beverages, Aerated Liquids, Mineral Waters, Perfumes, Extracts, &c., p. 73.

This class comprises methods of and apparatus for preparing unconcentrated or potable infusions ; extracts or decoctions of tea, coffee, and chicory and unconcentrated infusions, &c., generally and for making drinks from chocolate, cocoa, &c. In order to make the series complete in preparing drinks from tea and coffee, one or two inventions relating to fermented decoctions have been admitted. Concentrated extracts, &c., of tea, coffee, &c., will be found in the series, "Tea, Coffee, Chicory, &c," 87. Although this series includes improvements in tea-pots, urns, &c., yet it does not embrace the process of their manufacture in metal or pottery. Slightly fermented beverages of the nature of ginger-beer, liqueurs, and other preparations unfermented themselves but with alcohol added, syrups for drinks, and fruit-squeezers, are admitted. In regard to aerated and effervescent liquids, mineral waters, &c., this class deals with their manufacture and preparation only. Inventions relating to bottling, stoppering, &c., will be found in the series "Preparing and Cutting Cork, &c.," 56. The manufacture and utilization of carbonic acid gas for aerated liquids is included. Aerating water in the sense of restoring oxygen to distilled water is of course excluded ; it forms part of the series "Purifying and Filtering Water," 79. Perfumes and extracts generally are included.

87. Tea, Coffee, Chicory, Chocolate, Cocoa, &c. (comprising their manufacture, but not the preparation of drinks therefrom), p. 73.

This class comprises the various processes relating to the manufacture of tea, coffee, chocolate, cocoa, and their substitutes, beginning at the period after the plucking of the leaf or fruit, and stopping short at the preparation of drinks therefrom.

Thus, concentrated extracts, infusions, or decoctions of tea, &c., either alone or in combination with concentrated milk, will be found in this series, but potable or unconcentrated extracts must be looked for in "Unfermented Beverages, &c.," 86.

Measuring tea is included in the series "Measuring, &c.," 100.

88. Fire-engines, Extinguishers, Escapes, Alarms, &c., including Fire-proof Dresses and Fabrics, p. 73.

The following subjects are such as are included in this series:—Fire-engines of all kinds, whether worked by manual or steam power, and whether portable or otherwise ; likewise all forms of pumps adapted for throwing a continuous stream of water, to extinguish fires, by being furnished with air-vessels.

Fixed ramifying arrangements of pipes and channels in houses, buildings, ships, &c., designed for extinguishing fires in such structures by water or steam.

Chemical substances, compounds, and solutions, as well as apparatus employed therewith, for generating carbonic acid or other stifling gases or smothering fumes, for suppressing or extinguishing fire. Fire-escapes of all descriptions, whether portable or fixed to buildings. Apparatus for indicating, by audible or visible signals, and started by self-acting means, for giving alarms in case of fires. Fire-proof dresses, fire-proof fabrics for making the same, and the accoutrements and equipments for protecting firemen whilst engaged in rescuing life and property from fire. The manufacture of hose-pipes of leather or other substances, and all kinds of flexible tubing designed for conveying water ; likewise fire-buckets and cisterns of similar materials, and methods of waterproofing the same.

The means of ventilating goods in store-houses, cargoes in ships' holds, &c., for the purpose of preventing spontaneous combustion.

Inventions relating to the following subjects are excluded:—

Fire-proof building materials, fire-proof cements, preserving and fire-proofing timber.

The construction of fire-proof buildings and fire-proof safes—the former being included in the class "House-building," 97 ; the latter being included in the series "Safes, &c.," 64.

The construction of ships in fire-proof compartments, fire-proof railway vans, or any other fire-proof structures, all of which are described in series relating respectively to such subjects.

Hydrants, stand-pipes, water-plugs, &c., for the general supply of water ; all such will be found in "Hydraulics," 32.

Fire-guards and all preventive apparatus connected with stoves, fire-places, and flues ; also fire-grates adapted for extinguishing, when required, the burning fuel they contain. For these latter see "Cooking, &c.," 61.

89. Washing and Wringing Machines, p. 73.

This series embraces machines for cleansing textile or similar goods by washing operations, also wringing machines for expressing moisture after washing or rinsing, but not other machines for using in dry mangling or pressing, whether hot or cold.

Washing machines for textile or similar fabrics, small or large, whether in lengths or made up into garments, &c., as well as machines for domestic laundry work and small articles generally, are included ; but the washing of rags or other material for paper-making, and of wool or other fibres preparatory to spinning, is omitted, and will be found, the former in "Manufacture of Paper," 11 ; and the latter in "Wool," 103.

Machines,

Machines, however, for washing spun threads or yarn (also used for washing woven goods, &c.) are included, except when they are linked with beaming, sizing, printing, dyeing, or bleaching, in which cases they should be looked for in "Weaving," 20, and "Bleaching, Dyeing, &c.," 14.

Dash wheels are excluded from this series of washing machines when not described in connection with general washing or laundry work, and will be found in the series relating to "Bleaching, &c.," 14. Unless claimed for domestic or similar washing, "bucking" or "bowking" apparatus, coppers, heating and steeping vessels, or boiling vessels with or without fixed or removable fittings to create a circulation of the water, are not included. Inventions thus omitted will be found in series embracing some of the other numerous different processes wherein such apparatus are generally employed.

Inventions referring to certain named machines, such as sifting, mixing, and churning machines, but also capable of very general application, are not included unless their connection with washing and wringing machines is claimed, and is of such a nature as to place the inventions within the scope of this series. This series does not comprise inventions relating to independent gearing, or to motive engines for rocking, rotating, &c., even though the working of washing-machines be included amongst the purposes indicated.

The cleansing of fabrics, as treated of in this class, is restricted to the removal of dirt by a washing operation, and not by mechanical means, such as beating or brushing (for which see "Dressing and Finishing, &c.," 91) and does not include the removal, otherwise than by washing, of grease spots or stains, which operations belong to the series of "Bleaching, &c.," 14.

The last-mentioned series of "Bleaching, &c.," should also be referred to, and not this class, for the treatment of newly woven piece goods and yarns, when such treatment merely embraces the alternative processes of cleansing, immersing, rinsing, and wringing, as ordinarily performed at bleaching and dyeing works, or at successive stages in processes of dyeing.

Similarly, the series devoted to dressing and finishing woven fabrics should alone be consulted for the fulling, milling, and scouring of newly woven materials for the purpose of finishing the same.

The manufacture of soap is not included in this series, but in that of "Oils, Fats, &c.," 27; whilst washing and cleansing powders, resembling bleaching agents, are contained in "Bleaching, &c.," 14.

Although wringing apparatus are included, mangles, when not also described as wringing-machines, are omitted, and will be found, together with presses and ironing, in "Dressing and Finishing, &c.," 91. The same distinction has been observed respecting pressing, squeezing, or expressing rollers, which will be found in the latter series when designed for treating dry fabrics, but in this series when designed for treating wet fabrics, as for expressing moisture or wringing.

Bluing, in connection with washing and apparatus used therewith, is included in this class, the series of "Dressing and Finishing, &c.," 91, treating only of this subject when connected with the "starching" and "getting-up" of articles after they have been washed.

In short, to comprehend a good general idea of its scope, the present class should be looked upon as supplemental to the two companion classes, "Bleaching, &c.," 14, and "Dressing and Finishing, &c.," 91, its main object being, whilst furnishing a separate series devoted to domestic washing-machines, to associate therewith all such classes of similar inventions as would escape adequate or complete notice in either one or the other above-mentioned classes. The manufacturing of bluing, starching, sizing, stiffening, and gumming materials is placed under "Stone blue, &c.," 105. Wool-washing is under "Wool," 103.

90. Chains, Chain Cables, &c., p. 73.

This class includes, in addition to ordinary ornamental and chain cables, chains and ropes for standing rigging, wire rope, gearing chains, jewellery and ornamental chains, and shackles or connecting links, swivels and swivel-hooks, including those for jewellery.

It also comprises apparatus for testing or proving chains and chain cables.

Pit chains and chain bands are placed under "Mining, &c.," 71.

Links and hooks for coupling railway carriages are under "Carriages and other Vehicles for Railways, &c.," 46.

Chains for suspension bridges only are under "Bridges, &c.," 36. This distinction has been made in consequence of such inventions involving no improvements in the construction of chains for general purposes, but simply a modification in the construction of suspension bridges.

91. Dressing and Finishing Woven Fabrics, and Manufacturing Felted Fabrics; including Folding, Winding, Measuring, and Packing, p. 74.

With regard to dressing and finishing woven fabrics, this series includes gig-mills, brushing machines, shearing machines, tentering machines, stretching and drying machines, also machines for giving elastic finish to fabrics.

Fulling, beetling, and so-called "felting" woven fabrics are likewise included; but of processes often more or less linked therewith, and having for their object the scouring and cleansing of fabrics, this series is limited to such as have some connection with the dressing and finishing of newly-woven materials, as roll boiling and steaming.

This series in no way treats of domestic and general washing and wringing machines, for which see "Washing and Wringing Machines," 89.

In addition to the "shearing," "shaving," or "cropping" of woollen and other cloth, apparatus for cutting and opening the pile of cut-pile fabric are included, when such operations are performed after the woven fabric has left the loom.

Besides the "fulling" and "felting" of woven fabrics, this series contains the manufacture of felt in general, and also the inventions relating to wadding; but not the manufacture of hats, for which see "Wearing Apparel," 65.

Inventions relating to the use of felt subsequent to its manufacture (as for example, the treatment of felt with tar or similar substance with the object of using the same as materials for protecting ships' bottoms, roofing houses, and covering floors) are excluded, although sometimes alluded to in the specifications, under such terms as suggest the "manufacture of felt"; for such inventions see "Shipbuilding, &c.," 21; "House-building," 97; and "Floor-cloths, &c.," 80.

Only fabrics composed of a layer of interlocked animal hair or wool are understood here by the term "felt." The manufacture of coarse paper-like tissues of vegetable fibres is not included.

Waterproofing,

Waterproofing, fireproofing, and preserving fabrics from the effects of damp, mildew, &c., are included only when the processes form part of the "finishing" of the fabrics, or "getting up" thereof for sale.

The manufacture of "stone blue," starch (including fire-proof starch), size, and other stiffening and gumming materials, forms the subject of a separate series, entitled "Stone Blue, &c.," 105; but apparatus for and processes of "getting up" and finishing fabrics with the aid of such materials are included. Compound fabrics made of two or more fabrics cemented together are *not* included; neither are cemented fabrics formed by attaching flock, feathers, fur, or similar substances to a ground fabric.

Respecting lace and hosiery, the scope of the series "Lace-making, &c.," 29, embraces the "dressing," "getting up," measuring, folding, and "finishing" such fabrics; hence they have been omitted from this series. Nevertheless, apparatus for removing the down from cotton and woven fabrics by "singeing" are included, as well as the "gassing" of all kinds of fabrics.

Apparatus for rolling up or folding piece goods, and presses specially claimed for finishing, hot-pressing, and packing bales of cloth are included, but not presses generally, nor the manufacture of bale-iron for securing or binding bales of compressed merchandise.

Mangles and smoothing irons are included, but not stoves for heating irons; nor are goffering, crimping, fluting, and quilting machines included; for these latter see "Wearing Apparel," 65.

92. Stone, Marble, Slate, and Cement, p. 74.

This class embraces all inventions relating to dressing and finishing stone, marble, and slate, but not those relating to quarrying or winning the same, which are placed under "Mining, &c.," 71. Cement in the shape of powder (including hydraulic cement), is included. Liquid cement is classed under "Stone Blue, &c.," 105. Concrete and building blocks, and also cement in a solidified form, are classed under "Bricks, &c.," 22. Stone-breaking and cubing machines are included, unless those used for preparing stone for road-making purposes, which are placed under "Roads, &c.," 35.

93. Glass and Glassware, p. 74.

This class includes the manufacture of glass used in construction and for mirrors; window-glass; plate-glass, rough and ground or polished; toughened glass; chemical and pharmaceutical glassware; vials and bottles; and decorative glassware. Glass chimneys and globes for lamps are excluded, and will be found under "Lamps, &c.," 44, or "Gas, &c.," 17. The silvering of glass is included, except the silvering of specula or reflectors for scientific purposes. Inventions relating to glass stoppers and to bottles constructed with necks of peculiar conformation for stoppering purposes will be found under "Cutting Cork, &c.," 56. Glass instruments and glass used in the arts and manufactures will be found in the classes to which they obviously belong. Glass painted, stained, or artificially decorated, table glass, and glass knobs and handles for cabinet furniture, are classed under "Furniture, &c.," 39. Glass pendants, prisms, &c., for chandeliers, are placed under "Lamps, &c.," 44; and those for gas fittings, under "Gas," 17. Furnaces, moulds, and blow-pipes for making glass and glassware, and machines and processes for dressing and ornamenting glass, are included. Bottle glass, when peculiarly conformed for stopping purposes, is placed under "Preparing and cutting cork, &c.," 56.

94. Carriages and other Vehicles for Common Roads, p. 74.

This series comprises inventions relating to the general construction of carriages for common roads, whether such carriages be drawn or propelled by animal, steam, or other power. It also embraces inventions in near relation to wheeled carriages for common roads, as, for example, hand barrows, sack trucks, and some machines used for agricultural purposes.

Some carriages for tram roads are included, though much relating to this head of the subject will be found in the series relating to "Carriages and other Vehicles for Railways and Tramways," 46.

A large number of the specifications relating to wheels, tires, axles, axle-boxes, springs, and brake and skidding apparatus, do not specially claim any application to either common road or railway purposes. Such inventions will be found included in the series of "Carriages and other Vehicles for Railways, &c.," 46. Where, however, special mention is made of a common road use, the abridgment has been repeated in this series.

Inventions relating to traction engines also form part of this series, but prominence is given to the running gear and special features fitting the engine for running on roads, rather than to the construction of the boiler and propelling engine itself. For these subjects the series entitled "Aids to Locomotion," 7, "Preparation and Combustion of Fuel," 30, and "Steam-engine," 49, respectively, should be referred to.

Of the details of carriages the following, among others, will be found noticed herein:—Apparatus for showing distance travelled by vehicles, for counting passengers, and for indicating fares; apparatus for lubricating wheels; compositions and materials specially claimed for the construction of panels and carriage bodies, and for covering vehicles, and the seats, aprons, and dashers thereof; springs, and other means of suspension; axles and axle-trees; whip-sockets and rein-holders; windows, blinds, and shutters; lamp irons; and guards and couplings.

Special modes of ventilating carriages are treated in the series entitled "Ventilation," 52. Lamps are included in the series entitled "Lamps, Candlesticks, Chandeliers, and other Illuminating Apparatus," 44. Specifications relating to lubricants for axles,—gun-carriages,—steam pumping apparatus for cleaning carriages, &c.,—mine trucks and carriages,—will be found abridged in the series, entitled respectively "Oils, Fats, Lubricants, &c.," 27; "Firearms and other Weapons, Ammunition, and Accoutrements," 10; "Hydraulics," 32; and "Mining, Quarrying, Tunnelling, and Well-sinking," 71. Fire-engines will be found in the series "Fire-engines, Extinguishers, Escapes, Alarms, &c.," 88.

It is obvious that many inventions relating to railway carriages are equally applicable to common road purposes, and *vice versa*. Strictly speaking, therefore, this series and the series of "Carriages and other Vehicles for Railways," 46, ought to be regarded as supplemental the one to the other. 95.

102. Rope-making, p. 75.

This class includes appliances for and methods of spinning, warping, tarring, laying, and carrying on all other operations incidental to the manufacture of cable-laid and hawser-laid ropes and large cordage. Hempen cables are included; also the tanning of ropes and cordage. String, twine, cord, fishing-lines, and all such manufactures that are not referable to "Spinning," 28, are likewise included.

Wire rope, and chains and ropes for standing rigging, are classed under "Chains, &c.," 90.

103. Wool, p. 75.

This class includes all inventions relating to the treatment of wool after the process of shearing, and up to that of preparing the fibre for spinning. It therefore includes woolwashing, also packing, pressing, and otherwise preparing wool for market.

Sheep washing and shearing will be found under "Farriery," 53; spinning, &c., under "Spinning," 28; and weaving, under "Weaving," 20. For the treatment and dressing of sheepskins with the wool on, and machines for cutting the wool from such skins, see "Skins, &c.," 55.

104. Hardware, Edge Tools, and Cutlery, p. 75.

Under this class are placed all inventions relating to hardware, ironmongery in general, edge tools, and cutlery, except those inventions which have specific reference to a definite class.

Builders' ironmongery is included, unless it partakes of the character of furniture, when it will be found under "Furniture, &c.," 39. Nails, bolts, screws, &c., are placed under "Nails, &c.," 58; hinges and springs for doors, under "Hinges, &c.," 59; locks and other fastenings for doors, windows, and gates, under "Locks, &c.," 60. House-bells are included, but other bells are classed under "Music, &c.," 26.

Some items related to this class, but more intimately connected with other classes, are not included; for instance, sheep-shears are under "Farriery," 53; agricultural implements, under "Agriculture," 81; house-building appliances generally, under "House-building," 97.

Sharpening, grinding, filing, and cutting instruments and machines generally are included.

105. Stone Blue, Starch (including Fire-proof Starch), Size, and other Stiffening and Gumming Materials, p. 75.

This class includes the manufacture of all substances and liquids employed as agents for getting up and finishing fabrics; but the application of such materials is excluded, as it belongs to "Washing and Wringing Machines," 89, or to "Dressing and Finishing Fabrics, &c.," 91. Modes of and apparatus for gumming, sizing, &c., are placed under the classes to which they respectively belong.

106. Scenic, Panoramic, and Illusional Apparatus, Translucent Advertisements, and Transparencies; also, Theatres, p. 75.

This class includes the use of lenses in magic lanterns; apparatus for producing scenic effects, apparitions, &c.; panoramas; translucent advertisements; transparencies; and the lighting, arrangement, and construction of theatres. Photographic camera lenses are placed under "Photography," 19.

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.]

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102. Rope-making, p. 75.

This class includes appliances for and methods of spinning, warping, tarring, laying, and carrying on all other operations incidental to the manufacture of cable-laid and hawser-laid ropes and large cordage. Hempen cables are included; also the tanning of ropes and cordage. String, twine, cord, fishing-lines, and all such manufactures that are not referable to "Spinning," 28, are likewise included.

Wire rope, and chains and ropes for standing rigging, are classed under "Chains, &c.," 90.

103. Wool, p. 75.

This class includes all inventions relating to the treatment of wool after the process of shearing, and up to that of preparing the fibre for spinning. It therefore includes woolwashing, also packing, pressing, and otherwise preparing wool for market.

Sheep washing and shearing will be found under "Farriery," 53; spinning, &c., under "Spinning," 28; and weaving, under "Weaving," 20. For the treatment and dressing of sheepskins with the wool on, and machines for cutting the wool from such skins, see "Skins, &c.," 55.

104. Hardware, Edge Tools, and Cutlery, p. 75.

Under this class are placed all inventions relating to hardware, ironmongery in general, edge tools, and cutlery, except those inventions which have specific reference to a definite class.

Builders' ironmongery is included, unless it partakes of the character of furniture, when it will be found under "Furniture, &c.," 39. Nails, bolts, screws, &c., are placed under "Nails, &c.," 58; hinges and springs for doors, under "Hinges, &c.," 59; locks and other fastenings for doors, windows, and gates, under "Locks, &c.," 60. House-bells are included, but other bells are classed under "Music, &c.," 26.

Some items related to this class, but more intimately connected with other classes, are not included; for instance, sheep-shears are under "Farriery," 53; agricultural implements, under "Agriculture," 81; house-building appliances generally, under "House-building," 97.

Sharpening, grinding, filing, and cutting instruments and machines generally are included.

105. Stone Blue, Starch (including Fire-proof Starch), Size, and other Stiffening and Gumming Materials, p. 75.

This class includes the manufacture of all substances and liquids employed as agents for getting up and finishing fabrics; but the application of such materials is excluded, as it belongs to "Washing and Wringing Machines," 89, or to "Dressing and Finishing Fabrics, &c.," 91. Modes of and apparatus for gumming, sizing, &c., are placed under the classes to which they respectively belong.

106. Scenic, Panoramic, and Illusional Apparatus, Translucent Advertisements, and Transparencies; also, Theatres, p. 75.

This class includes the use of lenses in magic lanterns; apparatus for producing scenic effects, apparitions, &c.; panoramas; translucent advertisements; transparencies; and the lighting, arrangement, and construction of theatres. Photographic camera lenses are placed under "Photography," 19.

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.

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

[Page given after each heading refers to description of Class.]

No. of Patent.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted in 1881.	Page in the Third Vol. of Specifications published in 1882.
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1. Drains and Sewers; including the Manufacture of Drain-tiles and Drain-pipes, p. 9.

[Abridged in Vol. 1 of Index : No. 155.]

2. Sewing and Embroidering, p. 9.

[Abridged in Vol. 1 of Index : Nos. 182, 309, 541, 690, 807.]

917	Lebbens Baldwin Miller and Philip Diehl.	18 Jan., 1881	Improvements in sewing-machines, consisting of certain constructions and combinations of mechanical devices in the shuttle mechanism, the feed mechanism, and the presser-foot mechanism.	26 March	47
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3. Manure, p. 9.

[Abridged in Vol. 1 of Index : Nos. 249, 268, 293, 425, 547, 566, 643, (p. 125), 861.]

984	Friedrich Petri	13 July, 1881	Improved processes for the preparation and utilization of materials for the disinfection of fecal matters, waste waters, and sewage, and for destroying the miasma thereof, without artificially supplying heat, consisting in the manufacture and application of—(1) a disinfecting powder, compounded of peat-waste, waste from brown coal, sawdust, or other organic matter, moistened with carbolic acid and crude chloroform, tempered with pulverized sulphate of iron mixed with coke-waste, and having added to it a solution of nitro-benzol and alcohol; (2) a disinfecting liquid, compounded of water, chloride of lime, and alcohol, mixed up into a paste, and having added thereto water and chloride of calcium, and afterwards alcohol containing nitro-benzol, which being allowed to settle, the pure disinfecting liquid may be decanted therefrom, leaving a sediment of caustic lime—an important characteristic of the liquid being the production therein of organic chlorides by the reaction of the chloride of lime upon the alcohol; (3) the subsequent mechanical treatment of the disinfected matter by reproducing it as a material for artificial fuel or manure.	3 Sept. ..	299
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4. Preservation of Animal and Vegetable Substances (without the use of Cold); also Preparation of same for Market, p. 9.

[Abridged in Vol. 1 of Index : Nos. 59, 70, 87, 95, 97, 105, 113, 115A, 135, 157, 159, 174, 187, 199, 210, 214, 218, 227, 235, 245A, 302, 310, 325, 326, 343, 447, 453, 504A, 532, 540, 559, 586, 614, 649, 663, 664, 677, 730, 752, 759, 766, 803, 859, 865.]

469	Alfred Lee, Alston Wallace, and Robert Wright Knox.	10 Mar., 1881	An improvement in tins or cans for preserving meat, consisting in dishing the inside of the top of the tin or can, and in covering with a grating the escape or discharge opening, in order to prevent the blocking up of such opening by any solid substance during the outflow of steam or liquid.	25 June...	171
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No. of Patent.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted in 1881.	Page in the Third Vol. of Specifications published in 1882.
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4. Preservation of Animal and Vegetable Substances (without the use of Cold); also Preparation of same for Market—*continued.*

972	Alfred Lee, John Alston Wallace, and Robert Wright Knox.	29 June, 1881	Improvements in the process of preserving meat and in tins for containing preserved meat, &c., consisting of—(1) constructing the tins with flanged joints and soldering the outsides in such manner that the contents cannot come in contact with the solder (<i>vide</i> previous entry); (2) giving the meat three boilings, draining the tin of its liquid contents after the first boiling, which is effected in a calcium bath; placing the tin in connection with a vessel over it by means of a pipe with a tap, and boiling under pressure without letting the water in the upper vessel descend into the tin for the second boiling; and boiling in the sealed tins for the third boiling, which process is chiefly suited for preserving unboned joints of meat, but is equally applicable to the preservation of other substances.	16 Aug....	267
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5. Marine Propulsion, p. 10.

[Abridged in Vol. 1 of Index : Nos. 301, 431, 775, 816.]

6. Manufacture of Iron and Steel, p. 10.

[Abridged in Vol. 1 of Index : No. 483.]

7. Aids to Locomotion, p. 10.

[Abridged in Vol. 1 of Index : Nos. 91 and 236 (p. 81), 510 (p. 97).]

8. Steam Culture, p. 11.

[Abridged in Vol. 1 of Index : No. 817.]

9. Watches, Clocks, and other Time-keepers, p. 11.

[Abridged in Vol. 1 of Index : No. 848.]

10. Fire-arms and other Weapons, Ammunition, and Accoutrements, p. 11.

[No Inventions under this Class yet registered.]

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

[Abridged in Vol. 1 of Index : Nos. 291, 359.]

994	Jules Gerard and Eugène Serullas (by their agent, C. Cecil Griffiths).	10 Aug., 1881	Invention for the industrial treatment of bagauze, so as to extract therefrom sugar, and at the same time to obtain a ligneous paste suitable for the manufacture of paper, consisting in the shredding and chopping of the bagauze when it comes from the mill after the crushing of the canes—the exhaustion of the bagauze by water in an apparatus “à effet continu,” and acted upon by an anti-fermenting element such as the salicylate of soda—the expression of the bagauze thus exhausted—the purification before the concentration, and by means of special filtrations, of the juice obtained by diffusion and expression—and the utilization of the ligneous residue, thoroughly disaggregated and purified, and possessing valuable economic properties, especially for the manufacture of paper.	4 Oct. ...	329
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12. Cutting, Folding, and Ornamenting Paper; including Envelopes, Cards, Paperhangings, &c., p. 12.

[No Inventions under this Class yet registered.]

13. Typographic, Lithographic, and Plate Printing (excluding Electro-telegraphic and Photographic Printing); also, Advertising, p. 12.

[Abridged in Vol. 1. of Index : Nos. 45, 273, 395, 451, 476, 513, 522, 799, 835.]

995	Samuel Henry Crocker.....	23 Aug., 1881	An improved process of engraving on glass or glassy surfaces, either direct or by transfer, applicable to the ornamentation of articles or the production of blocks for typographical purposes, consisting 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.	10 Oct. ...	333
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No. of Patent	Name of Applicant.	Date of Application.	Nature of Invention.	When granted in 1881.	Page in the Third Vol. of Specifications published in 1882.
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14. Bleaching, Dyeing and Printing Calico, and other Fabrics and Yarns, p. 12.

[Abridged in Vol. 1 of Index : No. 407 (p. 175).]

15. Electricity and Magnetism, their generation and application, p. 13.

Generation of Electricity and Magnetism.

[No Inventions under this Division yet registered.]

Conducting and Insulating.

[Abridged in Vol. 1. of Index : Nos. 28 (p. 126), 107, 176, 781 (p. 130).]

910	Thomas Alva Edison	4 Jan., 1881	Improvements in systems of conductors for the distribution of electricity as a lighting and motive-power agent and in appliances connected therewith, consisting of electric, distributive, and translation systems, feeding and other circuits, and various devices, whereby is attained the equalization of the electro-motive force or "pressure" where there are many translating devices for converting electricity into either power or light arranged upon the multiple arc or derived circuit system, and each set of conductors are run out from the central station in a straight circuit—the general effect of the invention being to maintain an equal pressure throughout each circuit when several circuits are in simultaneous operation, and to obviate the "drop" or general diminution of force towards the ends of the conductors which is occasioned by the resistance of the main conductors.	7 March..	23
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Electric and Magnetic Telegraphy—Signalling, Transmitting, Receiving, or Recording Apparatus.

[Abridged in Vol. 1 of Index : Nos. 43, 697.]

976	Orazio Lugo, M.D.....	30 June, 1881	Improvements in telegraphy, being a novel organization of the conductors composing electric circuits for telephonic or telegraphic transmission, whereby is prevented the interference with such circuits of derived or induced currents, caused by the action and reaction exerted by such currents upon each other through the proximity and parallelism of the lines, and consisting in—(1) preventing electro-static induction, or the existence of induced, derived, or magnetized currents, by surrounding one portion of a circuit with the other helically, in such manner that the straight portion passes through the mathematical axis of the helical portion and is insulated from it, thus forming a solenoid, one portion of which is used for a direct and the other for a return conductor; (2) enveloping the direct conductor with a compound helix consisting of several parallel conductors whose joint resistance per unit of conductivity is equal to that of the conductor itself; (3) placing in same conduit or pipe any number of independent circuits, large or small, and for whatever purposes used, through which currents may be passed without producing inductive currents between the circuits; (4) organizing the apparatus for serving intermediate as well as terminal stations, using each helical conductor of the series for a different purpose (e.g., one for dynamo-electric currents, another for battery currents, and another for telephonic transmissions); (5) combination of direct and helical conductors with signalling apparatus, with a short circuiting switch, with a rheostat, and with a shunt and switch.	24 Aug....	277
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Instruments for Exhibiting Electric Effects.

[No Inventions under this Division yet registered.]

Electric Lighting, Igniting, and Heating.

[Abridged in Vol. 1 of Index : Nos. 361, 721, 804, 821, 857, 858, 881.]

922	Thomas Alva Edison	13 Dec., 1880	Improvements in electric lamps and in carbons or incandescing conductors therefor, and in means for and methods of manufacturing the same—applicable chiefly to carbons for lamps in which an incandescing conductor is sealed hermetically in a glass enclosing globe—consisting in the use of carbons of the highest possible resistance in a very small bulk, capable of resisting the disintegrating effects of very high heats and the absence of atmospheric pressure, and purely structural in character, that is, consisting of such natural fibres or fibrous materials as are capable of carbonization, especially such as are large, filamentary, and cellular in character, whether consisting of a single fibre like American "monkey bast," or of several fibres aggregated together artificially, or of a piece composed of numerous elementary fibres like bamboo cane—and having reference to various features connected with such carbons and lamps, especially the shaping and carbonization of the carbons, the testing of the carbons before using them, and the manufacture and adjustment of the globes and other parts of the lamps.	2 April	73
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No. of Patent.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted in 1881.	Page in the Third Vol. of Specifications published in 1882.
15. Electricity and Magnetism, their generation and application—continued. Electric Lighting, Igniting, and Heating—continued.					
968	Thomas Alva Edison	15 June, 1881	<p>Improvements in systems of electric lighting, in electric lamps, and in constituent parts thereof, and in means and methods of manufacture connected therewith:—(1) Improved method of forming carbons, by depositing carbon on a metallic blank and then removing the metallic portion by the action of an acid; (2) forming carbon articles of any shape by carbonizing shaped paper, also punching shapes out of a carbonized sheet; (3) removing hydrogen from carbons by passing a stream of chlorine or equivalent gas through the flask containing the carbons while heated to a high temperature; (4) methods of treating carbon conductors for electric lamps before permanently sealing the glass case or globe containing them; (5) removing the occluded gases or vapours from the incandescent conductors of an electric lamp, and from the enlarged end and clamps of such conductor; (6) several methods of curing flaws in carbons after they are mounted, by the internal or external application of heat to easily volatilizable solid carbon compounds or to hydro-carbons, and the deposition by that means of carbon on the conductor or on the weak points thereof; (7) method of treating filamentary carbons; (8) replenishing carbon of lamp by passing a heated regulated current into the lamp from a retort or vessel containing heated hydro-carbon; (9) enlarging and increasing conductivity of clamped ends by deposition of carbon thereon; (10) plating ends of carbon for clamping; (11) uniting the carbon filament and conducting wires, &c., mechanically, and then securing the union by electro-plating; (12) various ways of arranging and combining incandescent lamps in multiple arcs, derived circuits, &c.; (13) making incandescent conductors of compressed graphitic carbon; (14) forming carbon of a straight instead of looped or horseshoe-shaped filament; (15) supports for carbons; (16) protruding conductors by which lamp may be secured to support; (17) carbon resistance with metallic contacts and key for controlling circuit; (18) supporting-neck for wires leading to loop; (19) support for incandescing loop; (20) central tube, conductor, or support for incandescing conductor, formed with chamber at its base for receiving neck of enclosed globe; (21) liquid seal for lamp supports.</p>	13 Aug. ...	249
1002	Thomas Alva Edison	7 Sept., 1881	<p>Improvements in electric lights and fittings and fixtures therefor, applicable to lamps having an incandescing conductor hermetically sealed in a glass-enclosing globe, consisting in means for holding the parts in the proper mechanical and electrical connection:—(1) Removable lamp and socket; (2) standard for lamp and chandelier; (3) chandelier or bracket arm; (4) shade or reflector; (5) two bracket arms and a pivotal connection therefor; (6) two bracket arms, one pivoted upon or within the other; (7) bracket arm provided with an insulated pivotal piece, &c.; (8) a swinging electrical lamp bracket composed of two or more arms; (9) circuit controllers; (10) circular or ring circuit controller for audibly indicating when the proper amount of movement has been given; (11) an electrical "knock down" chandelier and its various parts.</p>	26 Oct. ...	353
1003	Thomas Alva Edison	7 Sept., 1881	<p>Improvements in electric arc lights, consisting in producing a steady arc and insuring smooth consumption, by employing carbons in the shape of pencils or rods, and keeping either or both of the carbons in revolution and position by means of an electric or other motor and suitable controlling, guiding, and feeding mechanism.</p>	26 Oct. ...	361
1013	Thomas Alva Edison	7 Sept., 1881	<p>Improvements in electric lamps and the manufacture thereof, and in systems thereof, consisting in—(1) method of manufacturing the globes and other parts of such lamps; (2) clamp for receiving and supporting an end of an incandescent conductor; (3) leading-in wire in three sections and with integral clamping device; (4) improved arrangement of incandescing carbon conductors; (5) carbon with less resistance or greater mass of matter at one end than at the other; (6) tapering carbon; (7) utilization of spotty or defective carbons; (8) in an electric lighting system, means for automatically transferring the current from one circuit upon its breakage to another; (9) also means for automatically closing a broken circuit and opening a new circuit; (10) series of lamps and automatically operated magnetic switches for controlling the circuit; (11) means for preventing deposition of carbon on lamp globes; (12) leading-in conductor with central platinum piece for sealing into the glass and terminals of other metals.</p>	5 Nov. ...	405

No. of Patent.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted in 1881.	Page in the Third Vol. of Specifications published in 1882.
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15. Electricity and Magnetism, their generation and application—*continued.*

Electro-deposition and Electrolysis.

[No Inventions under this Division yet registered.]

Dynamo or Magneto Electric Machines and Electric Motors and Railways.

[Abridged in Vol. 1 of Index : No. 857, p. 46.]

901	Thomas Alva Edison.....	17 Nov., 1880	Improvements in dynamo or magneto electric machines and electric motors, relating chiefly to the construction of the rotating armature, the arrangement of the commutator brushes or contacts, and the shaft of the rotating armature and commutator; and including motion-imparting and circuit-controlling devices, a governor, a fly or balance wheel, a circuit-breaker, and, in electro-motors, a brake on the main driven wheel, a friction pulley on the rotating shaft, and a mechanical brake on the main driven wheel.	19 Jan. ...	1
948	Thomas Alva 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, adapted chiefly for the service of railways or tramways on which traffic is very light or is limited to certain seasons, or in which the difficulties or expenses of grading render ordinary steam roads impracticable; and consisting in a complete electro-magnetic railway system, embracing the generation, distribution, and utilization of electric currents as a motive power, and including various novel devices and combinations of devices for effecting these objects—the salient feature of the system being that the road is divided into electrical sections, the rails forming the conductors, and each section being provided with a central station at which is located an engine, a generator of electricity, means for controlling and completing the circuits to trains and to switches, cars electrically divided so that motors are insulated from track, and means for completing circuit from line of rails through the motor.	25 June...	177
950	Thomas Alva Edison.....	12 May, 1881	Improvements in magneto or dynamo electric machines, applicable to both generators and engines, consisting in—(1) an improved construction and disposition of the commutator brush, being a system of brushes called the "Large Current Multiple Brushes"; (2) combining the prime motor with the magneto or dynamo electric machine direct, instead of through intermediate gearing; (3) in generators, replacing large cores and large castings for polar extensions, by a series of coils and cores or field magnets, each set having its own polar extensions, but one armature or bobbin being common to all; (4) mounting the engine and generator on one base, and introducing at suitable points non-magnetic materials for supports and connections, so as to unite the parts physically, and make them one structurally, while separating them magnetically; (5) governor for automatically regulating the cut-off; (6) so constructing the bobbin or armature that it may act as a fly or balance wheel to the engine; (7) using an auxiliary generator and increasing capacity of generator; (8) governing or regulating such machines when used as engines for converting current into power; (9) communicating motion from the rotating armature of an electric engine to the driven mechanism without the use of belts, gears, or other similar devices for diminishing speed; (10) transmission of power to a distance from a prime motor, by utilizing the power of water-wheels and applying it to a battery of separate generators mounted on the same driving shaft, and dividing up the motors and retranslating engines in like manner, instead of using one large generator, the object attained thereby being the reduction of the potential between the layers or sections of each bobbin, whereby an immense degree of horse-power may be safely converted into electricity, and the electricity conveyed to a distance by moderate-sized or even small conductors; (11) establishing certain definite relations of power between the generators and engines; (12) applying a shunt circuit to one or all of the bobbins, which circuit passes around and energizes the field of the whole series of field magnets; (13) constructing armatures so that any one coil can be removed or repaired without disturbing the remainder, by alternative methods,—which inventions are applicable to electric engines or motors as well as to magneto or dynamo electric machines.	4 July ...	189

No. of Patent.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted in 1881.	Page in the Third Vol. of Specifications published in 1882.
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15. Electricity and Magnetism, their generation and application—*continued.*

Dynamo or Magneto Electric Machines and Electric Motors and Railways—*continued.*

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, consisting in—(1) a system for supplying electricity from one source for a number of translating devices, by means of an arrangement for ensuring 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 may 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; (2) providing means whereby, when one or a number of lamps are thrown into circuit, the act of so throwing them into circuit automatically and at the same time puts into operation means whereby the generative capacity of the generators is proportionately increased; (3) preventing any ill effect upon the lamps, by combining with a motor devices which, while preventing it from starting up immediately at full head, when it is placed in circuit, causes it to gradually attain its maximum power or speed and to give the counter electro-motive force that takes the place of wire resistance; (4) means whereby the field of force magnets of a number of Faradic machines may be readily and controllably energized; (5) means for obviating any ill effects arising from momentary currents of a higher electro-motive force than those normally used.	26 Oct. ...	365
1011	Thomas Alva Edison	20 Sept., 1881	Improvements in magneto or dynamo electric machines or electric engines, consisting in—(1) dynamo or magneto electric machine in which the iron core of the armature is not necessary, and the loss of power caused by the heating of the same is avoided, the inductive portion of the armature only 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; (2) machine of this character so constructed as to 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; (3) an extension of this arrangement in which the armatures are made with a large number of bars, the current commencing at the negative commutator brush or spring being divided into two parts, each of which passes through one half of the radial bars, and combines with the other part at the positive commutator brush or spring; (4) the application of concentric rings for making the multiple arc connections of the copper bars in dynamo or magneto electric machines or electric engines having the armatures of cylindrical form.	5 Nov. ...	397
1018	Thomas Alva Edison	3 Sept., 1881	Improvements in commutators for dynamo or magneto electric machines or electro motors, consisting in—(1) reducing the spark at the commutator by breaking the circuit at a number of points simultaneously, by means of a series of commutator brushes, one of which is set noticeably behind the others, and which have two or more circuit-breaking points arranged in series and breaking circuit simultaneously with the breaking of the circuit at the commutator, this being effected by means of a commutator cylinder, at one end of which the conducting spaces are narrowed and the insulating spaces widened, and 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, such breaking cylinder having its surface composed of alternate metal and insulation, and being provided with a number of brushes which make and break circuit simultaneously during the revolution of the cylinder, two or more of the brushes on the revolving cylinder breaking circuit simultaneously with the isolated brush.	29 Nov. ...	417

Electric Apparatus for Transmitting, Recording, or Reproducing Sounds.

[Abridged in Vol. 1 of Index : Nos. 693, 843, 855, 875.]

911	Louis John Crossley	13 Jan., 1881	Improvements in apparatus and arrangements for telephonic and microphonic purposes, consisting in devices for transmitting and receiving sounds by means of electric currents, for the purpose of conveying messages and for other useful purposes, and relating also to improvements in the construction of transmitters and electro-magnetic telephone receivers, and in the methods of connecting or joining up the transmitters and receivers—the important points or features of which invention are the combination of a number of conductors or semi-conductors and the mode of connecting the same.	7 March	29
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No. of Patent.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted in 1881.	Page in th Third Vol. of Specifications published in 1882.
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15. Electricity and Magnetism, their generation and application—*continued.*

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

41	Frederic Allen Gower	23 Feb., 1881	An improvement in telephonic apparatus, relating to the combination of what is known as the Gower-Bell or other magneto-telephone with a microphone enclosed in the same case, which arrangement is designed to afford 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 which improvement consists chiefly in the employment in the said telephonic apparatus of a flexible double tube for speaking and listening.	14 June...	149
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Measuring the Electric Current.

912	Thomas Alva Edison.....	13 Jan., 1881	Improvements in means for measuring the amount of electrical current flowing through a circuit, which invention constitutes a mechanically registering and recording electric meter, designated a "Vebermeter." The apparatus consists of an electro-depositing cell, a pair of polar plates, balanced, and alternately immersed in the bath, which immersion makes each plate an anode and a cathode by turns; this produces alternate electro deposition on each plate, which causes the plates to oscillate or dip by gravitation, through the instrumentality of the mechanical connections.	7 March	33
966	Thomas Alva Edison.....	15 June, 1881	Improvements in vebermeters or devices for measuring and registering the current of electricity flowing through conductors, consisting in the following forms of meter:—(1) Deflecting a definite proportion of the current, and passing it through an electrolytic cell, being a vessel partly filled with water floating in a vessel containing the same liquid, by which means the water in the cell is decomposed and partially displaced by the gases evolved therefrom, thereby lessening the specific gravity of the cell, and causing it to rise till it closes an electrical circuit and sends the current through the released gases, exploding them and converting them into water again, which operations cause the vessel to rise and fall alternately, and to act upon the registering mechanism in a degree proportionate to the amount of electricity passing; (2) an electro-depositing cell, the metal lining of which forms one electrode, while a piece of metal suspended therein forms the other electrode, so that the piece of metal becomes alternately heavier and lighter by electro-deposition, according as the side of the vessel and it becomes each in turn anode and electrode, the degree of change being exhibited by means of an index and scale connected with the piece of metal and the spring, and being recorded by means of automatic registering mechanism (the scale being either in vebers, weight of metal deposited, or amount of light from a given number of feet of gas of standard quality, which quantities bear a definite relation to each other and are reducible to equivalent terms); (3) combination with an electric circuit containing translating devices of an electric motor, having a definite amount of work to perform or of loading to overcome, regulated by a fan or blades revolving in a thick liquid, and having a registering apparatus connected therewith.	13 Aug...	239
987	Thomas Alva Edison.....	8 Aug., 1881	Improvements in devices for measuring the electric current passing through or used upon a certain circuit, being an improved form of vebermeter, consisting of—(1) Two electro-depositing cells, one of which deposits with greater rapidity than the other; (2) electro-depositing cell with a resistance whose increase compensates for the decrease in resistance of the cell; (3) means for attaching the cathode plate to the electro-depositing cell; (4) two electro-depositing plates having circular cathode plates of different diameters; (5) two electro-depositing cells, one of which acts as a check to prove the other.	24 Sept..	309

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., p. 14.

[No Inventions under this Class yet registered.]

No. of Patent.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted in 1881.	Page in the Third Vol. of Specifications published in 1882.
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17. Production and Applications of Gas, p. 14.

[Abridged in Vol. 1 of Index : Nos. 12, 21, 37, 217 (p. 87), 297, 327, 339, 363, 418, 560, 561, 579, 589, 680, 692, 701 (p. 88), 724, 762 (81), 773, 788, 790, 814 (p. 88), 825, 841, 847 (p. 88), 868.]

904	William Rigg and William M'Lean (assignees of William Smith).	3 Dec., 1880	Improvements in apparatus for the manufacture of gas, relating to the construction of furnaces and retorts for the manufacture of gas from oil, and consisting in—(1) 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—the lining being longitudinally grooved and perforated and the retorts ribbed—and the retorts being oval and flask-shaped with deflecting ribs and having a peculiar neck and oil inlet; (2) 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 in which the said pins and wire are imbedded.	27 Jan. ...	11
949	John Louis Castner	25 May, 1881	Invention of an apparatus for regulating the flow of gas or gases, consisting in a box having a horizontal diaphragm nicely adjusted to occupy a medium position therein by means of a conical spiral spring above and below, such diaphragm being raised or depressed by a lever which is actuated by the force exerted upon the ingress valve by the inflowing gas; so that when a stop-cock is placed at the exit and kept open, the ingress valve is held in suspension and allows only just as much gas to pass at a uniform pressure as the stopcock is set for.	4 July ...	187
967	John Dixon	17 June, 1881	Invention of apparatus and method of manufacturing an improved gas for illuminating purposes, by the decomposition or dissolution by heat of the component parts or constituents of certain specified materials, depending upon the principle of blending the coloured lights produced by strongly heating different chemicals and producing therefrom a white light, and consisting in—(1) generating gas from metals, earths, earthy bases, acids, carbon, and hydro-carbon substances or liquids, and certain other chemicals, by subjecting such materials or some of them to a cherry-red heat in closed retorts and intermittently injecting certain mixtures conveyed in solution by kerosene or other equivalent as a vehicle; or generating gas from hydro-carbon liquids, in combination with the aforesaid ingredients, by the chemical heat resulting from the combining of such ingredients, or some of them, in closed retorts, while subjected to a cherry-red heat; (2) the use of a primary charge and secondary charge of the materials specified; (3) recovering the kerosene or other vehicle, by extracting same from the gas in the hydraulic or first main, and afterwards distilling and reusing the vehicle and the residuary products; (4) constructing and arranging retorts; (5) constructing and arranging retort-supplier cisterns and connecting and combining same with the retorts.	13 Aug. ...	243

18. Metals and Alloys, p. 14.

Alloys.

[Abridged in Vol. 1 of Index : No. 893.]

Antimony.

[Abridged in Vol. 1 of Index : Nos. 314, 490.]

997	Henri Herrenschildt	27 Aug., 1881	A process of smelting antimony ore, without the aid of iron or any other metals or chemicals, consisting in the production and collection of antimony, through a blast or cupola furnace, and the smelting of artificial oxide of antimony with crude antimony and charcoal, to produce regulus of antimony.	10 Oct. ...	339
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Bismuth.

[Abridged in Vol. 1 of Index : No. 117.]

Copper, &c.

[Abridged in Vol. 1 of Index : Nos. 226, 318, 569, 573.]

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, consisting in—(1) the application of foregoing process of electro-chemical amalgamation (patent of same inventor, No. 903) to the treatment of ores or other substances containing copper, oxides of copper, salts of copper, or sulphurets, antimonnets, or arsnurets of copper, and the like, that is to say, by 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, and in the addition to the mass, after the commencement of the amalgamation, 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; (2) the preliminary	21 May ...	125
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No. of Patent.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted in 1881.	Page in the Third Vol. of Specifications published in 1882.
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18. Metals and Alloys—*continued.*Copper, &c.—*continued.*

935	Paul Gustave Louis Gabriel Designolle— <i>continued.</i>	5 April, 1881	separation of the greater part of the amalgam by decantation and filtration; (3) separating 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; (4) grinding apparatus working with metal cylinders turning freely in a rotating drum; (6) 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; (7) 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.		
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Gold, &c.

Alluvium, &c.

[Abridged in Vol. 1 of Index : Nos. 23, 355.]

Gold.

[Abridged in Vol. 1 of Index : Nos. 31, 62, 145, 152, 163, 247, 264, 329, 369, 419, 802.]

914	Henry Rosales	17 Nov., 1880	Improved apparatus for extracting gold from pyrites, consisting in grinding the pyrites raw, and without mercury, in a Chilian mill, and then amalgamating the pyrites and mercury in Tyrolese mills and dollies or other rotatory contrivances, the material being kept moist and having placed in it a slight admixture of caustic soda or sodium amalgam, and the runner and basin, or in some cases the basin only, being covered with a metal plate coated with mercury.	7 Mar....	39
959	Thomas Denny	9 June, 1881	Improved separator and concentrator for treating stanniferous ore, auriferous gravel, wash-dirt, and quartz tailings, entitled "Denny's Improved Percussion Separator and Concentrator," consisting of—(1) percussion sieve suspended in a box of water; the rods by which it is suspended are attached to a block one end of which rests upon a cam, the rapid revolutions of which impart a jiggling motion to the sieve, and cause the metallic products to pass downwards through the perforated sheet forming the bottom of the sieve and fall into compartments below, where they may be drawn off in a clean state, while the tailings pass over the tail end of the sieve into a box, from which they can be taken by a lift and discharged at any required height; such sieve to hang perfectly horizontal when working, and to have rises in the bottom, so as to admit of different thicknesses of loading being placed on upper surface of sieve, to present a level surface for the material under treatment to press over; (2) rapidly revolving screen, which may be used in conjunction with the sieve described, fed from a screen hopper, and by its inclination passing the material through it gradually till it falls into a tail-race.	2 Aug....	211

(Gold, Silver.)

[Abridged in Vol. 1 of Index : Nos. 30, 288, 337, 368, 379, 380, 596, 598.]

973	Louis Thénot, M.D.	15 June, 1881	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, such apparatus consisting of several separable parts, each part composed of two perpendicular tubes of different sections, and of various globular, serpentine, and other forms, all communicating with each other continuously, the invention being 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, such alternate columns of quicksilver and of water forming a kind of siphon, the mixture of sand or soil and water being driven by a column of water under pressure or drawn by an exhaust apparatus.	16 Aug....	271
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(Gold, Silver, Other Metals, Precious Stones.)

[Abridged in Vol. 1 of Index : Nos. 19, 33, 44, 108, 118, 125, 190, 200 (p. 116), 219, 237, 313, 319, 323, 348, 367, 390, 570, 660, 681, 716, 851.]

903	Paul Gustave Louis Gabriel Designolle.	1 Dec., 1880	Improvements in methods of extracting gold and other precious metals from ores and other substances, and in the apparatus employed therein, consisting in—(1) the system or mode of electro-chemical amalgamation, obtained and carried out by means of combined mechanical and chemical action, involving the application and use of bichloride of mercury, in conjunction with chloride of sodium; (2) grinding and amalgamating apparatus, constructed entirely of iron, and consisting of a cylinder and balls, with provision for the admission and discharge of the materials; (3) apparatus for fixing the amalgam, 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.	27 Jan. ...	7
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No. of Patent.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted in 1881.	Page in the Third Vol. of Specifications published in 1882.
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18. Metals and Alloys—*continued.*Gold, &c.—*continued.*

985	Pierce Butler Wilson.....	13 July, 1881	Improvements in amalgamators, relating to the adaptation of a centrifugal machine to the separation of gold and other precious metals from water, sand, and crushed ores, and consisting chiefly in—(1) the interposition between the revolving basket and the outer casing of a mercury-coated plate, preferably made in sections, adapted for receiving the contents of the revolving basket when thrown off by centrifugal force; (2) the introduction (when desired) of an inner conical basket and surrounding mercury-coated plates, to increase the amalgamating surface; (3) the use of a vessel with suitable stirring appliances for receiving the amalgam, water, and ore after being treated in the aforesaid apparatus.	19 Sept. ...	303
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(Quartz, &c.)

[Abridged in Vol. I of Index: Nos. 57, 114, 251, 684.]

Mineral and other Substances.

[Abridged in Vol. I of Index: Nos. 200 (p. 116), 330, 334, 375, 381, 531, 793.]

939	Richard James Tonks	21 April, 1881	Improvements in machinery for crushing, pulverizing, and amalgamating, consisting in—(1) in machines 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,—in (first) the construction and arrangement of the inwardly projecting teeth, (second) in having two or more of such rapidly revolving discs placed under one another, and (third) in securing such discs to their supporting shaft; (2) in pulverizers in which the substance pulverized is placed in a revolving drum with iron balls,—in (first) perforating body and ends of drum, in (second) making drum of chilled iron plates, combined with an outer casing of wire gauze, and in (third) providing a hollow horizontal axle through centre of drum, for the purpose of allowing a blast of cold air to be supplied in the interior; (3) in barrel amalgamators,—in the combination and arrangement of parts specified; (4) crushing or disintegrating machine, consisting of two main or principal parts, constructed to take full advantage of a blow given by rapidly revolving arms, and to economize the full power in the centrifugal force of a disc running at a speed of from two to three thousand revolutions per minute.	14 June. ...	141
962	Carl Wagemann	30 May, 1881	Improvements in machinery for reducing and classifying ores and for amalgamating the metals contained therein, consisting of a disc mill, a Chilean mill, and an ore classifier, which may be used separately or consecutively: in the reducing machine the material is conducted between the vertical faces of two or more discs; in a modification of the mill, only one disc is driven direct, the other being driven by friction, such other being set eccentrically to the main disc, and there is a self-feeding arrangement for supplying the mill by the aid of a vacuum; there is also a cog-wheel on the vertical spindle and gearing or cog-wheels on the inner face of the rollers of the Chilean mill; and there are conical sieves of varying mesh, set on an incline, the highest one having the largest mesh and the lowest the smallest mesh, and likewise contrivances for fixing the jackets of the sieves.	2 Aug. ...	223
1020	William Henry Harrison ...	29 July, 1881	"Harrison's Concentrator," for separating mineral and other substances, consisting of—(1) a bed-frame to which is attached driving gear and an eccentric; rod connecting eccentric with carriage-frame; carriage-frame resting on four flanged wheels; tram for carriage-wheels, each rail consisting of springs fastened at the centre to the bed-frame and extending from such fastening horizontally in both directions; body resting longitudinally on central pivot-bar, which fits at each end into an eye set in the carriage-frame; body may be adjusted transversely at any required angle by means of a pair of perpendicular hand-screws, one on each side of the pivot-bar; the body having very sloping sides and vertical ends—having a pair of adjustable curtains or diaphragms sliding in grooves extending from end to end, and having in the bottom between the diaphragms a hole or holes with flood-gate, and lever for actuating same; (2) the eccentric giving a stroke of 1 inch and making about 80 revolutions per minute causes the body not only to run backwards and forwards in a longitudinal direction, but also to sink on its spring rails at each end of the stroke, thus imparting to it a gentle yet rapid oscillating and vertical jerking motion, which causes the heavier parts of the wash to sink to the bottom, whence it can be removed through the discharge valves, and the lighter parts to pass out under the adjustable curtains into the body, the lightest parts rising to the surface and falling over the sloping sides.	29 Nov. ...	423

No. of Patent.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted in 1881.	Page in the Third Vol. of Specifications published in 1882.
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18. Metals and Alloys—continued.

Nickel.

[Abridged in Vol. 1 of Index : Nos. 585, 587.]

Ores, Minerals, Metals, &c.

[Abridged in Vol. 1 of Index : Nos. 55, 124, 131, 153, 191, 194, 213, 224, 263, 278, 281, 311, 344, 350, 354, 383, 397, 469, 533, 557, 617, 619, 661.]

Quartz, &c.

[Abridged in Vol. 1 of Index : Nos. 13, 53, 92, 138, 139, 234, 258, 261, 445, 898.]

977	George Ashcroft.....	28 June, 1881	Improvements in machinery for pulverizing quartz, rocks, and earths, for sorting the powder so obtained, and for treating it with mercury, consisting in—(1) pulverizer, being a strong iron pan, circular in shape, and having a hemispherical section, in which run two balls of iron of nearly same diameter as the pan, these balls being kept rolling and at the same time turning on their own axes by contact with two cones which are borne round by a cross-shaft attached to a horizontal shaft kept in revolution by bevel gearing underneath, the action of the balls being controlled by that of the cones, which can be raised or lowered at pleasure; the overflow passes out through spouts furnished with wire gauze of the requisite mesh round the top of the pan, and falls into a circular trough discharging into the sorter; (2) the sorter consists of two horizontal troughs, being half cylinders communicating with each other at the ends; in each trough lies an archimedean screw, which can be raised or lowered at pleasure, and the revolutions of which keep the material travelling round the double trough; the troughs have the necessary doors, &c., for discharging into the amalgamator; (3) the amalgamator consists of an apparatus like the sorter, except that the revolving blades are in permanent contact with the bottom and act as scrapers; and there may be more amalgamators than one, communicating with each other.	24 Aug....	233
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Shaping and Working Metals.

(See also *Iron and Steel, Class 6*; *Plating and Coating Metals with Metals, Class 23*.)
[Abridged in Vol. 1 of Index : Nos. 4 (p. 72), 97, 662 (p. 42), 702, 717 (p. 42), 767.]

Silver, &c.

[Abridged in Vol. 1 of Index : No. 356.]

Sulphurets, Amalgam, &c.

[Abridged in Vol. 1 of Index : Nos. 206, 443.]

Tin, &c.

[Abridged in Vol. 1 of Index : Nos. 328, 340, 352, 353, 442, 544.]
(See also *Abridgment, No. 959, p. 53, of this volume.*)

19. Photography, Photo-lithography, and Photo-mechanical Printing, p. 14

[Abridged in Vol. 1 of Index : Nos. 27, 725.]

20. Weaving, p. 15.

[No Inventions under this Class yet registered.]

21. Ship Building, Repairing, Sheathing, Launching, &c., p. 15.

[Abridged in Vol. 1 of Index : Nos. 35 (p. 121), 63 (p. 98), 123, 151 (p. 98), 494.]

22. Bricks and Tiles, Artificial Stone and Concrete, p. 15.

[Abridged in Vol. 1 of Index : Nos. 69, 78, 93, 140, 154, 167, 262, 272, 280, 427, 444, 527, 535, 652, 869.]

23. Plating or Coating Metals with Metals, p. 15.

[Abridged in Vol. 1 of Index : Nos. 4, 248.]

24. Pottery, p. 15.

[No Inventions under this Class yet registered; but see Bricks and Tiles, &c., 22.]

No. of Patent.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted in 1881.	Page in the Third Vol. of Specifications published in 1882.
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25. Medicine, Surgery, and Dentistry, p. 15.

[Abridged in Vol. 1 of Index : Nos. 141, 149, 370, 604, 741, 836.]

1023	Peter Langwill	26 Oct., 1881	"Langwill's Improved Naso-oral Antiseptic Respirator," consisting chiefly of—(1) A mouthpiece terminating in a tube, to act as a socket for another part of the instrument, which is adjusted to it telescopically; (2) an expiratory valve in mouthpiece; (3) an inspiratory valve in tube; (4) screen of wires, netting, or perforated plate near each end of tube, with sponge or other absorbent material between the screens—which construction renders the instrument very portable, readily adjustable, and easily cleaned and repaired, and prevents the wearer's breath from contaminating the contents of the chamber containing the antiseptic.	13 Dec. ...	431
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26. Music and Musical Instruments, p. 15.

[No Inventions under this Class yet registered.]

27. Oils, Fats, Lubricants, Candles, and Soap, p. 16.

[Abridged in Vol. 1 of Index : Nos. 20, 76, 112, 202, 231, 320, 321, 466, 549, 601, 792, 862, 896.]

28. Spinning; including the Preparation of Fibrous Materials and the Doubling of Yarns and Threads, p. 16.

[Abridged in Vol. 1 of Index : Nos. 162, 175, 349, 388, 539.]

29. Lace-making, Knitting, Netting, Braiding, and Plaiting; including the Manufacture of Fringe and Chenille, p. 16.

[No Inventions under this Class yet registered.]

30. Preparation and Combustion of Fuel, p. 17.

[Abridged in Vol. 1 of Index : Nos. 1, 25, 48, 133, 403, 422, 436, 446, 524, 787.]

916	John Alves (by his attorney, Edward Waters).	10 Dec., 1880	Improvements in fire-bars and furnaces, consisting in—(1) fire-bars with longitudinal knife-edge or ridge on upper side, and either with or without tapering sides, such tapering bars being so set as to leave spaces between them gradually widening towards the front, and to leave a narrow space between them and the fire-box; (2) fire-bridges with cast-iron substructure and slots or spaces to admit air from the back end of the fire-bars, and with brick superstructure or water chamber thereon, the whole being braced or bolted together; (3) rakes with teeth adapted for cleaning such furnace.	26 Mar. ...	43
923	Adam Cyrus Engert.....	9 Feb., 1881	Improvements in fire-grates, designed to prevent the formation of smoke by heating the fuel before using it, and consisting in—(1) constructing open domestic fire-grates, kitcheners, and ranges with—(a) a fuel chamber in the position at the back of the grate usually occupied by a fire-lump, such chamber opening into the fire-place, and being provided with a movable back plate, by means of which when it is desired to feed the fire the fuel may be pushed forward out of the chamber; (b) bars passing under grate for working pusher-plate; (c) curved plates above and below grate for directing draught; and (2) constructing closed fire-grates in a similar manner, but with either a bar or a hand-lever to operate pusher-plate.	7 April..	85
938	Thomas Denny.....	15 Mar., 1881	Improved furnace for the combustion of fuel, suitable for burning bricks in brick kilns and for generating steam in steam boilers, and designed to bring about proper chemical union between the coal gases and the oxygen of the air, and thus increase combustion, save time and fuel, and prevent smoke, consisting in—(1) in the case of brick kilns, of a furnace built outside the ordinary fire-holes as an extension thereof and lined with fire-brick, and in the case of steam boilers of a fire-box also lined with fire-brick; (2) in the use of white fire-brick for the lining of brick-frames and furnaces, as being the material best adapted for the purpose by its conductivity and its colour; (3) in the employment of perforated sliding doors with door-frame and rollers, and of perforated dead-frame plate, all of iron, the doors being set at an angle and being made long and narrow, in order to exclude as much cold air as possible in getting at the fire.	21 May...	137

No. of Patent.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted in 1881.	Page in the Third Vol. of Specifications published in 1882.
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30. Preparation and Combustion of Fuel—continued.

982	Marie Jean Léon Marie (by his agent, A. M. Clark).	13 July, 1881	Improvements in furnaces for burning cane-trash, shavings, and other fuel dry or moist, by drying same before consuming it, consisting in a furnace having a reverberatory chamber of any fire-resisting material, surmounted by a feed-hopper with balance-door, such furnace being placed in any convenient position relatively to and communicating by suitable openings in its walls or crown with any boiler or other furnace, or with a set of sugar-evaporating pans or copper wall battery, so as to effect the drying and combustion of the bagasse or other fuel contained in such first-mentioned furnace by means of a natural draught	3 Sept. ...	291
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31. Raising, Lowering, and Weighing, p. 17.

[Abridged in Vol. 1 of Index : Nos. 42, 71, 198, 242, 254 (122), 275, 306, 481, 486, 498, 499, 602, 603, 606, 642 (p. 154), 743, 751, 801, 818, 840, 885.]

906	Owen Blacket	29-Nov., 1880	"Automatic Revolving Earth-scoop," consisting of a travelling scoop, attached to shafts and worked by horse-power, having two points of draught, one for filling and the other for overturning, also having a hand-lever for disconnecting the draught from one point and changing it to the other, whereby the point of draught is raised, causing the scoop to make a complete revolution, in doing which it is assisted by the shape of its sides.	8 Feb. ...	17
937	Henry Cherry (by his attorney, Owen Blacket).	29 Mar., 1881	Improvements in machinery for raising and lowering heavy bodies, consisting in the combination of a cylinder and piston with a rotating drum contained in a casing at the end of such cylinder, rotatory motion being communicated to the said drum by the said piston, through the medium of chains, ropes, or bands, or toothed chain wheels, &c., winding round an extension of the axis of the drum, such motion being transmitted by the said axis to the exterior of the casing, around which the hoisting rope, &c., is coiled, and this 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.	21 May ...	133

32. Hydraulics, p. 17.

[Abridged in Vol. 1 of Index : Nos. 18, 100 & 101, 109, 211, 400, 414, 421, 553, 669, 706, 713, 762.]

926	William Dalziel	19 Feb., 1881	Improved water-waste preventer, being a combination of cock and valve for the positive prevention of waste of water when the supply is derived from a high-pressure service, and being specially adapted for water-closet and other domestic purposes, consisting in providing the cock through which the 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 consisting of a piston which is gradually raised by the liquid, and which 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 and under the piston.	7 April ...	95
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33. Railways and Tramways, p. 17.

[Abridged in Vol. 1 of Index : Nos. 32, 39 (156), 88, 312 (p. 43), 520, 603 (p. 78), 642 (p. 154), 742, 744, 810, 846, 866, 886, 892.]

964	Andrew Smith Hallidie.....	5 July, 1880	Improvements in wire-rope tramways, entitled the endless wire-rope-way, for transporting articles and substances from place to place, and in the machinery and apparatus connected therewith, consisting in the employment of an endless wire-rope, carried upon pulleys, mounted on suitable posts in single or double line; the course of the line can be changed, and, as the rope passes around a horizontal pulley at each end, it traverses in both directions; a stationary steam or other engine supplies the motive power; the substance, article, or thing to be transported is either attached to the rope or is placed in a car, basket, or other vehicle, which is afterwards attached to the rope, to be carried to the place of delivery, which system of transportation requires no grading, follows the outline of the country, straight or crooked, and permits a divergence of one of the branches of the rope if a double line of posts is used; it also includes self-dumping ore-buckets, and devices for attaching and detaching, loading and unloading, without interfering with the travel of the rope.	2 Aug. ...	231
1026	William Robert Rowan (by his agent, F. C. Rowan) ..	7 Oct., 1881	Improved method of constructing tramways and light lines of railway, consisting in discarding the ordinary cross sleepers embedded in ballast, and instead thereof excavating two trenches of suitable depth and width in the earth formation of the line, filling in these trenches with ballast, and laying thereon longitudinal sleepers as supports for the rails, which are to be of "bridge" pattern and deep, the joints being connected by fish-plates and the fixity of gauge being maintained by wrought-iron tie-bars introduced at necessary intervals.	22 Dec. ...	433

No. of Patent.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted in 1881.	Page in the Third Vol. of Specifications published in 1882.
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34. Saddlery, Harness, Stable Fittings, &c., p. 17.

[Abridged in Vol. 1 of Index : Nos. 34, 86, 178, 495.]

35. Roads and Ways, p. 18.

[Abridged in Vol. 1 of Index : Nos. 485, 731, 869.]

915	John Walter Grierson	18 Jan., 1881	"Grierson's Keyed-wood and Composite Pavement," adapted for road or foot ways or floors, consisting of wood blocks of suitable size, cut wedge-shape and keyed together, so as to form one continuous and compact whole—the keys preventing vibration and holding the blocks down and together on their respective bearings—the blocks being laid on a floor of 2½-inch broken metal about 3 inches thick, the abutments formed by ramming—the gulleys and cross gulleys between the blocks being filled in and rammed with 1½-inch broken metal to a depth of about 2 inches, and then filled in flush to the surface with asphalt, concrete, or cement—and the whole being rolled with a heavy roller.	28 March	41
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36. Bridges, Viaducts, and Aqueducts, p. 18.

[No Inventions under this Class yet registered.]

37. Writing Instruments and Materials, p. 18.

[No Inventions under this Class yet registered.]

38. Railway Signals and Communicating Apparatus, p. 18.

[Abridged in Vol. 1 of Index : No. 471, 520 (p. 82), 538, 744 (p. 82), 824, 839, 846 (p. 82).]

39. Furniture and Upholstery, p. 19.

[Abridged in Vol. 1 of Index : Nos. 22, 137, 215, 409, 463, 564, 626, 705 (p. 99), 745, 770, 777.]

902	H. Cambier and L. Cambier (Brothers), by their agent, Fr. Huylebroeck.	26 Nov., 1880	Improved chair for children, convertible at will into a perambulator or a cradle. When in the form of a chair, the upper half is hinged to the lower half and connected by hook and eye. To make the chair assume the form of a perambulator, the hook and eye are disconnected, the play-table thrown back and pivoted, and the two halves of the chair swung on their hinges. To convert the perambulator into a cradle, rockers are placed underneath and secured by hooks to the rails, and the hinged part of the seat is swung over to form a continuous rest for the mattress.	27 Jan. ...	5
1014	Henry Upton Alcock	23 Sept., 1881	Improved convertible table, capable of being used as either a billiard-table or a dining-table, consisting in making the billiard-table and the outer framework separate, and so constructing same (by alternative methods) that the billiard-table may be lowered from its position face upwards (instead of being reversed like other tables), by means of eccentrics or cams, &c., so as to be on or below the level of the framing, and then placing over the framing leaves to form a dining-table, and <i>vice versa</i> ; also, constructing such tables with sliding extensions.	16 Nov. ...	411

40. Acids, Alkalies, Oxides, and Salts, p. 19.

[Abridged in Vol. 1 of Index : Nos. 122, 228, 346, 502, 699, 842.]

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 in such apparatus, consisting in—(1) interposing between the burning-plate of the furnace and the sulphuric acid chambers, &c., a reservoir of heat, such as a mass of fire-brickwork set pigeon-hole-wise, &c.; (2) passing through such reservoir air, previously heated by waste heat or not, and measured by an anemometer or not, by which means the proper admixture of gases is attained, the entire combustion of the volatilized sulphur is effected, and the whole of the heat employed in the operations is utilized; (3) arranging the vessels or pans for sulphuric acid or other liquid in such a way as to enable the process of concentration to go on continuously.	7 April..	91
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No. of Patent.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted in 1881.	Page in the Third Vol. of Specifications published in 1882.
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40. Acids, Alkalies, Oxides, and Salts—continued.

986	Juan Francisco Nepomuceno Macay.	8 Aug., 1881	Improved apparatus for dissolving and filtering and for effecting chemical reactions in chemical and metallurgical processes—(relating to apparatus for dissolving solids in liquids and producing chemical reactions; and apparatus for filtering and separating liquids from solids in chemical and metallurgical processes in which soluble substances mixed or combined with insoluble ones are to be dissolved in given solvents, and the solution separated by filtration from the undissolved residue; and means for keeping the filtering surface from being clogged)—and consisting in—(1) a rotary decanting filter, constructed of an inner and outer barrel or shell with an intervening annular space, divided into segmental compartments by longitudinal and circumferential partitions, the inner shell being perforated and covered with asbestos cloth or other filtering material; (2) the use or not in such filters of means for forcing in or drawing off steam or air, gases or liquids, through the filtering material and through the contents of the apparatus, by introducing the same through hollow journals; (3) keeping the filtering surface practically clear by means of such rotary and decanting action.	24 Sept. ...	305
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41. Aeronautics, p. 19.

996	Count Antoine Apraxine ...	23 Aug., 1881	Improvements in aerial balloons, designed 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, consisting in the mode of constructing, arranging, and operating the following machines:—(1) An aerostat composed of a main balloon and two auxiliary balloons in combination with two reversed parachutes; (2) an aerostat composed of a balloon in combination with two suspended reversed parachutes; (3) an aerostat composed of a balloon in combination with two suspended non-reversed parachutes and two counterpoises; (4) an aerostat composed of a main balloon and of two auxiliary balloons surmounting and in combination with two non-reversed parachutes; (5) an aerostat composed of a balloon in combination with horizontal frames provided with valves; (6) an aerostat composed of a balloon in combination with two archimedean screws.	10 Oct. ...	335
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42. Preparation and Use of Tobacco, p. 19.

[Abridged in Vol. 1 of Index : Nos. 115, 164, 208, 525.]

965	John F. Allen and Louis Ginter.	9 June, 1881	Amber saliva-proof mouthpiece cigarette, consisting in preparing one end of the rice-paper used with a substance for preventing the paper from sticking to the lips or becoming moist in any way.	13 Aug. ...	237
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43. Books, Portfolios, Card-cases, &c., p. 19.

[No Inventions under this Class yet registered.]

44. Lamps, Candlesticks, Chandeliers, and other Illuminating Apparatus; excluding Inventions for lighting by Gas or Electricity, p. 19.

[Abridged in Vol. 1 of Index : Nos. 54, 74, 203, 707, 737, 820, 864, 894.]

930	Frederick Siemens	24 Mar., 1881	Improvements in lamps, relating 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, consisting in—(1) An annular burner, constituted by preference of a number of small vertical tubes rising from an annular chamber, having 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 to a certain height beyond the level of the burner, such extension being by preference of reduced diameter; (2) surrounding the outside of the burner is a second chamber open at its upper and lower ends, and preferentially contracted in diameter at the point of most intense heat, also containing material offering extended surfaces; at the upper edge of such outer chamber, at a certain distance above the top of the burner, are provided by preference annular notched or comb-like shields; on to the upper end of such chamber is fitted by preference a separate cylinder, preferentially of fire-clay or	16 May ...	103
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No. of Patent.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted in 1881.	Page in the Third Vol. of Specifications published in 1882.
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44. Lamps, Candlesticks, Chandeliers, and other Illuminating Apparatus; excluding Inventions for lighting by Gas or Electricity—*continued.*

930	Frederick Siemens— <i>contd.</i>	24 Mar., 1881	other suitable refractory material; (4) the regenerative chambers are preferentially filled with a number of perforated hollow cones or frustrums of cones of metal or fire-clay, placed one above the other; (5) according to one arrangement for producing downward draught, the lower end of the lamp is connected 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; according to another arrangement, the arms supporting the burners constitute pipes connecting with tube forming part of central stem and constituting a chimney for draught; (6) adaptations of these lamps may be made to burn with a steady light in the open air without the aid of chimney glasses.		
940	James Nicholas Douglass ...	21 April, 1881	Improvements in oil or 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, and consisting of—(1) an arrangement of an outer deflector surrounding the burner and lower part of the flames—one or more of which it covers—and 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, 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 current of air, and in such a manner as to invigorate the combustion of the flames and augment the intensity of their light; (2) 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 altering the external form or dimensions thereof, which property renders this description of burner specially adapted for use with optical apparatus.	14 June...	145
992	Francis Edward De Lacye Richards and John Kinloch.	9 Aug., 1881	Portable pantascope gas-light, consisting in an automatic gasometer and lamp, and a gas-producing liquid for using therewith: (1.) The apparatus consists of a reservoir for holding the fluid, and a tube with tap in middle connecting the reservoir with the lamp; the tube being filled with oil, a lighted match is applied underneath, which causes gas to form in it very rapidly; this gas rushes through an aperture in the end of the tube, thence into a gas-well, and thence out through a hole in the apex, through a directing tube, and into the burner, whence part of the current is deflected by the dome-shaped interior of the nipple, and thrown back to a point at which it escapes in two small jets, which being lighted heat up the tube and thus maintain the supply of gas automatically as long as any oil remains in the tube. (2.) The liquid, which is called "Richards' Oil," is an illuminating fluid derived by means of filtration from the refuse of kerosene shale, increased to the standard illuminating power (when necessary) by the addition to it of equal parts of sulphuric acid and bichromate of potassium (at a high temperature)—the kerosene of this Colony requiring no such addition to enrich it, and the liquid being equal to benzene in eradicating grease stains. (3.) It is claimed for this lamp, that it is non-explosive, easily extinguished, portable, gives a brilliant mild light, is simple in construction, cleanly, cheap, and effective, is almost indestructible, not likely to get out of order, requires no wicks or chimneys, and it can be used in lieu of coal, kerosene, or candles; and it is claimed for the flame that it has great staying qualities in windy weather—and for the oil, that it is equal to benzene for eradicating grease stains.	4 Oct. ...	323

45. Needles and Pins, p. 20.

[No Inventions under this Class yet registered.]

46. Carriages and other Vehicles for Railways and Tramways, p. 20.

[Abridged in Vol. 1 of Index: Nos. 38, 39 (156), 51, 72 (p. 156), 73, 80, 231, 246 and 271 (p. 157), 317, 351, 373, 595, 599, 654, 673 (p. 157), 689, 698, 708, 768, 832, 863.]

963	George Westinghouse, junr.	31 May, 1881	Improvements in working brakes by fluid pressure, applicable to systems in which there is on each brake-carriage an auxiliary reservoir containing compressed air and constituting a local store of power for working the brakes—a cylinder with a piston connected to the brake-lever, or sometimes (instead of such cylinder and piston) a collapsible vessel or a flexible diaphragm, also an "automatic train-pipe" connecting each of the auxiliary reservoirs and brake-cylinders or their equivalents through a valve-box, which valve-box (commonly known as the "triple valve") so acts that when the automatic train-pipe is charged the compressed air is discharged from the brake-cylinder and the brake is released,	2 Aug. ...	227
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No. of Patent.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted in 1881.	Page in the Third Vol. of Specifications published in 1882.
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46. Carriages and other Vehicles for Railways and Tramways—continued.

963	George Westinghouse, junr.— <i>continued.</i>	31 May, 1881	and when the automatic train-pipe is relieved the escape from the brake-cylinder is closed and connection from the auxiliary reservoir to the brake is opened, thus applying the brake whether the stoppage is made on purpose or has occurred accidentally, and which improvements consist in a new arrangement also worked by compressed air, such compressed air being conducted directly from the main reservoir on the locomotive by an additional pipe called by preference the "non-automatic train-pipe," and consist further in making certain modifications in the triple valve, in the construction and connections to the brake-cylinders and auxiliary reservoirs, and in the couplings of the pipes, all which improvements are respectively necessary to adapt the existing systems of fluid pressure brakes to the new combined arrangement.		
1012	Edward D. Barker (per Herbert Harris).	21 Sept., 1881	Improvements in the method of actuating railway brakes, part of which invention is applicable generally as a steam pump, consisting of—(1) brakes actuated by means of a continuous line of piping connected with an hydraulic accumulator: in which water is stored under pressure, the water being forced along this line of piping into hydraulic rams fastened underneath the carriages, one ram being made to actuate either four or two brake-blocks—in the former case the blocks being connected on the opposite sides of the carriage by cross-bars, a cylinder and piston or their equivalents being 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; (2) modifications for one or more wheels, also mechanism for preventing the blocks from receding too far from the wheels and compensating for the wear of the blocks; (3) cylinder charged with fluid under pressure in each brake-carriage, for use in case of the carriage becoming detached; (4) coiled spring to work the brake in case of a carriage becoming separated from the accumulator; (5) accumulator of any description, but preferentially with steam from boiler as motive force to drive the water through the pipes; (6) steam pump for charging accumulator with water, direct-acting, worked by steam from the boiler, steam cylinder and pump cylinder in line with each other, piston rod connecting the two pistons passing through stuffing-box, peculiar valve connections, no dead point; the general arrangement of the whole mechanism adapting it for actuating a continuous, direct, and automatic hydraulic apparatus.	5 Nov....	401

47. Umbrellas, Parasols, and Walking-sticks; Awnings and Sunshades, p. 20.
[Abridged in Vol. 1 of Index : No. 17, p. 99.]

48. Sugar, p. 20.

[Abridged in Vol. 1 of Index : Nos. 7, 8, 10, 61, 166 (p. 139), 189, 193, 197, 229, 253, 266 (p. 150), 332, 440, 451A, 452, 567, 622, 629, 718, 740, 746, 779, 782.]
[See also Abridgment No. 994, p. 46 of this volume.]

49. Steam-engine, p. 20.

[Abridged in Vol. 1 of Index : Nos. 99, 133, 136, 217 (p. 89), 232, 270, 287, 299, 304, 406, 467, 482, 496, 510, 515, 529, 563, 630, 673 (p. 157), 726, 739, 750, 776, 849.]

932	Robert Bodington	2 Sept., 1880	Improvements in apparatus for arresting sparks from steam-engines, involving the use of a wire cage or screen with suitable meshes affixed to the top of the funnel or flue of the engine, and consisting in providing such apparatus with a cleaner, which may work either constantly or intermittently against either the inside or the outside of the cage. (1) The cage may revolve around the top of the funnel or flue, in which case the wires may be placed either vertically or horizontally; (2) the cleaners may have elastic bearings, or may be kept in position by springs, or may be otherwise arranged; and they 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, or of a metal comb—either of which forms is adapted for penetrating the interstices and removing adhering particles from the wires; (3) the cleaners may be worked either by hand or by gearing from the engine; (4) if a series of washers are used, they are to be preferentially threaded on a tube and screwed tightly together, the tube being passed over a spindle on which it can revolve freely; (5) the cleaner may be made to travel around the cage instead of the cage revolving against the cleaner, and the cleaner may be placed inside the cage; (6) circular or flat brushes, revolving or stationary, may be substituted for the cleaners, but comb cleaners are to be preferentially used; (7) arrangement of comb cleaner.	16 May....	111
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No. of Patent.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted in 1881.	Page in the Third Vol. of Specifications published in 1882.
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49. Steam-engine—*continued.*

942	Edward Davies	24 Mar., 1881	Improvements in apparatus for feeding locomotive and other steam boilers and generators, applicable also for raising and forcing liquids for other purposes (relating to improvements upon that apparatus for the purposes abovenamed, for which two several Letters Patent were granted in England to applicant 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 referring to improved combinations and arrangements of parts, consisting mainly in arranging the moving part of the split cone (described in the specification No. 4,014 aforesaid) upon a hinge formed at one end, and in surrounding the split cone and overflow orifice or outlet with an airtight 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, which combination and arrangement of parts, constituting the subject of this invention, allow the split cone to be self-acting, and this simplifies the construction and working of the injector; the said invention is intended to be worked by exhaust steam from high-pressure engines in preference to being worked by live steam direct from the boiler, and is capable of being worked by exhaust steam when the engine is working, and by live steam when the engine is not working; (2) supplementary injector, provided with overflow or outlet for the fluid to start the apparatus by using live steam (dispensing with a split cone) till injector is properly at work, and then cutting off steam by means of cocks, valves, and a handle or handles; (3) closing overflow outlet by a water seal or valve when apparatus used without casing or chamber, and arranged as in specification No. 4,014 aforesaid—which improved apparatus is or may be used for elevating and injecting liquids, or for ejecting liquids or fluids, and when applied to the latter purpose is applicable also to that apparatus known as the ejector condenser for forming a partial vacuum in the cylinders of steam-engines.	14 June...	153
970	Peter Tyrer.....	29 April, 1881	Improved contrivances for arresting and extinguishing sparks from steam-engines, consisting in—(1) for arresting sparks, a cage introduced between the blast-pipe and the funnel or flue, constructed of several parts, each gradually increasing in diameter from bottom to top, superimposed like a series of funnel-shaped cages placed one above the other, and increasing in width as the tier ascends, and terminating in a flat ring attached to the bottom of the funnel; (2) for extinguishing sparks, a perforated circular pipe for supplying water spray, placed anywhere in the funnel, but by preference just around the bottom and above the cage; (3) the wires of the cage may be made continuous and spiral instead of in horizontal rings; the cage may be made to revolve; the water spray may be dispensed with, except perhaps in the case of engines burning wood, or of portable engines engaged in farm work.	16 Aug....	261

50. Paints, Colours, and Varnishes, p. 21.

[Abridged in Vol. 1 of Index: Nos. 63, 123, 151, 239, 627.]

924	The Tasmanite Manufacturing Co. (Limited) (assignee of John Henry Fector Bruyeres and George Theodore Adams Lavater)—J. F. L. Tucker, secretary.	14 Jan., 1881	Improvements in the treatment of Tasmanite, for the purpose of producing therefrom silicate colours in powder, polishing powder, and moulders' powder.	7 April..	89
947	Henry Ferdinand Ihlee and William Cullen Horne (assignees of the Executrix of the will of the late William Henry Balmain).	10 Mar., 1881	Improvements in painting, varnishing, and white-washing, relating to a method of rendering paints, white-washes, and temperings luminous, and consisting 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—such illuminant for mixing with such paints, &c., being obtainable by simply heating together a mixture of lime and sulphur, or carbonate of lime and sulphur, or such compounds of these substances as alabaster or gypsum, 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.	25 June...	173

No. of Patent.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted in 1881.	Page in the Third Vol. of Specifications published in 1882.
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51. Toys, Games, and Exercises, p. 21.

[Abridged in Vol. 1 of Index : Nos. 127, 142.]

52. Ventilation, p. 21

[Abridged in Vol. 1 of Index : Nos. 106, 215 (p. 85), 456, 618, 705, 771, 800.]

53. Farriery, p. 22.

[Abridged in Vol. 1 of Index : Nos. 29, 65, 161, 172, 185, 207, 240, 269, 307, 362, 405, 455, 489, 493, (p. 134), 578, 591, 645.]

952	John Addison Coleman	4 May, 1881	Improvements in apparatus for the manufacture of nails for fastening horse-shoes and other purposes, relating to machines in which 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 metal intended each to form a nail, the thickened end in each case being suited to form the head of the nail. These pieces being severed 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 these rollers the blanks are drawn out in length, and squeezed partly towards the finished shape. Leaving these 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 rollers, delivering the nails in finished condition; and consisting 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, is thus rendered more durable and capable of producing an increased quantity of the articles which it manufactures.	8 July..	203
978	John Griffith Corey and Nathan Weston Spaulding (by their agent, Edward Waters.)	6 July, 1881	Improvements in sheep-shears, for enabling the tension of the shears to be adjusted to the strength of the operator at different times, and for different descriptions of work, consisting in—(1) A U-shaped spring, with parallel sides and curved ends, secured between the shanks of the shears, with its head in the bow of bow-spring shears, and near the joint in shears having their blades united by a rivet through the ends of the shanks; (2) the outwardly curved ends of such spring riveted or otherwise secured to the inside of the shanks; (3) fulcrum introduced between the parallel sides of such spring, which fulcrum may consist of a piece of coiled elastic spring, and may be set at any point by catching it between the finger and thumb and moving it along, the tension of the shears being thus adjusted to any required degree.	24 Aug...	287
988	Francis Seaman	17 Aug., 1881	Improved arrangements for, and method of washing sheep, by means of which the work can proceed without cruelty to the animals (in substitution for the old method of driving the sheep through a race to the brink of the soak-hole, and throwing them into the water with more or less violence), consisting in laying a tramway from the yard to the soak-hole, and running sheep-trucks thereon, such trucks being tilted and the sliding doors thereof opened automatically, so as to discharge the sheep gently into the soak-hole, whence they are passed through a pair of wash-pens and away through a swim-out, and the empty trucks are shunted on to a siding and brought back to the yard.	24 Sept...	313

54. Artists' Instruments and Materials, p. 22.

[No Inventions under this Class yet registered.]

55. Skins, Hides, and Leather, p. 22.

[Abridged in Vol. 1 of Index : Nos. 5, 165, 201, 252, 324, 376, 503, 545, 719, (p. 75), 774, 895.]

931	William Weber (F. B. Hales, agent).	14 Mar., 1881	Improved process for tanning leather, consisting in—(1) treating "green leather" with alum and sulphate of alumina, without using zinc as is done in "Heinzerling's method"; (2) using chloride of barium to fix or make fast the different tans, &c.; (3) using soft green soap after the tans have been fixed, to preserve the evenness of the leather, where salts and alum have hitherto been used; (4) using carbolic acid, resin, vaseline, whale-oil, and ox, cow, or sheep's brains, for finishing—which treatment renders the leather water-tight, pliable, tough, and durable, and prevents belt-leather from stretching.	16 May...	109
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No. of Patent.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted in 1881.	Page in the Third Vol. of Specifications published in 1882.
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55. Skins, Hides, and Leather—*continued.*

936	Christian Heinzerling	24 Mar., 1881	Improvements in converting skins or hides into leather, designated "The Heinzerling Tanning Process," relating to the employment of chromates for that purpose, and consisting in—(1) leather made from skins which have been soaked in a chrome solution, and then treated with stearine or a certain equivalent compound, and afterwards submitted to the action of light before use; (2) 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 certain of its chemically equivalent compounds, and exposed to light before use; (3) 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, and exposing it to light before use; (4) the process of converting skins into leather by soaking them in a chrome solution, and then treating them with stearine or certain equivalent materials, and then exposing them to light before use; (5) 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; (6) 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; (7) 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.	21 May ...	129
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56. Preparing and Cutting Cork; Bottling Liquids; Securing, Opening, and Stoppering Bottles, &c., p. 23.

[Abridged in Vol. 1 of Index: Nos. 242A, 345, (p. 156), 387, 389, 435, 449, 548, 555, 607, 646, 694, 736, 748, 785, 786, 882, 900.]

905	John Lamont	1 Dec., 1880	Improvements in stoppers for bottles for containing aerated or gaseous liquids, being an internal stopper, specially constructed for use with bottles made according to Imperial Patent by same inventor, No. 1,923 of 2nd June, 1874, but adapted for use with any other description of aerated water bottle having a contracted neck, and consisting of a conical stopper of glass, &c., with recessed bottom, and with groove round side for receiving a vulcanized india-rubber ring—which form of construction makes the head of the stopper the heaviest part of it, and causes the stopper to fall into the neck of the bottle in the proper position to close it (when the bottle is inverted while being filled), and there to remain till it is pushed in; also, the piece of india-rubber tube or ring on the stopper serves to prevent either stopper or bottle from getting broken by concussion with each other.	31 Jan. ...	15
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57. Brushing and Sweeping, p. 23.

[Abridged in Vol. 1 of Index: Nos. 461, 474, 795.]

58. Nails, Rivets, Bolts, Screws, Nuts, and Washers, p. 23.

[Abridged in Vol. 1 of Index: Nos. 580, 644, 682, 811.]

59. Hinges, Hinge-joints, and Door Springs, p. 23.

[No Inventions under this Class yet registered.]

60. Locks, Latches, Bolts, and similar Fastenings, p. 23.

[Abridged in Vol. 1 of Index: Nos. 303, 582.]

1001	The Escape Door-lock Company (Limited), (assignee of Jas. Palmer Black)—by its attorney, T. Parfitt.	31 Aug., 1881	Improved door-fastening, designed for expediting the opening of doors to facilitate the sudden egress of large numbers of persons when influenced by excitement, consisting of two bolts, one above and one below, fitting into sockets (say, in the architrave and sill, respectively), kept in position by a thrust spring attached to each, the pressure of the springs being overcome by means of cords, 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, the discs being so adjusted that when the bolts are withdrawn, a pawl falls into a ratchet tooth on one of them, and prevents the return motion of the discs, thus keeping the bolts drawn till the pawl is released.	15 Oct. ...	351
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No. of Patent.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted in 1881.	Page in the Third Vol. of Specifications published in 1882.
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61. Cooking, Bread-making, and the Preparation of Confectionery, p. 24.

[Abridged in Vol. 1 of Index : Nos. 16 (p. 76), 25, 41, 82, 111, 500, 826, 897.]

62. Air, Gas, and other Motive-power Engines, p. 24.

[Abridged in Vol. 1 of Index: Nos. 6, 26, 89, 259, 378, 408, 462, 537, 574, 588, 597, 623, 653, 683, 805, 822.]

918	Frederick Edward Blackett Beaumont.	17 Nov., 1880	Improvements in motor engines worked by compressed air or other elastic fluid under high pressure, being an improvement upon Imperial Patent No. 7 of 1st January, 1876, granted to same inventor, and being applicable to locomotive or other motor engines worked as compound engines by compressed fluid supplied from a reservoir to act in successive cylinders, consisting in—(1) 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 ; (2) 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 ; (3) 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 ; (4) the combination of a lever worked by an eccentric, levers with rollers, screwed rod worked from the piston rod, and sliding adjustable blocks, constituting a variable cut-off apparatus for working the supply valves of the small cylinder ; (5) combining with the cut-off apparatus just described, levers worked by hand, for opening the supply valves of the small cylinder ; (6) combining with the compound cylinders and their passages, casings supplied with steam or hot fluid.	26 March	55
961	Nicolaus August Otto	4 May, 1881	Improvements in gas motor engines, applicable to engines in which the combustible gaseous charge is ignited while the piston is at the dead centre before commencing the working stroke, as in the patent called the "Otto Silent Engine" by the same inventor, and having for its object the removal from the space for containing the charge by which the engine is enabled to be worked (which space is situated in the cylinder beyond the piston) the air or products of combustion remaining in such space when the piston has performed its return stroke after the working-out stroke, and consisting in—(1) retaining the said space at the end of the cylinder and 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 new combustible charge is drawn in and is being compressed the said space is left free by the auxiliary piston, or, according to another arrangement, dispensing with the auxiliary piston and making the working piston 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 ; (2) forming the combustible charge by causing air alone to be drawn in at the commencement and afterwards a combustible mixture, instead of forming the charge (as in the previous patent) in such a way that at the point of ignition it consists of undiluted explosive mixture rendering ignition certain, while the other portion of the charge consists 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 is made to take place gradually ; (3) under different modifications, the foregoing principles are applied to engines with or without an auxiliary piston, or with either one or two cylinders, or with various mechanical means for expelling the products of combustion from the chamber, as in the specification described.	2 Aug. . . .	217
1021	James Robson (by his attorney Owen Blacket).	22 Sept., 1881	Improvements in gas-engines for obtaining motive power, consisting in—(1) an arrangement and general combination of engine by means of 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, the burnt gases of the previous forward stroke being expelled and replaced by the compressed gases from such reservoir during the backward stroke on the other side of such piston, and the compression of the gases being completed by the continued backward motion or ascent of such piston and explosion on the forward stroke ; (2) an alternative form of such engine ; (3) using either gas-flame or the electric spark for igniting the gas ; (4) constructing the gas-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 ; (5) using for starting gas-engines a small supplemental engine worked by the high-pressure exploded gases obtained from the cylinder and stored in a reservoir.	29 Nov. . . .	427

No. of Patent.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted in 1881.	Page in the Third Vol. of Specifications published in 1882.
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63. Water-closets, Earth-closets, Urinals, &c., p. 24.

[Abridged in Vol. 1 of Index : Nos. 144, 184, 514, 715, 829.]

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., &c., into a fertilizing material, consisting in—(1) a novel contrivance for supplying and scattering the deodorizing material over excreta deposited in closets or their pans, viz., a bellows for applying powder, or a spray apparatus for applying liquid deodorants, worked automatically by the seat or otherwise; (2) closet-pan or receptacle with a double flanged lid, packed with india-rubber or other elastic material, and fastened by links and bands, for readily and effectually sealing up the contents for removal; (3) in distilling apparatus for deodorizing and converting offensive matters into a fertilizing material, passing the vapours arising from the heating and stirring of such matters into and through a heated retort containing a red-hot alkali—especially unslaked lime—for the purpose of converting the vapours and gases which have a foul smell into ammonia and sulphur compounds easily separated and of commercial value, such retort being so constructed as to admit of its contents being readily removed and replaced.	3 Sept. ...	295
991	Robert Dale Owen Smith (by his attorney, Joseph W. Oakman).	8 Aug., 1881	Improvements in closets, commodes, urinals, sinks, traps, and other depositories for offensive matters, consisting in so constructing same as to cause a flow of pure air inward and downward through the closet, &c., and thence into a special flue for discharging the current, with 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 into the atmosphere as to render the emanations innocuous.	4 Oct. ...	319

64. Safes, Strong Rooms, Tills, and similar Depositories, p. 24.

[Abridged in Vol. 1 of Index : No. 176.]

65. Wearing Apparel—Head Coverings, p. 24.

[Abridged in Vol. 1 of Index : Nos. 52, 56, 245.]

66. Wearing Apparel—Body Coverings, p. 25.

[No Inventions under this Class yet registered.]

67. Wearing Apparel—Foot Coverings, p. 25.

[Abridged in Vol. 1 of Index : Nos. 130, 205, 322, 415, 450.]

975	George Blackeby	20 June, 1881	Improved lasts for making full and half sizes of boots and shoes, consisting in an adaptation of the form of iron last in general use, by means of which adjustable shells, heel-pieces, and corn and bunion pieces, of brass or other metal, may be easily and securely fixed upon such lasts, giving them the size and shape of the boot or shoe required to be made.	24 Aug. ...	275
1000	Charles Frederic Gardner, Managing Director of the Blake and Goodyear Boot and Shoe Machinery Com- pany, Limited (by his at- torney, Edward Waters).	23 Aug., 1881	Improvements in sewing machinery, 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, consisting in—(1) arrangement of the upper jaw or channel-gauge and the lower jaw or table; (2) combination with the latter of devices for locking and releasing same; (3) mechanism for regulating the action of the awl; (4) arrangement of the cast-off mechanism in combination with the needle and awl and their adjuncts; (5) novel arrangement of the cast-off mechanism, &c., by means of which a clear space or path is left for the thread of the boot or shoe around the stitching point; (6) combination in the same mechanism of the foregoing and other specified devices; (7) employment of a curved needle and adjuncts whose movements are regulated or determined by or according to the thickness of the material being sewn; (8) combination of parts connected with the latter; (9) combination with the support for the needle lever fulcrum of a wedge or device for regulating length of loops; (10) combination with the latter of a stop to govern the movements of such wedge; (11) curved needle, wedge, stop, springs, and other parts, with their respective adjuncts, as combined to constitute the complete machine.	15 Oct. ...	345

No. of Patent.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted in 1881.	Page in the Third Vol. of Specifications published in 1882.
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67. Wearing Apparel—Foot Coverings—*continued.*

1006	George Blackeby	12 Aug., 1881	Invention for pricking, channelling, nailing, and channel-setting; soles of sewn boots and shoes, being a machine for making and putting on the soles of all kinds of strong sewn boots and shoes, especially nailed boots, consisting of mechanism for pricking two or three rows of holes around the sole, piercing at one time all the holes required in the centre of the sole, cutting a double or triple channel all round the sole, and after the nails have been put into the holes prepared for them pressing them all in at one time, then sewing the sole on to the upper, and finally setting the channel, and so completing the operation without using a hammer, whereby the mischief done to the sewing of boots by hammering over or driving nails through the seams is obviated, and the strongest hob-nailed boots and shoes may be made by machine sewing instead of by pegging and riveting as heretofore.	26 Oct. ...	377
1009	George Harrison.....	23 July, 1881	Machine for polishing or burnishing the edges of the soles of boots and shoes, consisting chiefly in—(1) general arrangement of machine by means of which a vibratory motion in the direction of the arc of a circle is imparted to the burnishing tool by the revolutions of a driving shaft; (2) tool-carrier so constructed as to have a vertical motion, and having a spring to keep it down on its work; (3) tool-holder and clutch constructed in such manner as to enable a change to be rapidly made from one tool to another.	29 Oct. ...	383

68. Wearing Apparel—Dress Fastenings and Jewellery, p. 25.

[No inventions under this Class yet registered.]

69. Anchors, p. 25.

[Abridged in Vol. 1 of Index : No. 300.]

70. Metallic Pipes and Tubes, p. 26.

[Abridged in Vol. 1 of Index : No. 760.]

71. Mining; Quarrying, Tunnelling, Well-sinking, and Boring; Mining Explosives and Blasting Appliances, p. 26.

[Abridged in Vol. I of Index : Nos. 2, 85, 103, 132, 183, 188, 195, 257, 315, 331, 341, 365, 366, 371, 416, 428, 511, 554, 556, 583, 637, 647, 657, 674, 675, 685, 700, 747, 853, 874.]

913	William Bickford Smith and George John Smith.	13 Jan., 1881	Invention of an instrument or contrivance for the simultaneous ignition of a number of safety or other fuses, consisting in uniting in one recipient or casing several fire-bearing fuses, either quick or slow burning or explosive, and interposing between the ends of such fuses and the end of a single fire-bearing fuse a suitable ignition sheet or wad, as a vehicle for conveying ignition to such fuses.	7 March	37
933	Henry Francis Parsons	16 Feb., 1881	Improved portable hand-power machine for drilling holes in rocks and other hard substances, constructed thus:—In one form of machine the drilling is effected 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 machine the drilling is done by a boring bit which is driven by gearing from the crank shaft; in each form of machine the 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 side 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 the barrel or to the breast-plate, as desired.	16 May..	115
958	Gilbert Smith Dean	7 June, 1881	Improvements in the preparation of nitro-glycerine compounds, having for their object—(a) the production of a compound of greater breaking power than pure nitro-glycerine, solid and free from leakage, and sufficiently plastic to enable the bore-hole to be completely filled, and the full force of the explosive to be thereby attained; (b) the preparation of said compound in such a manner as to permit of its ready and complete admixture with common blasting powder; (c) increasing the safety of such compounds and of nitro-glycerine compounds, consisting in—(1) Preparing a new variety of nitro-dextrine, by converting cellulose into dextrine, and by the nitration and washing of the material thus produced; (2) compounding nitro-dextrine and nitro-glycerine; (3) compounding nitro-glycerine, nitro-dextrine, and blasting powder; (4) increasing the safety of nitro-glycerine by combining therewith an inexpensive liquid.	2 Aug. ...	207

No. of Patent.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted in 1881.	Page in the Third Vol. of Specifications published in 1882.
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71. Mining, Quarrying, Tunnelling, Well-sinking, and Boring; Mining Explosives and Blasting Appliances—continued.

971	John Mitchell	22 April, 1881	Improvements in rock-drills, of the percussive class, having one cylinder and piston, made of iron, steel, brass, or other metal, and worked by compressed air or steam, consisting in—(1) the construction and arrangement of the cylinder with annular grooves or belts, for the entrance and exit of the motive power, and for surrounding the piston with belts of pressure; (2) the combination with such cylinder of a piston having one or more holes or portways 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; (3) the combination and arrangement of piston, thimble, and rod or bar, the rod or bar having straight flats and a ratchet and pawl at its end, for the purpose of giving a compulsory intermittent rotary motion to the piston; (4) the construction of the drill-tool with cutting point formed to cut and crush; (5) the combination and arrangements of the several mechanical contrivances forming a complete rock-drill.	16 Aug....	263
993	John Dickinson Brunton (per John Mackintosh).	19 Aug., 1881	Improved tunnelling machine, entitled "Brunton's Heading Machine," being an iron frame, carried on wheels, arranged to suit the radii of the circle of the tunnel to be operated on, and kept firm in position by over-head guiding wheels, which machine may be driven either by steam, compressed air, gas, electricity, or a wire rope, and consisting of—(1) 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; (2) 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; (3) the action of the delivery drums and scoops, in connection with the over-fall plate in collecting the <i>débris</i> , and discharging and forwarding same; (4) the general combination and adaptation of the parts constituting the complete machine.	4 Oct. ...	325
999	William Stephens	2 Sept., 1881	Improvements in and relating to machines for boring in the earth, having reference, first, to the contrivances used to lessen the wear and tear of the rope, as it travels over the several pulleys 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 either drift or rock, and especially a bore in drift into which a 6-inch pipe has been forced, and consisting in—(1) the self-adjusting pulleys which slide across and across the framing on the rocking shaft, so as to accommodate themselves to and form permanent guides for the rope as it winds and unwinds from the winch barrel; (2) the combination, with the winch framing, of the standard, rocking shaft, side brackets with the bent arms, quadrant pieces, chain, pin, arms, loose pulleys, and cross-head; (3) constructing reamers with the upper part swivelling on the lower part or nose, and with contrivances for opening out the cutters (or reamers proper) when required, and for closing them again when required; (4) the special combination of parts forming the improved reamer.	15 Oct....	341
1019	John Naylor and Robert Thornton.	10 Oct., 1881	Improvements in rock-drills, relating to contrivances for regulating the supply and exhaust of the air or steam which gives the necessary motion to the drills, and being simple in construction, effective in operation, easily removable, and noiseless in action, consisting in certain peculiarities in the construction and arrangement of an equilibrium reversing valve fitted by preference above the centre of the drill cylinder, and embracing—(1) 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; (2) combining such hollow reversing valves with the cylinders of rock-drills by means of passages, such as and for the purpose described in the specification.	29 Nov....	421

72. Milking, Churning, and Cheese-making, p. 26.

[Abridged in Vol. 1 of Index: No. 686.]

73. Masts, Sails, Rigging, &c., p. 26.

[Abridged in Vol. 1 of Index: Nos. 146, 298.]

74. Casks and Barrels, p. 26.

[Abridged in Vol. 1 of Index: No. 275 (p. 77).]

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75. Steering and Manœuvring Vessels, p. 26.

[Abridged in Vol. 1 of Index : No. 233.]

76. Optical, Mathematical, and other Philosophical Instruments; including Nautical, Astronomical, and Meteorological Instruments, p. 27.

[Abridged in Vol. 1 of Index : Nos, 3, 35, 84, 289 (p. 77), 499 (p. 78), 667, 668, 695.]

77. Harbours, Docks, Canals, &c., p. 27.

[Abridged in Vol. 1 of Index : Nos. 505, 576.]

78. Grinding Grain and Dressing Flour and Meal, p. 28.

[Abridged in Vol. 1 of Index : Nos. 158, 177, 192, 267, 659, 778, 827.]

944	John Auguste Arnold Buchholz.	10 May, 1881	Improvements in machinery for grinding wheat and other grain, and in the process of converting wheat into flour and bran, having for their object, 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 to treat wheat as that it may be converted, by one continuous operation, into marketable flour, and into clean compressed marketable bran, and consisting (as described in the specification) of—(1) the arrangements of machinery whereby wheat and other grain may be reduced to flour, by the operation of two pairs of grinding rollers, or three rollers acting as two pairs of grinding surfaces; (2) the improved mode of conducting the operations; (3) 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.	25 June...	161
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79. Purifying and Filtering Water; including Distilling Sea Water to produce Fresh Water, p. 28.

[Abridged in Vol. 1 of Index : Nos. 424, 526, 854, 874 (p. 120).]

80. Artificial Leather, Floorcloth, Oilcloth, Oilskin, and other Waterproof Fabrics, p. 28.

[Abridged in Vol. 1. of Index : Nos. 28, 294.]

81. Agriculture—Field Implements, &c.; including methods of Tilling and Irrigating Land, p. 28.

[Abridged in Vol. 1 of Index : Nos. 9, 15, 90, 96, 221, 282, 338, 464, 470, 577, 590, 635, 636, 638, 656, 696, 732, 749, 753, 781, 808, 815, 817, 838, 884.]

990	Thomas Haxton (by his agent, Edward Waters).	17 Aug., 1881	Improved harrow or grubber for harrowing, grubbing, and breaking up ground, constructed as follows:—(1) A number of pieces of bar or rod iron are so formed and twisted that the pieces may be easily linked or hooked together, with the teeth or tines (which are part of the pieces) pointing downwards or upwards as may be desired; (2) the pieces may be easily unlinked or unhooked again, or the machine rolled up for the purpose of facilitating the carriage of it; (3) any number of such pieces may be linked or hooked together without the use of a chain or split links, the harrow or grubber thus formed presenting the appearance of a network of lozenge-shaped apertures, having one link less in each row from the front; (4) the machine may be hooked to and pulled by the ordinary whipple-tree.	4 Oct. ...	317
1005	Almerin Hubbell Lighthall	2 Sept., 1881	Improvements in heading and harvesting machines for heading and thrashing grain in the field, relating (first) to that species of combined header and thrasher in which the thrasher may be detached from the header, and in which each being a machine complete in itself may be used separately and independently of the other, and (second) to certain details of construction having the following objects:—(1) 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; (2) 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 perfectly 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; (3) to pro-	26 Oct. ...	371

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81. Agriculture—Field Implements, &c.; including methods of Tilling and Irrigating Land—
continued.

1005	Almerin Hubbell Light-hall— <i>continued.</i>	2 Sept., 1881.	vide 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; (4) 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; (5) 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; (6) 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; (7) to provide a means whereby the headed grain, as it is carried up the inclined portion of the header craper, is prevented from falling down on to the horizontal portion thereof; (8) to provide an improved way of applying tension to the stay or truss-rods on the ends of the main framework; (9) 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.		
1010	James Hornsby, John Innocent, and George Thomas Rutter.	20 Sept., 1881.	Improvements in harvesting and sheaf-binding machinery or apparatus, having reference chiefly to apparatus combined or connected with harvesting machinery for the purposes of compacting and binding the cut and delivered crop into sheaves of uniform bulk and compactness, and 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 applicable also to harvesting or reaping machines of other descriptions, and consisting chiefly of the following parts:—(1) Apparatus for raising and lowering reaping or harvesting machines, to adapt or adjust the relative elevation to that of the corn or crop to be cut, consisting of quadrant-shaped or curved brackets fixed upon the main framing of the machine, and having internal teeth, with which engage spur pinions, actuated by chain wheels, driven by a handle and worm gearing; (2) apparatus for sheaf-binding of the class in which the packing spindle and discs with their claws are arranged to continuously revolve, provided with 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; (3) packing and binding apparatus, automatic in action, and so constructed and arranged that all the sheaves are of about the same size and compactness, in which apparatus the crop is packed against a compressing lever, and 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 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; (4) the knotting apparatus used by preference in connection with the binding apparatus is similar to that described in Imperial Patent No. 2,517, Charles Denton Abel, 21 June, 1880, arranged 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; (5) the ejector, which comes into action immediately after a sheaf has been securely bound and the string or cord severed, consists of lever operated by a crank attached to a spindle passing through a sleeve or tubular shaft carrying the binder-arm, the path of the said ejector being suitably controlled by a radius rod, and motion being imparted to it by a chain-wheel, separate and independent of that of the binding arm; (6) 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, or (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.	5 Nov. . .	387

No. of Patent.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted in 1881.	Page in the Third Vol. of Specifications published in 1882.
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82. Agriculture—Barn and Farm-yard Implements; including the Cleansing, Drying and Storing of Grain, p. 29.

[Abridged in Vol. 1 of Index : Nos. 24, 102, 110, 150, 241, 308, 417, 468, 479, 517, 519, 568, 575, 613, 714, 765, 772, 867, 899.]

960	James Morrow and William Henry Nicholson (assignees of James Morrow).	3 Dec., 1880	Improvement in machines for stripping grain, relating to the contrivance for conveying motion to the beaters of such machines, and having for its object the reduction of the draught, by substituting for the belt and pulley, as the vehicle of motion, toothed gearing, either spur or mitre or the chain and chain pulley.	2 Aug...	215
989	James Martin, John Felix Martin, and Frederick May, trading as James Martin & Co. (per Paine.)	10 Aug., 1881	Improvements in machines for thrashing wheat or barley, consisting in introducing into the body of the ordinary stripper a spiked roller and a concave spiked board, such spiked roller being driven by a belt from the belt-wheel shaft, whereby the grain, having been taken off by the beaters in front, sent up, and passed between the spikes of such cylinder and board, may be thrashed in damp or cool weather without breaking or damaging it.	24 Sept...	315

83. Agriculture—Traction Engines, p. 29.

[Abridged in Vol. 1 of Index : No. 711.]

84. Trunks, Portmanteaus, Boxes, and Bags, p. 29.

[No Inventions under this Class yet registered.]

85. Ice-making, Ice Safes, Ice Houses; Cooling, Chilling, Refrigerating; and use of Cold as a preservative agent, including the Transportation of Substances at low temperatures, p. 30.

[Abridged in Vol. 1 of Index : Nos. 14, 36, 47, 64, 77, 156, 166, 173, 180, 181, 199 (p. 39), 216, 250, 256, 360, 384, 385, 394, 411, 429, 434, 473, 487, 488, 501, 504, 558, 634, 710, 722 (p. 41), 723, 771, 812, 850, 887, 888.]

920	Leicester Allen	13 Jan., 1881	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; and relating 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 being—(1) the obtaining of large expansion and much work from the compressed air, and a corresponding large effect in the cooling, either with or without great intensity of cold; (2) 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; (3) 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; (4) 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; (5) a method and means of drying the air while cooling the same, if necessary to be dried; and (6) 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.	28 March	65
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No. of Patent.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted in 1881.	Page in the Third Vol. of Specifications published in 1882.
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85. Ice-making, Ice Safes, Ice Houses ; Cooling, Chilling, Refrigerating ; and Use of Cold as a preservative agent, including the Transportation of Substances at low temperatures—*continued.*

929	Thomas Bell Lightfoot	10 Mar., 1881	Improvements in refrigerating apparatus, applicable to machines for effecting refrigeration by compressing, cooling, and afterwards expanding air while it is performing work, and designed for preventing the deposition of moisture in the form of ice and snow in the pipes and passages and in the chamber in which the cold air is employed, causing obstructions therein ; consisting in employing two or more cylinders of different sizes in which the compressed and cooled air may be expanded by stages, instead of allowing it to expand to its full extent in one cylinder—suitable vessels or passages being introduced between the successive cylinders for receiving the moisture which has been deposited therein in a liquid form, and means being provided for running or blowing off such moisture—whereby, in 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 ; also, when two stages of expansion suffice for the object in view, 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.	16 May ..	99
943	William Archer, William Atinar Fanning, George Fairbairne, Alexander Donald Macleay, Francis A. Gwynne, Alexander Caldcleugh Macleay, and Herbert Maguire Whitehead.	13 Jan., 1881	Improvements in machinery or apparatus for the artificial production of cold for ice-making and other purposes, depending upon the principle of expressing and distending or expanding the air without the old chemical production, and consisting of the following parts :—(1) 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 ; 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. (2) 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 <i>vice versa</i> . (3) 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 overhead shaft are similar to those of the piston of compression aforesaid. (4) 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.	17 June...	157

No. of Patent.	Name of Applicant.	Date of Application.	Nature of Invention.	When granted in 1881.	Page in the Third Vol. of Specifications published in 1882.
945	Leon Ribourt	4 May, 1881	Improvements in apparatus for preserving alimentary substances by means of cold, particularly applicable to the transport of fresh meat for long distances by sea, and consisting of a refrigerator, having an outer cylinder and an inner cylinder with an annular space between them, such annular space being closed at both ends, and fitted with partitions forming a circuitous channel, to the two ends of which are connected the inlet and outlet pipes for the circulation of incongealable liquid, the whole being constructed and arranged and operating as described in the specification.	25 June...	167
951	Raoul Pierre Pictet	4 May, 1881	Improvements in producing cold and in the manufacture of sulphurous acid, and in apparatus for these purposes, designed for employing sulphurous acid as an agent for the production of ice, instead of ammonia, methylated ether, or sulphuric ether, on account of its liquefying at a lower temperature, having a lower tension, reacting neither on greases nor on metals when in an anhydrous state, facilitating the manufacture of numerous sulphites, and preventing explosion or fire, consisting of—(1) apparatus for sulphurous acid, being a cast-iron retort set in brickwork, provided with a flanged pipe and inclined slightly upwards; two furnaces underneath and a chimney on top; sulphur vapour, or sulphur in either flour or sticks, or other substance capable of giving off sulphur vapour, being introduced into the retort, together with a small stream of sulphuric acid, the whole is converted by reaction into sulphurous acid; the gas is cleansed by being made to ascend an inclined pipe; sulphurous acid gas in an anhydrous state is preferable, and this is produced by passing the gas over an hygrometric substance, such as chloride of calcium, chloride of sodium, &c., or over a stream of sulphuric acid, the latter process being effected by using a pair of washing tubes, an oil gasometer, pump, and worm surrounded with ice; the anhydrous sulphurous acid coming from the worm in a liquid state is stored in copper vessels with a tight tap; a vessel surrounded with ice may be used for condensing the water in the gas before passing it into the washing tubes; the gas thus liquefied and stored is ready for use, and is applied to the making of ice by using it as an agent for producing cold through the evaporation of the volatile liquid on the ordinary principle, but in a simpler way; (2) refrigerator, consisting of an ordinary copper or iron tubular boiler, jacketed and having tight joints; the liquid sulphurous acid introduced through feed-pipe surrounds and circulates amongst the tubes, becomes volatilized, and is sucked up an ascending tube; a saline solution circulates rapidly in the interior, being assisted by a screw in front of the tube-plate; iron tanks, containing the water to be frozen, are disposed around the tubular boiler, with the saline mixture circulating between them and forming a cold bath for them; (3) double action suction and circulating pump, for conveying to the condenser the vapours resulting from the volatilization of the liquid acid in the boiler of the refrigerator; (4) condenser, tubular or in shape of a worm, with stream of water constantly circulating around it in opposite direction to flow of gas; the condensed liquid is collected in a copper or iron receptacle, whence portions of it are constantly being liberated by means of an automatic floating valve for the purpose of being recondensed; (5) a small steam-engine for working the apparatus, and other details.	8 July...	199

86. Unfermented Beverages, Aerated Liquids, Mineral Waters, Perfumes, Extracts, &c., p. 30.

[Abridged in Vol. 1 of Index : Nos. 242A, 266, 465, 836.]

87. Tea, Coffee, Chicory, Chocolate, Cocoa, &c. (comprising their manufacture, but not the preparation of drinks therefrom), p. 30.

[Abridged in Vol. 1 of Index : Nos. 58, 828.]

88. Fire Engines, Extinguishers, Escapes, Alarms, &c.; including Fire-proof Dresses and Fabrics, p. 30.

[Abridged in Vol. 1 of Index : Nos. 50, 60, 148, 333.]

89. Washing and Wringing Machines, p. 30.

[Abridged in Vol. 1 of Index : Nos. 292, 497, 512, 658, 703, 780, 783, 806.]

90. Chains, Chain Cables, &c., p. 31.

[Abridged in Vol. 1 of Index : Nos. 260, 754.]

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91. Dressing and Finishing Woven Fabrics, and Manufacturing Felted Fabrics; including Folding, Winding, Measuring, and Packing. p. 31.

[Abridged in Vol. 1 of Index : Nos. 11, 876.]

92. Stone, Marble, Slate, and Cement. p. 32.

[Abridged in Vol. 1 of Index : Nos. 40 (p. 83), 49, 274, 284 (p. 83), 372, 609, 809, 883.]

93. Glass and Glassware. p. 32.

[Abridged in Vol. 1 of Index : Nos. 345, 386, 393.]

94. Carriages and other Vehicles for Common Roads. p. 32.

[Abridged in Vol. 1 of Index : Nos. 39, 46, 72, 246, 271, 296, 317 (p. 89), 491, 523, 673, 769, 856.]

95. Brewing, Wine-making, and Distilling Alcoholic Liquids. p. 33.

[Abridged in Vol. 1 of Index : Nos. 134, 166, 168, 391, 475, 584, 794, 813, 837.]

1008	John Thomas Toohy and James Toohy.	7 Sept., 1881	Improvements in the manufacture of beer and yeast, being the application thereto of a cooling system, the cooling agent being water of a natural freshness, or water cooled by means of ice, or water cooled in an ice-making machine, and the cooling apparatus consisting of—(1) water reservoirs situated above the fermenting cellars for feeding the main pipe, from which latter a branch pipe leads to every cask; (2) the flow for each cask is regulated by a tap in the top of the beer-cooler which is inserted therein; (3) the current passes down and then up through the beer-cooler, and then down again outside the cask through a pipe leading to the yeast trough or yeast canal, underneath the metal bottom of which is a zigzag road formed with lathes, for finishing the cooling operations; it then finds its way by gravity into the waste water reservoir, where it is kept for further use; (4) the branch joints for the union cellar arrangement are made of india-rubber hose, for coupling off from the main pipe for the washing of casks, troughs, beer-coolers, or yeast-pipes with coolers.	29 Oct. ...	381
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96. Timber. p. 33.

[Abridged in Vol. 1 of Index : Nos. 81, 220, 225, 276, 377.]

1017	David Barnes	19 Sept., 1881	Invention of machine for splitting wood, consisting of—(1) suitable frame with guides for sliding-block; (2) sliding-block, carrying one or more knives, and deriving motion from rod and bell-crank, swinging bar, pawl and ratchet, secured to carriers; (3) alternative devices for increasing or diminishing speed, so as to regulate the supply of wood to the knife or knives.	25 Nov....	415
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97. House-building. p. 33.

[No Inventions under this Class yet registered.]

98. Machine Belts and Bands. p. 33.

919	Maurice Gandy	25 Jan., 1881	Improvements in and relating to belts or bands for driving machinery, and an improved mechanical process for manufacturing the same, and machinery employed therefor, consisting of—(1) belts possessing the following composition and characteristics: a foundation of cotton canvas, composed of warp stouter than the weft, both warp and weft hard spun, and the canvas hard or tight woven; such foundation 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; the interstices and fibre of a structure thus made, saturated with and pressed full of linseed oil, or any mixture of linseed oil, or any other drying oil, or a compound of oil and resin or tallow and resin; the structure thus treated, pressed and stretched rigid, hard, and even, and the elasticity nullified or killed; (2) the mechanical process of and appliances for manufacturing canvas belts, including 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.	28 March	
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99. Signalling, p. 33.

934	Elphinstone Roe.....	7 April, 1881	Improved system of and apparatus for semaphore signalling, entitled the "Nyetagraph," adapted for use at sea or on land, and as a scientific toy, being a means of signalling by night with a lamp having coloured glasses, and by day with coloured flags, and involving the use of the code of colour signals and apparatus described in the specification—such code being identical with the telegraphic code in general use, with the exception that the colours red and blue are adopted as the respective equivalents of the dot and dash, and that a white light is flashed or white flag shown after spelling out each word complete.	21 May...	121
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100. Measuring, Counting, Indicating, and Registering; including Tell-tales and Devices for Recording the arrival of Workmen, p. 33.

[Abridged in Vol. 1 of Index : No. 695 (p. 122).]

101. Submarine and Pneumatic; also Dresses and Appliances for Prevention of Drowning, and Natatory Appliances, p. 33.

[Abridged in Vol 1 of Index : Nos. 35 (p. 121), 552 (p. 113).]

102. Rope-making, p. 34.

[No Inventions under this Class yet registered.]

103. Wool, p. 34.

[Abridged in Vol. 1 of Index : Nos. 75 (p. 74); 110, 150, 241 (p. 133); 255 and 265 (p. 74); 285 (p. 75); 292 (p. 153); 407, 468 (p. 134); 478 (p. 75); 479 (p. 134); 499 (p. 78); 517, 519, and 568 (p. 135); 772, (p. 136); 831 (p. 75).]

909	Thomas John Mullings	30 Dec., 1880	New and improved process for extracting oil and fat, and oily and fatty matters, from wool and other fibrous substances, consisting in removing the hydro-carbons used for cleansing such substances, by the application thereto without heat of the bisulphide of carbon, thereby saving the colour or quality of the material from being deteriorated by the application of heat.	28 Feb. ...	19
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104. Hardware, Edge Tools, and Cutlery, p. 34.

[Abridged in Vol. 1 of Index : No. 789 (p. 42).]

105. Stone Blue, Starch (including Fire-proof Starch), Size, and other Stiffening and Gumming Materials, p. 34.

[Abridged in Vol. 1 of Index : No. 253 (p. 92).]

106. Scenic, Panoramic, and Illusional Apparatus, Translucent Advertisements, and Transparencies; also Theatres, p. 34.

[Abridged in Vol 1 of Index : Nos. 79 and 126 (p. 121); 761 and 852 (p. 122.)]

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Sewing-machines for boots and shoes	Gardner (<i>Waters</i>)	1,000	67	66	345
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Sheep, improved method of washing	Scaman	988	49	63	313
Sheep-shears, improvements	Corey and Spalding (<i>Waters</i>)	978	53	63	287
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Steam-engines, improved contrivances for arresting and extinguishing sparks.	Tyrer	970	49	62	261
Steam-boilers, improved furnace	Denny	938	30	56	137
Steam-boilers, improvements in apparatus for feeding	Davies	942	49	62	153
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Telephones, improvements	Lugo	976	15	47	277
Telephonic apparatus, improvement	Gower	941	15	51	149
Telephonic and microphonic apparatus, improvements	Crossley	911	15	50	29
Thrashing machine, improvement	J. & J. F. Martin & May (<i>Paine</i>)	989	82	71	315
Thrashing machine, improvement	Lighthall	1,005	81	69	371
Tins or cans for preserving meat, improvement	Lee, Wallace, and Knox	946	4	45	171
Tins for preserved meat, improvements	Lee, Wallace, and Knox	972	4	46	267
Tramways, method of constructing	Rowan (<i>F. C. Rowan</i>)	1,026	33	57	433
Tramways, wire rope, for transporting articles and substances, improvements in and in machinery and apparatus.	Hallidie	964	33	57	231
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1883-4.

LEGISLATIVE ASSEMBLY.
NEW SOUTH WALES.

LETTERS OF REGISTRATION OF INVENTIONS

UNDER

16 VICTORIA, No. 24;

FOR

1882.

Printed in accordance with Resolution of Legislative Assembly.



SYDNEY: THOMAS RICHARDS, GOVERNMENT PRINTER.

1884.

1883-4.

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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A.D. 1882, 4th January. No. 1027.

IMPROVEMENTS IN THE REFINING OF IMPURE COMMERCIAL COPPER.

LETTERS OF REGISTRATION to Claude Theodore James Vautin, Russell Barton, and George Hardie, for Improvements in the Refining of impure commercial Copper.

[Registered on the 5th day of January, 1882, 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 CLAUDE THEODORE JAMES VAUTIN, of Rae-street, North Fitzroy, near Melbourne, in the Colony of Victoria, assayer, and RUSSELL BARTON and GEORGE HARDIE, both of Sydney, in the Colony of New South Wales, gentlemen, have by their Petition humbly represented to me that the said Claude Theodore James Vautin is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in the Refining of impure commercial Copper," which is more particularly described in the specification which is hereunto annexed; and that they, the said Russell Barton and George Hardie, are now, by virtue of an assignment made by the said Claude Theodore James Vautin, the joint owners in the Colony of New South Wales with the said Claude Theodore James Vautin of the said invention; 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 Claude Theodore James Vautin, Russell Barton, and George Hardie, 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 Claude Theodore James Vautin, Russell Barton, and George Hardie, 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 Claude Theodore James Vautin, Russell Barton, and George Hardie 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 fourth day of January, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in the refining of impure commercial Copper.

SPECIFICATION of CLAUDE THEODORE JAMES VAUTIN, of Rac-street, North Fitzroy, near Melbourne, in the Colony of Victoria, assayer, and RUSSELL BARTON and GEORGE HARDIE, both of Sydney, in the Colony of New South Wales, gentlemen, assignees of said Claude Theodore James Vautin, the inventor, of an invention entitled "Improvements in the Refining of impure commercial Copper."

In this invention there are two distinct improvements in the refining of impure commercial copper, the one having reference to the removal of the impurities by oxidizing them, and the other to their removal by chlorodizing them. By "impure commercial copper" we mean such as Spanish copper, or the Cobar copper of New South Wales.

Before proceeding to describe our first improvement of removing the impurities by oxidizing them, we wish to state that we are aware that the ordinary method of removing them is by oxidation, but the ordinary method leaves a large percentage of them behind, whereas ours either wholly removes them or reduces their percentage to a minimum; so that this portion of our invention may be called an improved process of oxidizing the impurities in commercial copper in order to their removal, the practical result being that the product of our process is of considerably more value than that of the ordinary process. The ordinary method of oxidizing the impurities in commercial copper is to melt the copper, and then by stirring or rabbling it to bring as much of it as possible into contact with the oxygen of the atmosphere. This, however, has proved to be a very imperfect process, and open to many objections. Our process is either to force oxygen alone or in combination with other gases (and preferably in the form of atmospheric air) throughout the whole mass, so as to oxidize the whole or very nearly the whole of the impurities at once, which then rise to the surface and are skimmed off. As an alternative to the use of oxygen in a gaseous form we substitute oxygen-producing solids, and mix them through the mass of melted metal to be purified. Metallic oxides that yield up a portion or the whole of their oxygen under heat will, when mixed with a suitable flux or re-agent, form such oxygen-producing solids. As samples—

1 part binoxide of manganese	} may be mixed with 2 or 3 parts of slack lime or soda ash.
1 ,, oxide of copper (copper scale)	
1 ,, sesquioxide of iron (hematite iron ore)	

Each oxide and its flux must first be ground and thoroughly admixed, and then the mixture should be thrown on the surface of the impure melted copper and thoroughly rabbled into or mixed with it; after which the heat should be raised in order to reduce the slag to as fluid a state as possible. When the slag is in a fit state it must be carefully removed, and the common operations of poling and casting conducted as usual. Of these solid oxygen-producing materials we prefer the mixture of oxide of copper and slack lime, and in the proportion of from two to three per cent. of the weight of the copper under treatment, and we prefer the use of the solid oxygen-producing materials to the gaseous.

Our second improvement is an alternative one to our first, and is of especial value where the copper to be treated contains bismuth. It consists essentially in such a use of chlorine as will bring it into contact with all the particles of the impure metal to be treated, with the object of taking up all the impurities and carrying them away in the form of volatilized chlorides. We accomplish this in two different ways, either by forcing a current of chlorine or hydrochloric acid gas through or in intimate contact with every particle of the impure melted copper, or by intimately mixing therewith a chlorine-producing composition consisting of a chloride and its re-agent. The best sample of such a composition known to us may be produced by mixing one part salt (chloride of sodium) with from three to three and a half parts of slack lime. Whatever may be the chlorides and re-agents constituting this composition, we first grind and then thoroughly admix the component parts and use the mixture thus:—After the slag has been thoroughly skimmed off the copper under treatment, we introduce it into the furnace in the proportion of from two to three per cent. of the weight of the melted copper, and thoroughly rabble or stir it in, with the object of making it permeate the whole mass. We prefer to throw in this composition by degrees, so as to prevent the waste of the chlorine. If this is done effectually, all or very nearly all the impurities will be expelled in the form of volatilized chlorides. During this portion of the process the damper should be closed, so as to prevent any unnecessary waste of chlorine by the draught of the flue.

When a current of chlorine or hydrochloric acid gas is used, it must be forced through or in intimate contact with the molten copper, and for this purpose almost any shaped vessel may be used, such as a crucible or a Bessemer's converter.

In respect to our second improvement, we prefer to apply the chlorine in the shape of chlorine-producing compositions, of which a mixture of salt and slack lime is the best we know.

Having thus described the nature of our invention and the manner of performing same, we would have it understood that, with respect to the first described improvement, we do not claim broadly the use and application of oxygen or atmospheric air to impure melted copper in order to oxidize its impurities, as we are aware that the common method of refining is to pass a current of atmospheric air over its surface, but what we do claim is—

First—Refining impure commercial copper by forcing a current of oxygen gas through it when in a molten state.

Second—Refining impure commercial copper by thoroughly stirring or rabbling into it, when molten, an oxygen-producing mixture, substantially as herein described and explained.

Third—Refining impure commercial copper by forcing a current of chlorine through or in intimate contact with it when in a molten state.

Fourth—Refining impure commercial copper by thoroughly stirring or rabbling into it when molten a chlorine-producing mixture, substantially as herein described and explained.

In witness whereof, we, the said Claude Theodore James Vautin, Russell Barton, and George Hardie, have hereto set our hands and seals, this first day of November, one thousand eight hundred and eighty-one.

CLAUDE T. J. VAUTIN.
RUSSELL BARTON.
GEO. HARDIE.

This

Improvements in the Refining of impure commercial Copper.

This is the specification referred to in the annexed Letters of Registration granted to Claude Theodore James Vautin, Russell Barton, and George Hardie, this fourth day of January, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 21 November, 1881.

In reply to your B.C. communication of 8th November, No. 10,638, referring to us the application of Messrs. Vautin, Barton, and Hardie, for Letters of Registration for "Improvements in the Refining of impure commercial Copper," we have examined the specification accompanying the same, and have now the honor to report thereon as follows:—Two operations are described in this specification for the purification of copper. The first is substantially the same as the Bessemer process applied to iron, and the second, so far as the forcing of chlorine gas through the metal is concerned, is simply an application of Miller's patented process for toughening gold, and such an application has previous to this been tried experimentally at the Sydney Mint. The mixtures described as oxygen-producing and chlorine-producing are, to the best of our knowledge, novel in their application, although the term "chlorine-producing" characterizing the mixture of common salt and slacked lime may on obvious chemical grounds be objected to.

We are not free from doubt in deciding on this application, but on the whole we consider there is sufficient novelty to warrant the issue of Letters of Registration, which accordingly we beg to recommend.

We have, &c.,

J. SMITH.

A. LEIBIUS.

The Under Secretary of Justice.



A.D. 1882, 4th January. No. 1028.

THE AUSTRALIAN WASHING-MACHINE.

LETTERS OF REGISTRATION to the Reverend Charles Capel Greenway, for
Improvements in Washing-machines.

[Registered on the 5th day of January, 1882, 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 REVEREND CHARLES CAPEL GREENWAY, of Grafton, in the Colony of New South Wales, Clerk in Holy Orders, 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 Australian Washing-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 Charles Capel Greenway, 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 Capel Greenway, 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 Capel Greenway 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 January, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

The Australian Washing-machine.

SPECIFICATION for a machine, to be called "The Australian Washing-machine," for washing clothes, cotton or woollen goods, wool or other fibrous or textile fabrics.

THE machine consists (figure 1A) of a water-tight rectangular or other shaped box, of wood or other material. B B are two uprights attached to the sides of the box A, and supporting an axle, C, on which are two pulleys, D D, the axle being moved by the lever E. F F are chains, straps, belts, or ropes, attached to the pulleys D D, and to the two uprights G, shown in end section. Fig. 2, H H are stops to J, top of open frame-work box, to keep it from rising. I I I is open frame-work box of wood and wire.

The material to be operated upon is placed in bottom of open framework box. The outer water-box, A, is partially filled with water. The machine is set in motion by the lever E being drawn downwards; the open frame-work box containing the material is lifted by means of the straps F F and the uprights G, and pressed against the lid or top J. (fig. 4), whilst by the upward motion of the lever the box again descends, and so on.

This is the specification referred to in the annexed Letters of Registration granted to the Reverend Charles Capel Greenway, this fourth day of January, 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

We have the honor to report that we are of opinion that there is no objection to the issue of Letters of Registration to the Revd. C. C. Greenway, for his invention entitled "The Australian Washing-machine," in accordance with the petition, specification, and claim, &c., transmitted to us under your B.C. communication No. 81-10,278 of the 28th ultimo.

Sydney, 17 November, 1881.

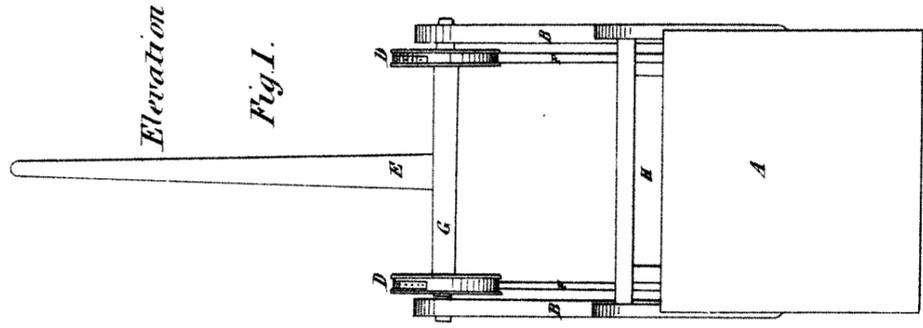
We have, &c.,

JAMES BARNET.

WILLIAM C. BENNETT.

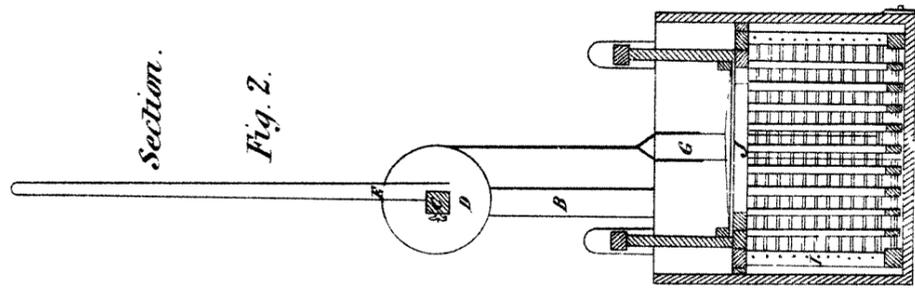
The Under Secretary of Justice.

[Drawings—one sheet.]



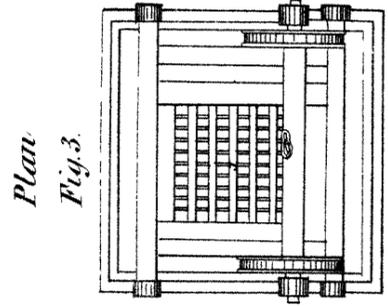
Elevation

Fig. 1.



Section.

Fig. 2.



Plan

Fig. 3.

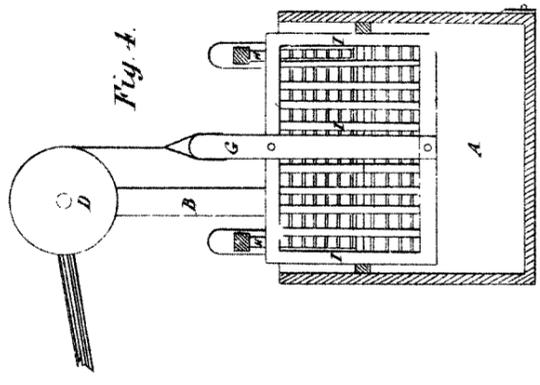
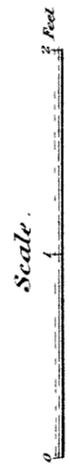
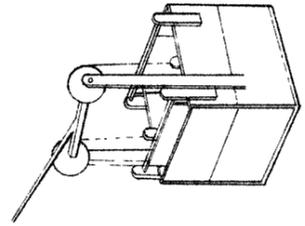


Fig. A.



*This is the Sheet of Drawings referred to in the annexed
Letters of Registration granted to The Reverend Charles
Cipiel Greenway, this fourth day of January, A.D. 1882.
Augustus Lortus.*



A.D. 1882, 7th January. No. 1029.

IMPROVEMENT IN MANUFACTURING ARTIFICIAL STONE.

LETTERS OF REGISTRATION to Robert Holden Stone, for an Improvement in the Process of manufacturing Artificial Stone.

[Registered on the 10th day of January, 1882, 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 HOLDEN STONE, of New-street, Brighton, 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 "An Improvement in the Process of manufacturing Artificial Stone," which is more particularly described in the amended 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 Robert Holden Stone, 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 Holden Stone, 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 Holden Stone 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 January, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvement in manufacturing Artificial Stone.

SPECIFICATION of ROBERT HOLDEN STONE, of New-street, Brighton, in the Colony of Victoria, civil engineer, for an invention entitled "An improvement in the Process of manufacturing Artificial Stone."

THE object of this invention is to manufacture artificial stone, by the formation in an improved manner of silicate of lime (or of hydrosilicate of calcium) *in situ* as the matrix or cementing medium; the said matrix being in chemical contact with the silicious aggregates employed to form the bulk of the stone, and produced by the action of heated water or heated solutions of lime permeating the mass after it has been moulded into the blocks required, as hereinafter more particularly described.

I first take as aggregates any natural silica or silicate, such as sand, disintegrated quartz, or other silicious rocks or earths, a portion of which should be either naturally in or reduced to an amorphous condition, whether or not in natural combination with any metallic base. I next take lime, either quicklime (by preference ground) or an equivalent of slaked lime (by preference) in the form of a pure hydrate (or hydroxide of calcium). These materials I mix; the aggregates in various degrees of disintegration, so that their particles shall, with those of the lime employed, reduce the volume of voids in the finished stone to a minimum. If quicklime is used, I employ a sufficient quantity of water with the aggregates to cause its perfect hydration before the next stage of the process, and use it in such proportions only as necessary to thoroughly coat every particle of the aggregates, no more being required.

The above materials I then thoroughly triturate with such a further quantity of water only as required to form a mass of sufficient plasticity to render it capable of being compacted by ramming or pressing in moulds of any form required, it being advisable to avoid any excess of moisture beyond that necessary to permanently compact the material. The concrete mass is then moulded, preferentially by ramming, in the required form, when the moulds can be at once removed, turning out the moulded piece to set on any suitable bed. To prevent carbonization of the exterior of the stone while setting, it is advisable to wash the surface over with a weak solution of silica in any convenient form (a dialysed solution being preferable), thereby forming immediately a surface of silicate of lime. This portion of the process is, however, not absolutely necessary, and is not claimed by me as a portion of my invention.

The process of setting will ordinarily occupy from three to ten days, and is to enable the blocks to be handled with safety; and although not necessary longer than to set the surface, by preference I allow time enough for it to take place throughout the mass.

I next place the blocks in baths or tanks of any suitable form, and immerse them in water (by preference charged with lime or other solution of calcium), for the purpose of preventing the immediate dissolving or washing out of the lime near the surface of the stone. The tanks are then gradually heated by any suitable appliance, as by steam pipes, and maintained at an average temperature of 200 degrees Fahrenheit (by preference, under 212°), until the requisite degree of hardness is acquired throughout the mass, the time being from forty-eight hours to six days; the combined action of the lime, water, and moist heat forming a solvent acting on the surfaces of the aggregates, and with the amorphous portions of them forming, as is believed, the matrix of silicate of lime. This action is believed to take place by the alkaline base of calcium in solution, by the continuous supply of water acting on the silica and forming an insoluble silicate of lime (or hydrosilicate of calcium), in an analogous manner to the formation of other alkaline but soluble silicates under analogous conditions. It is essential to the appearance and perfection of surface that no degree of heat should be applied to subject the stone to the disintegrating action of steam by expansion.

The following form and proportions of materials are successfully employed and form a good stone:—

Sand (free from all vegetable matter), 70 to 80 per cent. by measure.

Amorphous silica or silicates, as calcined clay, 10 per cent. by measure.

Quicklime, reduced to hydrate, 10 per cent. by measure.

Water, 10 per cent. by measure.

I do not confine myself to the precise details herein specified, such as the precise proportions of the materials used, nor to the time of their treatment, so long as the nature of my invention be retained, although in these particulars I have stated those which I believe to be the best; nor do I claim the manufacture of artificial stone by the admixture of limes and silicates, as I am aware that such admixtures are already in use; but what I do claim as my improvement in the process of manufacturing artificial stone is the use and application of heated water, with or without lime in solution, to such combinations (of lime and silicate) to form a matrix of silicate of lime or hydrosilicate of calcium, substantially as herein described and explained.

In witness whereof, I, the said Robert Holden Stone, have hereto set my hand and seal, this twenty-sixth day of September, one thousand eight hundred and eighty-one.

R. HOLDEN STONE.

Witness—

EDWD. WATERS,
Melbourne, Patent Agent.

This is the amended specification referred to in the annexed Letters of Registration granted to Robert Holden Stone, this seventh day of January, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Improvement in manufacturing Artificial Stone.

REPORT.

Sir,

Sydney, 6 October, 1881.

Having examined and considered the application of Mr. Robert Holden Stone for Letters of Registration for "An improved Process of manufacturing Artificial Stone," we have the honor to report that the specification discloses no novelty of invention beyond processes at present in use—protected in this Colony by Patents granted in 1863 to Mr. Fredk. Ransome, and in 1876 by Messrs. Nicolle and Mort,—except the use of heated water with or without lime in solution during the process of manufacture, for which we see no objection to Letters of Registration being granted.

We have, &c.,

JAMES BARNET.
EDMUND FOSBERY.

The Under Secretary of Justice.

NOTE.—The specification and claim having been altered as suggested, Letters of Registration were issued accordingly.



A.D. 1882, 16th January. No. 1030.

IMPROVEMENTS IN THE DISTRIBUTION AND APPLICATION OF ENERGY BY ELECTRICITY FOR LIGHTING, &c., AND IN THE APPARATUS EMPLOYED THEREIN.

LETTERS OF REGISTRATION to St. George Lane Fox, for 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.

[Registered on the 17th day of January, 1882, 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 ST. GEORGE LANE FOX, of Queen Anne's Gate, 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 entitled "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," which is more particularly described in the amended 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 St. George Lane Fox, 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 St. George Lane Fox, 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 St. George Lane Fox 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 January, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in the distribution and application of energy by Electricity

A.

SPECIFICATION of ST. GEORGE LANE FOX, of Queen Anne's Gate, London, England, gentleman, for an invention entitled "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."

My invention has reference primarily to a system whereby energy for the general purposes of lighting, heating, or the development of motive power is transmitted by means of electric currents from any point or station where energy is developed, to a town, district, or building, for distribution as required.

The development of energy at the said point or station may result either from the combustion of fuel or other chemical action, or it may be developed from natural causes.

My system is as follows:—From the generating station I lay down insulated electrical conductors, which proceed in the direction where the energy is required. These insulated conductors, which may be called electric mains, submains, and branches, are distributed throughout the town, district, or building. The electrical generators which produce the currents are so connected with the mains that they keep them and the submains and branches charged at a constant electro-motive force or potential tending to develop currents in every direction to the earth. This being so, it is obvious that any electrical communication being made between the mains (submains or branches) at any point and the earth, a current will pass at such point between the main and the earth, the strength of which current will depend on the electro-motive force of the mains at that point and the resistance of its communication with the earth.

Thus, in applying my system to electric lighting, for example, the lamps are worked in multiple arc, and the light is produced by the incandescence of a resisting conductor; and although the number in actual use will vary considerably from time to time, the electro-motive force is maintained constant.

The maintenance of a constant electro-motive force in the mains, submains, and branches is effected as follows:—First, by electrometers or electro-dynamometers, such as those hereinafter described, controlling the action of the generators; secondly, by electrometers or electro-dynamometers, controlling the action of rheostats or resistances inserted at junctions between the mains and the branches; and thirdly, by the use of secondary batteries joined together in series, these batteries being in some cases furnished with commutators, as hereinafter described.

In the accompanying drawings, figure 1, sheet 1, is a diagram indicating the manner in which I distribute the electric energy, by mains, submains, and branches throughout a town or district. The electric generator or generators are situated at A, for example, and from one pole or electrode the large conductors or mains proceed. To these mains the smaller conductors or submains are connected, and to these in turn may be connected still smaller conductors or branches, all as indicated in the figure. The other pole or electrode of each electric generator is connected with the earth. The size of the main conductors should be as large as practicable, in order to reduce as much as possible the inequality of tension or electro-motive force in different parts, and to reduce the loss by transmission. The size of the submains or branch conductors should depend on the amount of electricity to be conveyed through them. The electro-motive force in the mains should be kept as nearly as possible constant at (say) 65 volts or British Association units, or more if the insulation will permit of it. It is, however, desirable not to increase the electro-motive force much above 65 volts, in order that no unpleasant shock may be caused in case a person by touching the terminals or otherwise brought himself into connection with the mains and the earth so that the current passes through his body.

The secondary batteries, which I employ to assist in maintaining the electro-motive force in the mains, are by preference Planté's lead and sulphuric acid batteries. I join these batteries together in series, as will be readily understood, between the main and the earth, and they serve as a kind of reservoir for the electricity. The cells should have a very large conducting surface, and there should be several batteries connected up at various points of the mains, so that by increasing the electro-motive force during the hours when not much electricity is being used, they will become charged, and the electric force will be stored up in them, so that a sufficient supply will be available when the electro-motive force falls owing to the draft from the mains when the force is most used and needed. The number of cells in each of these batteries will depend on the electro-motive force of the mains. Figure 2, sheet 1, is a diagram representing a secondary battery joined up between the main and the earth, for the purpose above described. A represents the electric generator or generators from which the electric currents are conveyed through the conducting mains, as already explained; B represents the secondary battery joined up between the mains and the earth; E E indicate the earth; and *ll*, the lamps or other points where the electricity is utilized; these lamps being worked in multiple arc, that is to say, every lamp has one pole connected with earth. I sometimes supply each of these secondary or reservoir batteries with commutators, as will be readily understood, and with means such as those hereinafter described, for working these commutators, so that it will not be necessary to increase the electro-motive force in the mains in order to charge them; but by merely coupling two or more parts or the whole battery for "quantity," they can be charged with a low electro-motive force, and be capable of giving, by an alteration of the commutators, the full tension when required.

In charging the secondary battery it is desirable, in order to prevent loss of energy, that as many cells as possible should be connected in series, that is to say, as large a number as will give an electro-motive force just inferior to that of the mains. Supposing the electro-motive force of the mains to be equal to that of fifty cells of the secondary battery (charged), and the battery to consist of fifty cells, no current will pass from the mains through the battery to charge it unless the electro-motive force of the mains be increased above that of the fifty cells, or else the number of cells in series be diminished. Now, in order to charge the battery, one of its cells may be cut out by means of the commutator, leaving the remaining forty-nine in series, through which number a current from the mains will pass, due to the electro-motive force of one cell and the resistance of the battery. The cell thus cut out of the series should be changed from time to time so as to equalize the charge in all the cells.

In order to keep the electro-motive force in the electric mains constant, there should be not only several generating machines and a number of secondary or reservoir batteries, but also a regulator; and
for

for Lighting, &c., and in the means or Apparatus employed therein.

for this purpose I employ an electrometer or electro-dynamometer, such as that which I will now proceed to describe. This instrument is represented in figure 3, sheet 1. It consists of an electro-magnet, *a*, connected with the main, *M*, and with the earth, *E*. The soft iron core of this magnet is magnetized in a degree proportionate to and varying with the electro-motive force of the main at the point where the wire of the coil is connected. An armature, *c*, fitted with a weight, *d* (or its equivalent), approaches or recedes from the core as the strength of its magnetism increases or diminishes. To the armature is connected a pivoted rod, *h*, which moves along a plate, *i*. On this plate are two contact pegs, *ll*, of platinum or other suitable material. These pegs are respectively in connection with two electro-magnets, *mm*, and the armatures of these two magnets are respectively connected to two levers, one of which works a valve for diminishing the supply of steam to the engine which works the electric generators, while the other lever works a valve for increasing the said supply of steam, or the two levers may otherwise control the action of the generators. Thus, as the armature *c* rises or falls to a sufficient extent the rod *h* comes in contact with one or other (as the case may be) of the pegs *ll*, and thus completes an electric circuit with the corresponding electro-magnet *m*, so as to operate the lever and valve in connection therewith. If the plate *i* be graduated as a scale, the position of the rod *h* can indicate the amount of electro-motive force in the main at the point where the electro-magnet *a* is connected therewith, and in this case the pegs *ll* should be attached to an adjustable or sliding piece, *k*.

One manner in which the magnets *mm* may be made to operate the levers and valves is represented in elevation in figure 4; *mm* are the electro-magnets; *nn* a pair of levers connected to the armatures, *n¹n¹*, and fixed to a rocking shaft, *o*, which works the valve or valves. To the shaft *o* is keyed a toothed wheel, *p*, communicating by a train of wheels, *q*, with the spindle of a fan, *r*. As the armature of one or other of the levers *n* is attracted by the corresponding magnet *m*, the shaft *o* in rocking has to move the wheels *p q* and fan, *r*; and as the fan must make several revolutions before the armature can come in contact with the magnet, the resistance of the air retards the action and prevents too sudden a movement.

The arrangement shown in figure 3 will also serve to move the commutator of the secondary battery as the height of the tension requires. In this case the levers connected to the armatures of the magnets *mm* are made to operate the commutators.

I employ a similar instrument to control the action of rheostats or resistances, connected where considered necessary at various points in the mains. The rheostat or resistances are inserted at the point of junction between each branch and its main, their object being to increase the resistance at the points of junction as the electro-motive force in the branch conductors rises, and thus to prevent too large a current passing through those branches, joining the main at points where the electro-motive force is temporarily high, and to decrease the resistance when the electro-motive force falls, and so to equalize the electro-motive force in that direction. By this means, although the electro-motive force in the main conductors may be continually altering, owing to the alteration of draft in different directions, the electro-motive force in the branches themselves will be maintained very nearly constant. The electro-magnet *a* of the electrometer or instrument (figure 3) is for this purpose placed in circuit between the branch conductor and the earth. The armature *c*, as it approaches or recedes from the magnet *a* in proportion to the increase or diminution in the strength of the current, causes the rheostat, through the instrumentality of currents set up by contact pegs through the magnets *mm*, to interpose more or less resistance to the passage of the current into the branch. Instead of working through the instrumentality of the magnets, as just described, the rheostat may consist of a vessel containing a conducting fluid such as mercury, and either fixed to the armature *c* or connected thereto by levers. The plates of a resistance coil dip into the mercury, and more or less of these plates are immersed according to the height of the armature and therefore of the mercury.

Figure 5 is a diagram representing my system complete. *AA* represent the electric generators, which are worked by a steam-engine or other power (not shown). These generators have each one pole or electrode connected with the mains and the other pole or electrode connected with the earth. *EEE* (in various parts of the diagram) represent earth; *xxx* are mains, and *yy* branches or submains. *BB* are the secondary batteries, which are joined up between the mains *x* (or branches *y*) and the earth. *F* represents the electrometer (which may be that hereinbefore described, and shown in figures 3 and 4) connected with the main and the earth, and acting, as hereinbefore explained, so as to control the action of the generators *A*, by acting on the engine which works the generators or otherwise. *G* represents a commutator for regulating the action of the corresponding secondary battery *B*, this commutator being itself operated by the electrometer *F¹*, which may be likewise that shown in figures 3 and 4. *H* represents the rheostat or resistances inserted at the junction between the main and a branch. The action of this rheostat is controlled by an electrometer, *F²*, which may also be that shown in figures 3 and 4. The sub-branches leading to the lamps are not indicated in the figures, as they are shown in figure 2.

For economy in the transmission of the electro-motive force from a distance I generate it at high tension, and for convenience of distribution I reduce it to a low tension. The reduction can be effected in several ways. One way is to charge secondary batteries in series and to discharge them in multiple arc by suitable arrangements of commutators and connections, as will be well understood. Another way is to charge condensers in series or in "cascade" and discharge them in multiple arc, likewise by suitable arrangements of commutators and connections. A third way is to use the high tension currents to actuate suitable motors, which in their turn actuate generators for producing lower tension currents.

Figure 6, sheet 2, is a side elevation, and figure 7 a plan of apparatus which I may use instead of the apparatus shown in figure 4, for acting on the valves of the engine which works the electric generators, or for operating the commutators of the secondary batteries, or for controlling the action of rheostats or resistances. *mm* are two electro-magnets, the circuits of which are respectively completed by an electrometer or instrument such as that shown in figure 3, when the electro-motive force in the mains rises above or falls below a given limit, as already explained. I connect these two electro-magnets *mm* in joint circuit, as seen in figure 7, with a third electro-magnet, *m¹*. The armature *m²* of this magnet has a spring *m³* attached to it, and is fitted similarly to the ordinary vibrating hammer of an induction coil, and it vibrates whenever the circuit through either of the contact pegs of the electrometer is completed. The armature *m²* carries a pawl or click, *m⁴*, which acts upon a ratchet wheel *m⁵* so that the vibrations of the
armature

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armature cause the wheel to rotate. The rotation thus imparted to the wheel m^5 is transmitted by means of any suitable devices, which are thrown into and out of gear by the electro-magnets $m m$, to the part or device to be controlled or regulated. The transmitting devices shown in the figures consist of a bevil wheel m^6 carried on the same shaft as the wheel, m^5 , and of two bevil wheels $m^7 m^8$ on a shaft, m^9 , which is connected with the part to be controlled. The armature n^1 , which is common to the two electro-magnets $m m$, is carried on the end of a lever m^{10} , centred at m^{11} , and connected at its upper end to the shaft m^9 . Thus, as the one or the other of the magnets $m m$ attracts the armature n^1 , so does the lever m^{10} move in the one direction or the other, and so is the shaft m^9 made to slide in a corresponding direction in its bearings, so as to bring the one or the other of the wheels $m^7 m^8$ into gear with the wheel m^6 .

Sometimes, instead of the third electro-magnet m^1 , I employ two electro-magnets, connected respectively with the two magnets $m m$. There will in this case be a separate vibrating armature to each of the two magnets, to act respectively upon two sets of ratchet teeth arranged in reverse ways on the wheel m^6 . The reversing gear will in this case be dispensed with, the rotation of the ratchet wheel in the one or the other direction being transmitted in any suitable way to the part or device to be acted upon.

For turning on and off the electric currents for various purposes—such, for instance, as turning on and off the current to light and extinguish a number of street lamps, without lighting or extinguishing the lamps in adjoining houses which derive their current from the same electric main as the street lamps—I adopt the following means:—

According to one method, represented in figure 8, sheet 1, I connect in series by a line wire A a number of apparatus fitted one to each of the street lamps B, which may be joined between the electric main C and the earth D. This apparatus is composed of a permanent magnet E and an electro-magnet F capable of altering its polarity according to the direction of a current sent through it. The coils of this electro-magnet F form part of the circuit of the line wire A. On sending a current through the line wire, the movement of the magnet at every lamp in the series is caused, by coming in contact with a peg, G, or by moving away from this peg, to turn on or off the current from the main, according to the direction of the current sent through the line wire; or an electro-magnet acting against a spring may be employed at each lamp, the magnets being acted upon by the current sent through the line wire. In this case the current must be maintained as long as the lamps are to continue alight, or as long as they are to continue unlighted, as may be arranged.

According to another method, represented in figure 9, sheet 1, I employ in connection with every lamp B to be lighted or extinguished an electro-magnet F, of very high resistance, many times greater than that of the lamp. The circuit of this electro-magnet is always closed, so that a feeble current is always passing through it from the main C to the earth D. In connection with this magnet is a spring armature, H, the tension of the spring exactly balancing the attraction of the magnet at the normal electro-motive force of the main. An increase or decrease in such force will therefore make the armature approach or recede from the magnet. The armature is placed so that the movement caused by a momentary increase of the electro-motive force closes the circuit of a second electro-magnet, I, and that the movement caused by a momentary decrease of the force closes the circuit of a third electro-magnet, K, these two magnets being each then joined between the main and the earth. One of these magnets, I, turns the lamp current on, and the other, K, turns it off, when the circuits are respectively closed. This is effected by means of the bar L connected with the main C, and having mounted on it an armature, M. The movement of the bar to the magnet I makes contact with the lamp B through the peg G, while the movement of the bar to the magnet K breaks the contact. The momentary increase of the electro-motive force can be conveniently produced by the momentary introduction between the main and the earth of a powerful secondary battery, and the momentary decrease by the sudden short circuiting of the mains with the earth, or by a sudden check of the source of supply of the electro-motive force. N is an insulated stop to prevent the armature M coming into contact with the magnet K, and therefore avoid the expenditure of electro-motive force which would otherwise take place through this magnet when the lamp is not lighted. The peg G is also so placed as to prevent the armature M coming into contact with the magnet I.

Instead of the first electro-magnet in the last-described arrangement, an electro-static apparatus such as a "quadrant electrometer" may be used.

My invention also includes improvements in electric lamps for use in connection with a system of distribution such as that hereinbefore described, the lamps being worked in multiple arc, and the light being produced by the incandescence of a resisting conductor, in the manner already hereinbefore explained.

Figure 1, sheet 3, is a vertical section representing one modification of my improved lamp. a is the flask or globe; $b b$ are glass tubes containing mercury. These tubes are closed at their upper ends by a layer of cotton wool, d , and a layer of plaster of Paris or other cement, e . The top of the neck of the flask is hermetically closed by uniting thereto, at the point x , by the ordinary glass-blowing process, the upper part of the glass piece c which carries the mercury tubes. $f f$ are the conducting wires or terminals; they are inserted into the tubes $b b$, and extend down into the mercury therein. $g g$ are the platinum wires; they extend up through the bottom of the tubes b , into which they are fused. The tubes should be of glass which has lead in its composition, because without the lead the glass and platinum will not adhere together without difficulty, and the glass is liable to crack. It will be readily understood that as the platinum wires g and the conducting wires f both terminate in the mercury in the tubes $b b$, the mercury forms the electric connection between them. The chief object of the mercury, however, is to prevent leakage of air into the lamp through any minute aperture which may exist where the platinum wires are fused into the glass. The lower parts of the tubes b are preferably formed of the enlarged or bulb shape shown at b^1 , as I find that if they are cylindrical or at all tapered, the air having no room to escape when the mercury is poured in, is liable to remain in the bottom of the tubes, from which it gradually finds its way into the flask and destroys the vacuum therein. The lower ends of the platinum wires g are thrust into holes drilled through cylinders or blocks $h h$ of carbon or plumbago. I cement them in these holes, and the cement I

use

for Lighting, &c., and in the means or Apparatus employed therein.

use for this purpose is (genuine) Chinese or Indian ink, either alone or mixed with some other material such as plumbago or carbon. I find this cement makes a good connection, particularly after it has become charred by the heat of the lamp. In order to give the cement a better hold the wires may be roughened. i is the resisting conductor, which I term the electric bridge; its ends are thrust into holes or slits in the cylinders h , so that they may meet the platinum wires g (but it is not necessary they should meet), and they are similarly cemented into these cylinders with Chinese or Indian ink. This ink is applied to the ends of the bridge i , and dabbed round the holes in the cylinders h , as seen at k .

The manner in which the parts of the lamp may be put together will be understood by figures 2, 3, and 4, sheet 3. Figure 2 represents the flask a as it is blown in the first instance. It has a hole at bottom, from which a tube l leads. Figure 3 represents the piece c ; it is hollow, and is blown with the tube m at its upper part; from its lower part depend the tubes b ; the parts nn below these tubes are solid, and have the wire g fused into them. After the carbon cylinders h have been thrust over the ends of the wires g , and the ends of the bridge i have been thrust into the cylinders h , the piece c is placed over the flask a so that the tubes b and other parts may enter the neck of the flask, as seen in figure 4. The glass of the piece c and of the flask neck at their point of junction x are then united together by blowing and fusing in the usual way, and the piece c is then severed at the point y . The mercury is then poured into the tubes b , the terminals f inserted, and the cotton wool and plaster of Paris introduced over the mercury. There now only remains to produce the requisite vacuum in the flask, and this is effected by exhausting through the tube l by means of apparatus constructed as hereinafter described, and as shown in sheet 4. When the vacuum has been produced the tube h is closed by fusion, as in figure 1. The bridge i is raised to a state of incandescence during the exhausting process by passing an electric current through it, and the exhausting is continued until gases cease or almost cease to be given off.

Figure 5, sheet 3, represents a modification in which the ends of the platinum wires g are formed with spirals, o , into which the ends of the electric bridge i are thrust and cemented by Chinese or Indian ink, the ends of the bridge i being made thick for the purpose.

Figure 6, sheet 3, represents another modification, in which the ends of the bridge i have a block p of porcelain or other suitable material between them to keep them apart, and they are pressed against this block p by a pair of metallic clips, q , which form the electric connection between the bridge i and the platinum wires g . The clips q are soldered to the wires g , and pass through a block r of porcelain or other suitable material. s is an india-rubber stopper, t a layer of mercury, and e a layer of marine glue or other cement. The tube l , by means of which the air is exhausted from the lamp, is shown as passing through the flask neck, but it may be at the bottom of the flask, as in figures 1, 2, and 4. Sometimes I substitute for the platinum wires in electric lamps sticks or cylindrical pieces of plumbago, which I insert through the bottoms of the tubes b , and secure thereto by carefully melting in.

I make the electric bridges for the lamps from various materials and in various ways. I sometimes make them from vulcanized fibre which has been baked to a white heat. I cut from a sheet of the vulcanized fibre a strip or piece narrow in the middle and comparatively wide at the ends, as seen in figure 7, sheet 3. The thickness, width, and length of the strip depend upon the resistance required; any resistance can be easily obtained between 10 and 1,000 ohms (British Association units). A conductor made from a strip $\frac{1}{8}$ inch thick, $\frac{1}{8}$ inch wide, and $1\frac{3}{4}$ inch long in the narrow part, will have a resistance of about 30 ohms when incandescent and 60 ohms when cold. These conductors, when incandescent, have half the resistance which they have when cold. Having cut the strips of the form above described, I bend each, as shown in figures 8 and 9, so that while the broad ends are brought parallel to each other and nearly together, the narrow part is in the form of a loop or bow. I then arrange several of them together, as represented in figures 10 and 11, so that the broad parts are pressed by means of a spring u between plates v of steel or porcelain, the plate separating the two broad parts of each strip being the same thickness as the small block of porcelain p which keeps them apart in the lamp, figure 6. The set of strips thus held by means of the spring u I then place in a crucible (see figure 12) filled or packed with powdered charcoal or plumbago. I raise the crucible to a bright red or white heat, taking care, however, not to so heat the spring u that it will lose its elasticity; for this purpose the main portion or body of the spring is kept out of the crucible.

When baked as above described, the strips or electric bridges are carbonized by heating them at a white heat in benzole vapour or other suitable carbon compound. This can be conveniently effected as follows:—The bridge having been mounted in clips similar to the clips q (figure 6, sheet 3) in a vessel containing only rarefied benzole vapour or carbon compound, an electric current is then passed through it so as to raise it to a white heat; the heated surface will rapidly assume a light greyish appearance, while the resistance of the bridge will be rapidly diminished. This process is continued for about half a minute, or until the bridge has been reduced to the required resistance. The broad parts are carbonized by passing a more powerful current through them; and during this operation, which is also conducted in a vessel filled with benzole vapour or carbon compound, the narrow part, or bridge proper, is immersed in some conducting medium such as mercury (see figure 13, sheet 3). The broad parts must be very well carbonized, so that their resistance may be made very small. Instead of heating the bridges by the passage of an electric current, they may be suspended in a porcelain vessel filled with the benzole vapour or carbon compound, the porcelain vessel being then raised to a white heat in a furnace.

The vulcanized fibre used for making the bridge should be as free as possible from mineral substances containing oxygen. In order to remove all traces of mineral matter the bridge, when finished, should be boiled in nitro-hydrochloric acid and then in hydrofluoric acid.

The mode and means herebefore described of manufacturing electric bridges from vulcanized fibre may also be applied to the manufacture of bridges from other suitable materials containing a substance of a highly refractory nature—such, for example, as paper.

Another way in which I manufacture the bridges is to wind thread, string, or tape of flax or other vegetable fibre around a block or piece of graphite or gas-carbon of suitable shape or dimensions—such, for example, as that shown at w in figures 14 and 15, sheet 3—into which block I have previously let a piece of steel or other metal, w' , capable of withstanding the heat hereinafter described. The piece of steel

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steel projects from the periphery of the block in the form of a knife-edge. To prevent the convolutions or turns of the thread, string, or tape getting displaced, I bind them with string, w^2 . I place the block (one or more at a time) with its convolutions of thread, into an hermetically-closed crucible, which I raise to a white heat. The thread thus becomes baked; in so doing it shrinks, and each turn or convolution breaks; but as the piece of steel w^1 acts as a cutting edge, all the convolutions break in the same line. The size of the blocks, and therefore of the convolutions, and the thickness of the threads are regulated according to the lighting power required. The baked threads are removed from the blocks w and placed in suitable numbers in clips or holders and immersed in an atmosphere of coal-gas or other carbon compound, while an electric current is passed through them so as to raise them to a white heat. The baked threads are at first of so high a resistance that it is difficult to get to pass through them an electric current of sufficient strength to produce incandescence. I overcome this difficulty by connecting the threads directly with a dynamo-electric machine or other electric generator, by then momentarily short-circuiting the machine, and suddenly breaking contact through the short circuit; the result of this is that the extra current set up has so high an electro-motive force as to momentarily raise the baked threads to a state of incandescence, during which time the resistance is diminished owing to the deposit of carbon on the surface. I repeat the operation a number of times, until a current of moderate electro-motive force will raise the threads to a white heat; and I keep up this current of moderate electro-motive force until the resistance of the threads is reduced sufficiently to suit the electro-motive force at which it is intended to work. Sometimes, in order to increase the effect of the extra current set up as above explained, I introduce into the short circuit a large electro-magnet having a very low resistance.

In order to thicken the ends of the carbonized threads so that they may be adapted for insertion in the platinum spirals o (figure 5, sheet 3), or other holders which may be used in the lamps, I connect the two sides of the threads at a short distance from their ends by a copper or other metal wire or clip, and I then continue to send a current through; and as this current does not pass through the parts of the threads beyond the wire or clip, the deposit of carbon takes place upon and thickens the ends only.

I also make the electric bridges from certain grasses or fibres, particularly from the roots of the grass or fibre known as French whisk (*Andropogon ischaemum*; or *Chrysopogon gryllus*), which I treat as follows:—I first boil the fibres in a strong solution of caustic soda or caustic potash; I then scrape off the outer skin, and afterwards boil the fibres in water until all trace of the soda or potash is removed. I then stretch the fibres on a block of carbon or other suitable material, buried in plumbago or hermetically sealed in a crucible, and raise them to a white heat. Then, after carbonizing them, if desired, the fibres are ready for mounting as electric bridges in lamps.

For exhausting the lamps so as to produce the requisite vacuum therein I employ any of the novel apparatus represented in sheet 4, which I will now proceed to describe.

Referring first to figure 1, A is the lamp or object to be exhausted; B is a vertical glass tube, 30 inches high or more, and terminating at its upper part in a bulb, C. The neck D of the bulb is ground, and it receives at certain times the ground lower end of a glass rod, E. This neck opens into another bulb F above, through the neck G of which the rod E also passes. The part of the rod which passes through the neck G is covered with india-rubber or other suitable material, so that the rod E, while capable of being forced up and down so as to open and close the neck D of the lower bulb, shall all the while preserve a tight joint in the neck of the upper bulb. Above the upper bulb is a cup, H. To the lower end of the glass tube B I connect one end of a strong flexible tube I, of greater length, to the other end of which an open vessel K is fitted. Sometimes I interpose an air-trap, L, as shown in dots between the tubes B and I, but this air-trap is not essential. To the glass tube B at P¹, just below the bulb C, I attach another tube, P, the other end of which is connected to the lamp A. In this tube P I fit a valve or device, Q (weighted with mercury), which, when it rises, closes the communication between B and A.

The action of the apparatus is as follows:—The open vessel K having been filled or partially filled with mercury when in a lowered position, is raised to such a height that while it becomes nearly empty the mercury rises in the two bulbs C and F, filling the same up to the cup H. The neck G of the upper bulb F is then closed by the rod E, the neck D of the lower one being left open. The open vessel K is then lowered until the mercury falls well below the point P¹. The consequent fall of the mercury in the bulbs produces a vacuum, which will be filled by the air in the lamp A forcing its way through the pipe P and valve Q into the bulb C and upper part of the tube B. The vessel K is then again raised, the neck of the upper bulb F being open to allow the air to escape, the valve Q closing to prevent any mercury being forced through the pipe P to the lamp A. The bulbs C and F again become full of mercury, the neck G is again closed, the open vessel again lowered, and the operations are continued until the lamp A is almost exhausted. The pumping action is then somewhat modified thus. The vessel K is raised and lowered several times while the rod E is out, so as to make the mercury rise and fall in the bulbs, which should now be slightly warmed in order to evaporate any moisture which may be present on their sides. Having got rid in this way of all traces of aqueous or other vapour, the rod E is again inserted (while the vessel K is raised) into the neck G, leaving the neck D open; the vessel K is then again raised and lowered several times, so that the mercury alternately rises and falls in the bulbs, and in this way all traces of air from the surface of the tubes or bulbs will collect in the upper bulb F. The vessel K is then placed at such a height that the mercury fills the bulb C, and is just above its neck, D. The rod E is then forced down so as to close this neck, and the vessel K is lowered until the mercury is below the point P¹; again raised, and so on as long as may be found necessary. The use of the upper bulb F is not essential, but by its employment the vacuum in the lower bulb, when the mercury falls, is rendered more perfect. By using sulphuric acid with the mercury, so as to wet the surface of the bulb C and the ground joint at the neck D, the bulb F may be altogether dispensed with; but the acid must be very pure, and the cup H should be almost closed at top (as in figure 3), leaving, however, a sufficient opening for the rod E to be moved freely up and down.

It will be understood that the joint or connection at P¹ forms a liquid valve which automatically closes and opens the end of the pipe P as the mercury respectively rises and falls.

The modification shown in figure 2, sheet 4, is precisely the same as that shown in figure 1, except that the valve or device Q is dispensed with; and in order to prevent the mercury being forced up into the lamp the tube P is made sufficiently high, say 40 inches, more or less.

Referring

for Lighting, &c., and in the means or Apparatus employed therein.

Referring now to the modification shown in figure 3, sheet 4, which I adopt when sulphuric acid or other liquid of comparatively light specific gravity is employed in lieu of mercury, the same letters of reference as those in figure 1 refer to corresponding parts. The pipe B in this modification, instead of being connected with a rising and falling vessel (K, figures 1 and 2), is connected with a fixed vessel K¹ slightly larger than the bulb or vessel C, and which is connected by a tube R with a pump worked by steam-power or otherwise so as to alternately force air into and exhaust air from the vessel K¹. S T are respectively the pressure and vacuum pipes communicating between the tube R and the pump. The action of the apparatus is the same as that hereinbefore described with reference to figure 1, the alternate pressure and exhaustion produced by the pump having the effect, like the rise and fall of the vessel K, figure 1, of causing the acid to alternately rise in the bulb or vessel C and then fall below the point P¹, and thereby to alternately force out the air from the vessel C through the neck D, and produce a vacuum in the pipe P. U is an air-drier interposed in the tube R, and V is a valve weighted so as to open outwards at the pressure due to the column of acid when it reaches about the middle of the cup H. The acid should be pure, and kept as cool as possible. Figures 4 and 5 are views of the valve Q on a larger scale.

Having now described my invention and the manner of performing the same, I claim :—

- First—The mode or system of distributing energy by electricity, by means of mains and branches, with connections to earth, the electro-motive force in said mains and branches being maintained constant, all substantially as described.
- Second—The employment respectively of secondary or reservoir batteries of commutators, of electrometers or electro-dynamometers, and of regulators, all in the manner and for the several purposes described in systems of distributing energy by electricity by means of mains and branches, with connections to earth, as set forth.
- Third—In a system such as that herein set forth of distributing energy by electricity by means of currents proceeding from one point or station, and in which the number of lamps in use is subject to considerable variation, I claim the working of the lamps in multiple arc by means of a constant electro-motive force, substantially as described.
- Fourth—The electro-dynamometer constructed and acting substantially as represented in figure 3, sheet 1, and herein described.
- Fifth—The regulator constructed and acting substantially as represented in figure 4, sheet 1, and herein described.
- Sixth—The regulator constructed and acting substantially as represented in figures 6 and 7, sheet 2, and herein described.
- Seventh—The means or apparatus, substantially as described, with reference to figure 8, sheet 1, and the means or apparatus, substantially as described, with reference to figure 9, sheet 1, for turning on and off electric currents for lighting and extinguishing lamps, or for other purposes.
- Eighth—In electric lamps the mercury tubes *b b*, figures 1 to 6, sheet 3, substantially as and for the purposes set forth.
- Ninth—The enlargements *b' b'* at bottom of the mercury tubes *b b*, substantially as and for the purpose set forth.
- Tenth—The carbon or plumbago blocks or cylinders *h h*, figure 1, sheet 3, for uniting the electric bridge to the platinum wires, substantially as set forth; also, the use of sticks of plumbago in lieu of the platinum wires, as described.
- Eleventh—The employment of Chinese or Indian ink, either alone or mixed with other materials, as a cement for uniting the electric bridge to the platinum wires, or for uniting other parts of electric lamps, substantially as set forth.
- Twelfth—The uniting of the electric bridge to the platinum wires in electric lamps by forming spirals on the wires, thrusting the ends of the bridge into the spirals, and cementing them with Indian ink or other cement, as described with reference to figure 5, sheet 3.
- Thirteenth—The several combinations or arrangements of parts of electric lamps hereinbefore described, and shown respectively in figures 1, 5, and 6, sheet 3.
- Fourteenth—The manufacture of electric bridges for lamps from vulcanized fibre, substantially as described.
- Fifteenth—The manufacture of electric bridges for lamps by bending into the form of bridges appropriately-shaped strips of a suitable material containing a substance of a highly refractory character, submitting them when so bent, and by means of an appliance such as that described, to a white heat, and then carbonizing them by raising them, by means of an electric current or otherwise, to a white heat in benzole vapour or other suitable carbon compound, all substantially as described with reference to figures 7 to 13, sheet 3.
- Sixteenth—The use, in the manufacture of electric bridges, of a suitably-shaped block with a cutting edge, substantially as and for the purpose described with reference to figures 14 and 15, sheet 3.
- Seventeenth—The method herein described of producing incandescence in baked threads, strings, or tapes, when manufacturing them into electric bridges, by connecting the said threads, &c., with a dynamo-electric machine or other electric generator, by then momentarily short-circuiting the machine and suddenly breaking contact through the short circuit, repeating the operations as often as required, as and for the purpose explained.
- Eighteenth—The method of thickening the ends of the carbonized thread, &c., by connecting the two sides at a short distance from their ends by a wire or metal clip, and then continuing to send a current through, as and for the purpose explained.
- Nineteenth—The manufacture of electric bridges for lamps from French whisk (*Andropogon ischamum*, or *Chrysopogon gryllus*) or other grasses or fibres, by boiling the fibres in caustic soda or potash, then scraping off the outer skin, afterwards boiling the fibres in water, and then raising them to a white heat, as set forth.

In

Improvements in the distribution and application of energy by Electricity, &c.

In witness whereof I, the said St. George Lane Fox, have hereunto set my hand and seal, this tenth day of August, one thousand eight hundred and eighty-one.

ST. GEORGE LANE FOX.

Witness—GEORGE C. BACON,
169, Fleet-street, London, gentleman.

This is the amended specification, marked A, referred to in the annexed Letters of Registration granted to St. George Lane Fox, this sixteenth day of January, A.D. 1882.

AUGUSTUS LOFTUS.

REPORTS.

Sir,

Sydney, 6 October, 1881.

We do ourselves the honor to report, in reply to your blank cover communication of 24th ultimo, No. 9,228, transmitting Mr. St. George Lane Fox's Petition for the registration of an invention entitled "Improvements in and connected with the distribution and application of energy by Electricity for Lighting purposes, and in the means or Apparatus employed therein," that we are of opinion the prayer of the Petitioner may be granted, with the exception of the twentieth (20) clause, set forth in Mr. Fox's specification, as it is similar to the mercury pumps at present in use.

We have, &c.,

E. C. CRACKNELL.
GOTHER K. MANN.

The Under Secretary of Justice.

Sir,

Sydney, 1 December, 1881.

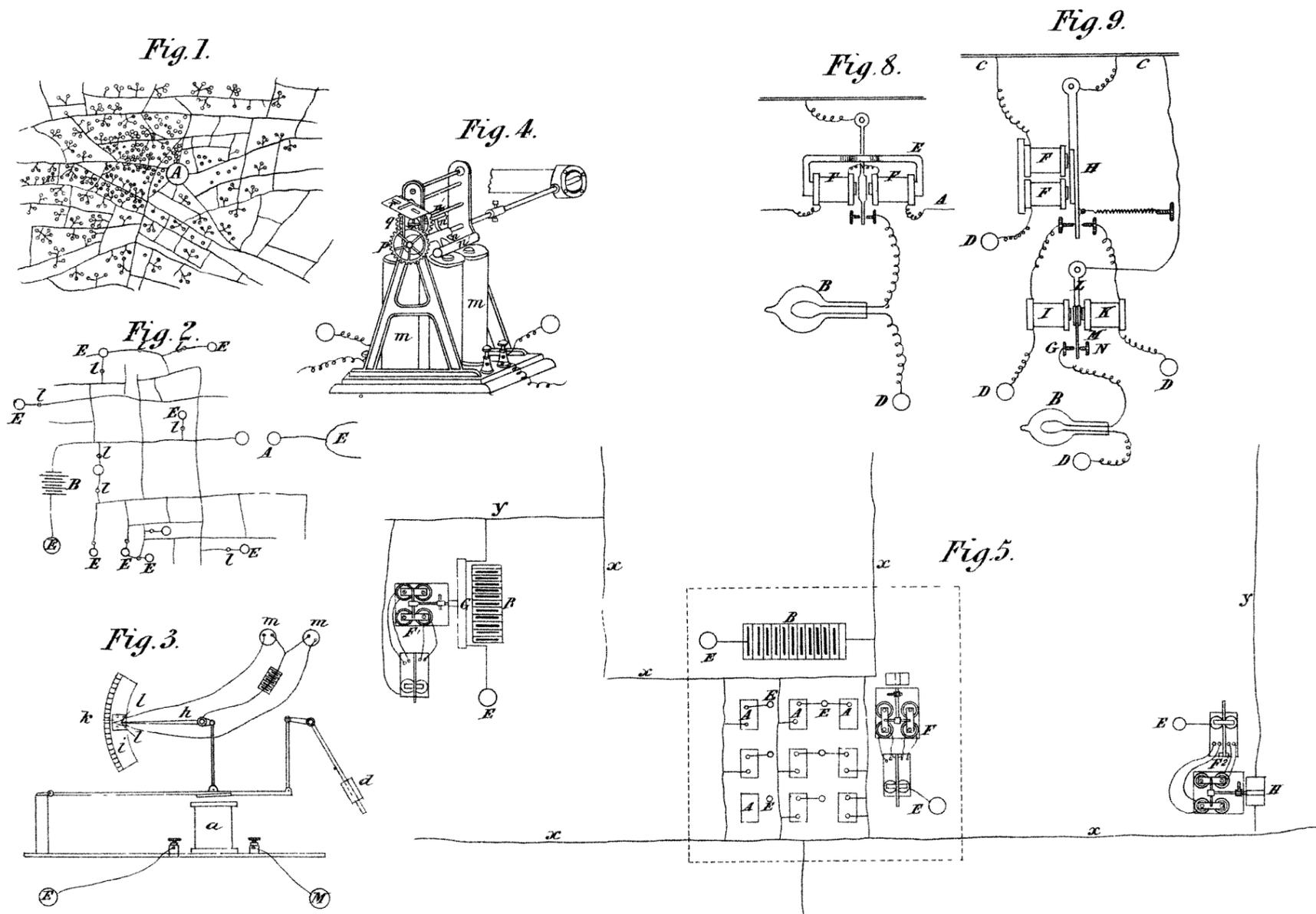
We do ourselves the honor to return the documents transmitted under your blank cover communication of the 18th ultimo, *re* Mr. St. George Lane Fox's registration, and to report that we are now of opinion the said Letters may now be granted.

We have, &c.,

E. C. CRACKNELL.
GOTHER K. MANN.

The Under Secretary of Justice.

[Drawings—four sheets.]



This is the Sheet of Drawings marked B. referred to in the annexed Letters of Registration granted to S^r George Lane Fox, this sixteenth day of January, A.D. 1882.

Augustus Loftus.

Fig. 6.

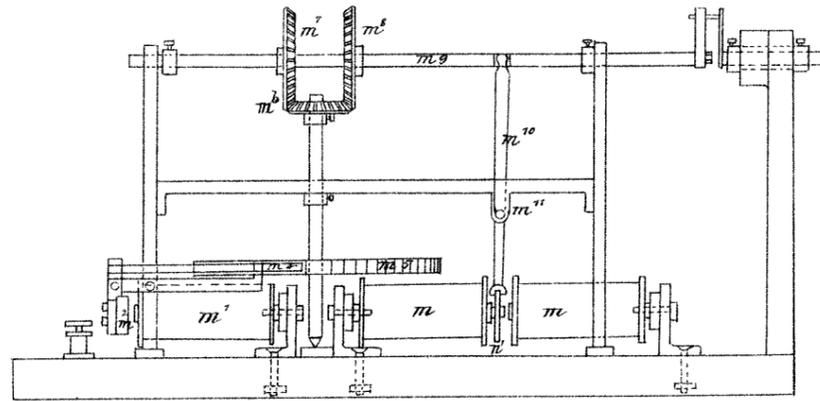
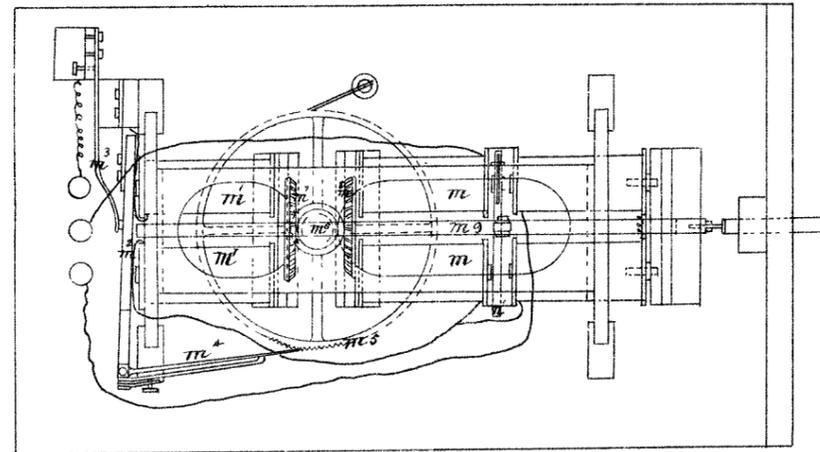
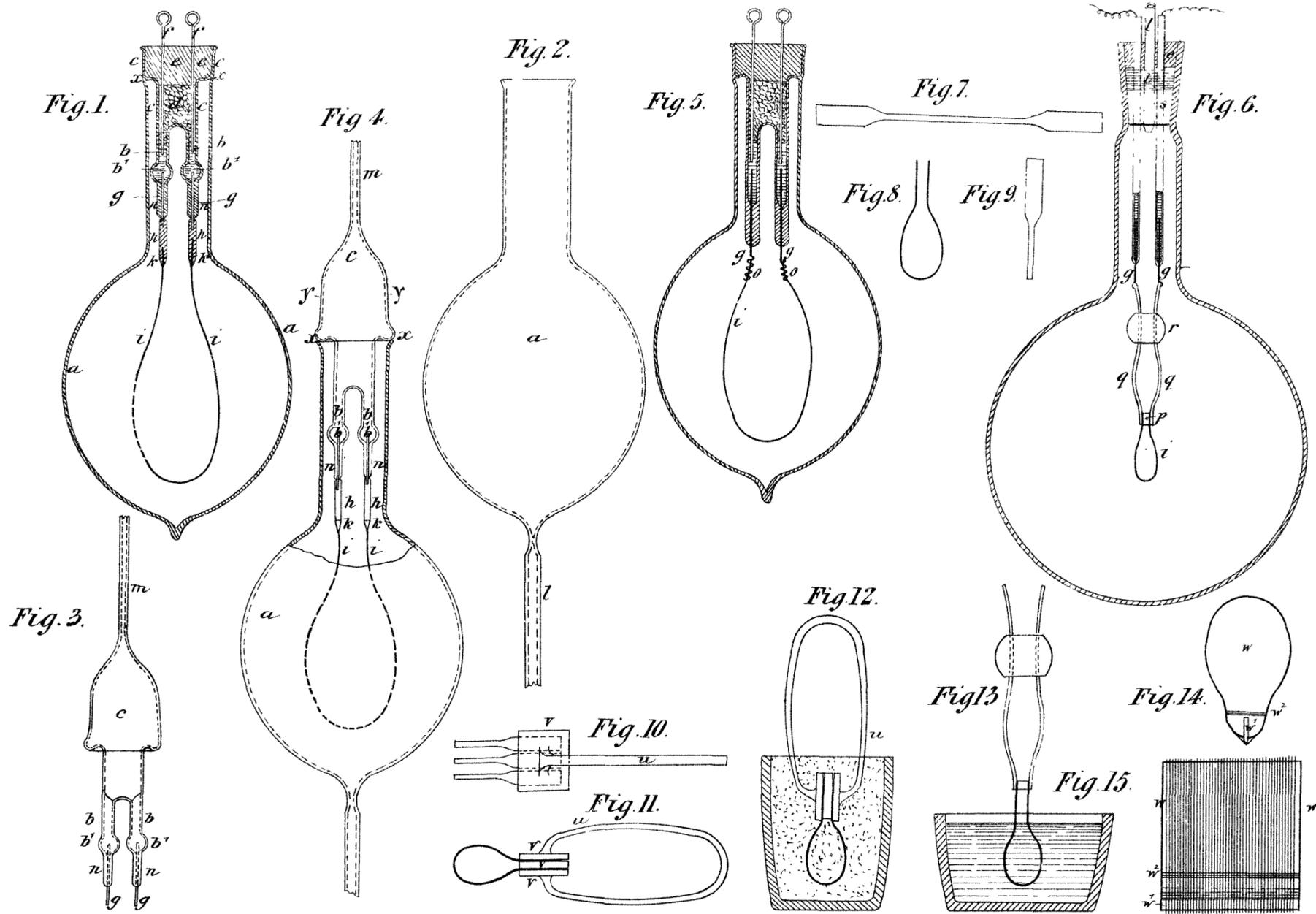


Fig. 7.



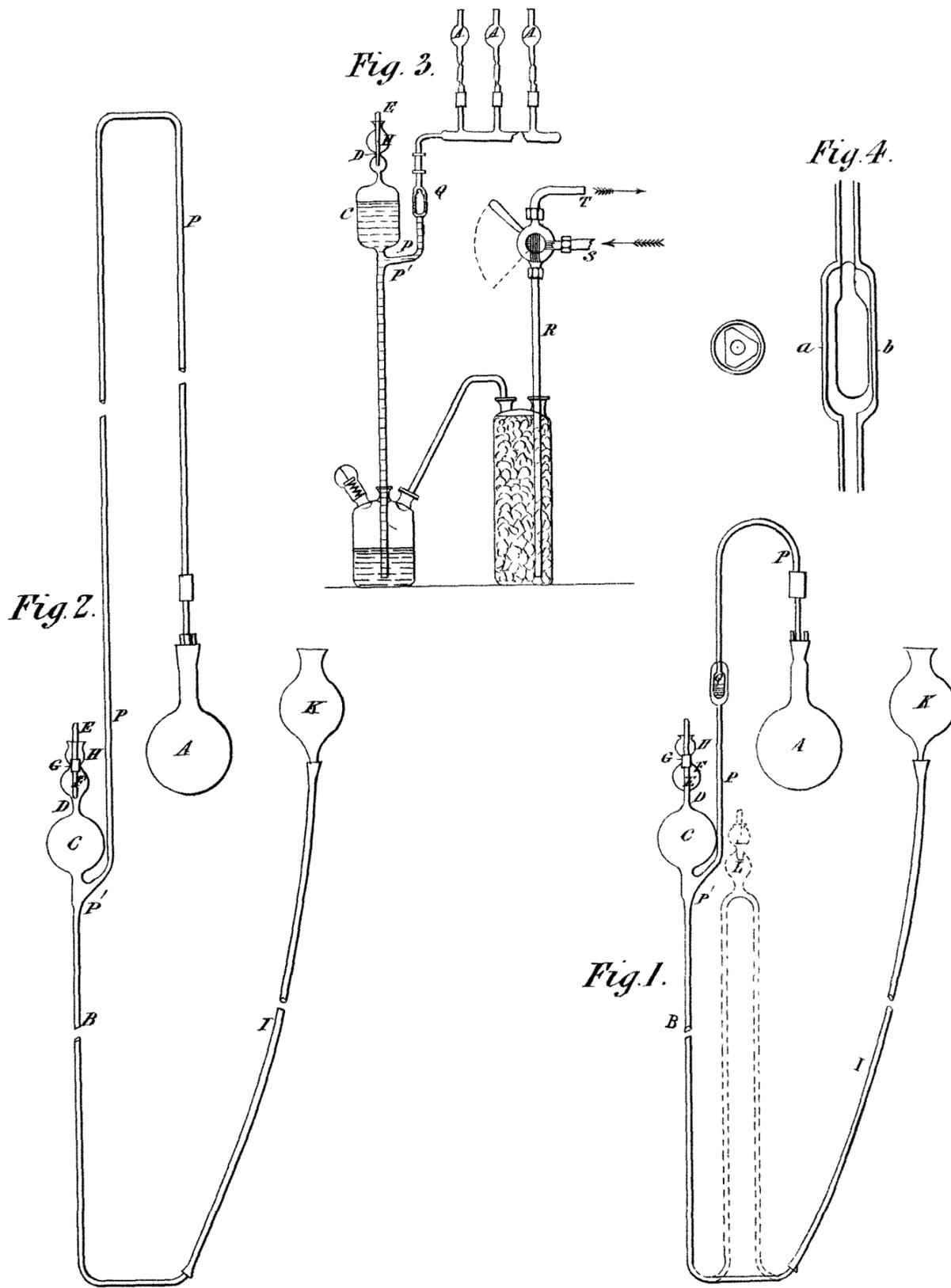
*This is the Sheet of Drawings marked C. referred to in the annexed
Letters of Registration granted to St George Lane Fox, this sixteenth
day of January, AD. 1882.*

Augustus Loftus.



This is the Sheet of Drawings marked D. referred to in the annexed Letters of Registration granted to St George Lane Fox, this sixteenth day of January A.D. 1882.

Augustus Loftus.



This is the Sheet of Drawings marked E. referred to in the annexed Letters of Registration granted to St George Lane Fox, this sixteenth day of January, A.D 1882.

Augustus Loftus.



A.D. 1882, 23rd January. No. 1031.

IMPROVEMENTS IN TELEPHONIC AND TELEGRAPHIC APPARATUS.

LETTERS OF REGISTRATION to Thomas Anthony Connolly, for Improvements in Telephonic and Telegraphic Apparatus.

[Registered on the 23rd day of January, 1882, 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 ANTHONY CONNOLLY, of Washington, District of Columbia, 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 Telephonic and Telegraphic 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 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 Anthony Connolly, 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 Anthony Connolly, 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 Anthony Connolly 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-third day of January, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Telephonic and Telegraphic Apparatus.

A.

SPECIFICATION of THOMAS ANTHONY CONNOLLY, of Washington, District of Columbia, United States of America, for an invention entitled "Improvements in Telephonic and Telegraphic Apparatus."

THE chief object of my invention is to provide means whereby in a telephonic exchange the operations of the central office are rendered automatic, so that the subscribers or members of the exchange may individually effect the requisite connection and disconnection of the lines, thereby avoiding the necessity of calling the central office and having the service performed by manual labour, as is now customary. The said invention is also partly applicable for telegraphic purposes. A telephone exchange based on my system and embodying my invention comprises a central machine or apparatus operated or controlled by electro-magnetism, a series of subscribers' or members' stations provided with devices for effecting such operation or control of the central machine, and lines or conductors leading from the members' stations to the central machine, for the transmission of the currents from the said stations to the central machine and for the intercommunication of stations connected through the said central machine.

The subscribers' stations are also provided with telephonic apparatus and suitable devices for receiving and sending signals.

I have devised a variety of electro-mechanical combinations for accomplishing my aim, all depending on the same substantial principle. Some of these I have illustrated in the accompanying drawings, in which figure 1 is a diagram illustrating the arrangement and relation of the central office machine and the subscribers' station devices to each other in an automatic telephonic exchange constructed in accordance with my invention; figure 2 is a horizontal sectional view of the central office machine or switching apparatus; and figure 3 is an elevation partly in section of the same; figure 4 is a plan or top view showing a preferable form of pawl and ratchet for the central office machine; figure 5 is a front elevation of a subscribers' station-box, a portion being broken away to show the interior arrangements; figure 6 is a diagram illustrating the circuits of the subscribers' station-box, and figure 7 is a similar view showing more in detail the circuits in the said subscribers' station.

Like letters indicate the same parts throughout the drawings.

I will first proceed to describe the central apparatus, which is illustrated in figures 1, 2, 3, and 4 of the drawings. This consists of a machine of an upright cylindrical form resting on a base, A, in which are fitted the binding posts for the various conveying wires. B designates the main frame of the machine, consisting chiefly of the uprights *b* and the cap *b*¹. To these uprights are attached the electro-magnets B¹, having pivoted armatures, B², to which are connected escapements or ratchet and pawl devices for converting the motion of the armatures into intermittent rotary motion of a suitable ratchet wheel or rack. The magnets B¹ are energized from a main battery or generator located at the central office of the exchange.

Normally the circuits of the said magnets are open. The closing of the circuits is effected by means of relays, C, in the normal circuit of the subscribers' or members' lines. These relays are responsive to the impulses transmitted from the subscribers' stations, hence each pulsation of an armature B² is in keeping or correspondence with that of its relay. These relays are polarized, and preferably of the form known as Siemen's polarized relays, and are adapted to close the circuit of the magnets B¹ when the current which energizes the said relay is passing in one direction. The current in the reverse direction may be utilized for signalling purposes without effecting any operation of the central machine. The magnets B¹ and their ratchet appliances are employed to effect the rotation of the rings or wheels D, one of which is allotted to each line. In addition to a ring, each line possesses a "contact bar" or frame, D¹. These frames are pivoted either inside or outside the ring or outside of the wheel. They are arranged at regular intervals around the rings, and are parallel with the axis thereof. Each bar traverses the whole series of rings, so that all the rings have a like relation to each and every frame. A connection of any two lines is effected through the ring of the operating or calling line and the contact bar or frame of the called line.

For this purpose each ring is furnished with a coupling or connecting device, which in the arrangement under consideration and shown in the drawings consists of a "tripper" or toggle lever. This lever as a ring rotates comes in contact with the several frames, and rotates, turns, or moves the same on their shafts or bearings. At the same time the tripper or toggle, which is normally tangential or inclined with reference to the periphery of the ring, assumes a different position, that is to say, it straightens out, and if then the movement of the ring is discontinued the tripper and frame remain in their conjointly assumed positions.

The object of moving the frame as stated is to isolate it, so that when engaged by a line no other line can obtain connection with it. For this purpose the conditions are such that in its normal position the outer end or head of the tripper does not project sufficiently far beyond the ring or wheel to touch the frame or contact bar when moved or turned by an engaged tripper or toggle.

A line when not in use or when employed in effecting connection with another completes its circuit to earth or to a common ground or return through its tripper or toggle. When engagement is made with a line this ground or earth connection is broken by the movement of the tripper under the toggle action of a frame or contact bar, and the circuit is completed through the line in which the frame is located.

More specifically each ring or wheel consists of two plates or rings, *d* *d*¹, of metal, separated by an insulating filling, *d*². The lower plate is in constant contact with the frame of the central machine, which communicates with earth or common ground or return, either through supporting rollers, if a hollow ring is used, or through a central shaft, *d*³, if a wheel with spokes be the form.

If the ring form be used, the lower plate may be formed with teeth on its periphery to gear or engage with a pinion which is driven by the magnet B¹ and its appurtenances, or the dog or pawl connected to the armature may engage directly with the lower plate, which will then have its teeth suitably bevelled. The same plan of operations may be adopted if a wheel be substituted for a ring, but in this case it is preferable to operate the wheel from the magnet through a ratchet wheel on the central shaft secured to the main wheel. It is not however necessary for the purposes of this invention that the form of the wheel or ring or the mechanism for imparting motion to the same should be of any particular nature. Various contrivances adapted to the purpose will suggest themselves to a skilful constructor, and are within the compass of my invention. The

Improvements in Telephonic and Telegraphic Apparatus.

The tripper or toggle lever *c* consists of a finger pivoted to the upper plate of the ring or wheel, and formed with a shoulder, *c*¹, abutting against a stop, *c*², which limits its movement in one direction, and against which the tripper is held in impingement when not engaging with a contact frame, by an easily yielding spring, *c*³. A spring tail-piece or continuation, *c*⁴, of the tripper or toggle impinges against a bent metal pin, stud, or block, *e*, rising from the lower plate of the wheel or ring, and travels thereon during a portion of the movement of the tripper on its pivot. Thus the operating line which leads into the upper plate and thence to the tripper or toggle makes ground through the said pin, stud, or block, until in engaging with a contact frame such ground connection or contact is broken by the tail-piece leaving the same, when the circuit is diverted into the contact frame, to be thence led to the line thereof. As above stated, the tripper or toggle lies normally in an oblique or tangential position as shown; its outer end is formed with a slight concavity or recess by which a contact frame in its path is caught and held in effecting and maintaining engagement therewith. As the tripper passes each unoccupied contact frame momentary engagement and conjoint movement ensue, and the diversion of circuit from central ground to line of engaged frame follows. Circuit or contact is made with the ring from the line thereof by means of a brush or rubber, *F*, in the path of the same line insulated from the main frame. A wire leading from the said brush connects with a binding post or cup, *f*, to which is led a return wire, *f*¹, from the relay of the same line. The main line wire *G* from a station leads to connections in the central machine, which will hereinafter be described, thence to the relay, and from the relay by the return wire to the binding post *f*. This circuitous path is provided in order that the relay of a called or passive line may be cut out so as to reduce resistance, but principally to prevent such relay from being operated by the current of the operating line. The cutting out is effected by the following means, that is to say, the contact frames consist each of a pivoted metal bar or shaft, *H*, journalled in insulated bearings at the top and bottom of the machine. Radial metallic arms, *h* *h*¹, support and secure a slender rod, *h*², which is the contact bar proper or the medium of engagement with a tripper or toggle. Attached to the pivoted shaft *H* near its lower end is a metal arm or brush, *h*³, or preferably two connected brushes, insulated from the shaft and bridging a pair of insulated segments, *h*⁴, of metal, the inner one shorter than the outer one. The direct line leads from its binding post to the outer or longer segment, and the circuit is thence by the brush *h*³ to the inner segment, and thence to the relay. *H*¹ is another metallic arm or contact spring attached to but in circuit with the shaft *H*, and so arranged that when the frame is swung to its limit the said metallic arm *H*¹ will come in contact with a pin, *z*, rising from the outer segment, the brush *h*³ at the same time leaving the inner segment and breaking the connection of the two. Thus when a contact frame is engaged, the circuit with its line is made directly from the outer segment to the wire without passing through the relay, the latter being in the branch circuit connected permanently with the inner or shorter segment.

It has been explained that when a contact frame is swung out to its limit and engaged by a toggle or tripper, the toggle or tripper of another line will pass by without contacting or obtaining engagement therewith, thus preventing disturbance of the communication through the frame of the called line. Engagement however with the frame of an operating line is not thus provided against, but such provision is necessary to prevent the operating line from being broken. For this purpose each contact frame is furnished with an arm, *K*, supporting an anti-friction roller, *k*, which rides on the periphery of the insulated filling of the ring of the same line. A cam recess, *k*¹, in the said filling adjacent to the tripper receives the said roller when the ring is home, but as the latter begins to move the roller is pressed outward to the periphery of the insulated filling. By this operation the contact frame of the operating line is swung on its pivotal points sufficiently to avoid contact of the passing trippers, but not far enough to break the circuit through the segments. It is therefore only when a line is at home that its contact frame can be caught. The term "home" is used to indicate the normal position of the tripper, that is, when it coincides with the contact frame of the line to which it belongs or pertains. A contact frame however is not to be pushed out by its own line tripper, otherwise the tripper of another line could not engage it. To avoid such a difficulty, each contact bar is notched or recessed at a point opposite or on the plane of its line tripper, so that when the latter is home it projects into the notch or recess and does not touch the bar.

As will be seen, the planes of the contact frames are oblique with reference to the circumferential lines of the rings, but this arrangement is arbitrary and need not be adhered to. The frames are normally maintained in proper relation to the rings, and after being swung outward and released are retracted by means of the springs *L* suitably arranged. These springs also serve to keep the tripper and contact rods in close and reliable impingement.

I will now proceed to describe the local subscribing station apparatus illustrated in figures 1, 5, 6, and 7 of the drawings. As has been shown, the operations of the central line-connecting apparatus are responsive to electrical impulses sent over the lines from the local or subscribers' stations. These impulses are produced by the intermittent closing of a normally open battery circuit, which correspondingly closes the relay at the central machine, and thus brings into action the power whereby the mechanical switching operations are performed. Each local or subscribers' station, for this purpose, is furnished with an independent battery or generator which has one pole grounded or in connection with a return common to all the lines. The local subscribers' station apparatus for giving control of the central devices pertaining to a given line are for convenience enclosed in a box or case, *P*, to which are connected if desired the necessary devices pertaining to the usual telephonic transmitter and receiver, which need not be particularly described.

From the battery the line and ground conductors lead to a reversing key, *N*, which is carried by a toothed disc or wheel, *m*¹, the teeth of which correspond in number with the number of impulses necessary to effect a complete revolution, at the central machine of the carrier, of a contacting finger or tripper. The said disc or wheel is caused to rotate by suitable clock-work mechanism (not shown in the drawings), and its teeth successively pass a contact-making spring or arm, *M*², which completes or closes the open line circuit and sends an impulse therethrough.

The disc or wheel *m*¹ is covered by a dial, *M*³, upon which the several lines of the exchange are indicated by suitable numbers or letters at regular intervals completing the circle. Holes are bored through this dial in coincidence with the said numbers or letters for the reception of a transferrable pin or

Improvements in Telephonic and Telegraphic Apparatus.

or plug, m^3 . A stud, m^4 , on the disc or wheel comes in contact with this pin on open circuit and arrests the movement of said wheel at any given number opposite the said pin, whereupon the operations of the devices pertaining to the operating line at the central apparatus cease, the operating line being then in coincidence and circuit with the line at whose number or letter the pin is placed.

To provide for a reversal of the current after such circuiting has been effected, the line and ground wires from the local station battery lead to the reversing key, through brushes, m^5 , touching insulated collars on the disc shaft, which collars communicate with the terminals or contact points of the reversing key. The latter has an elongated arm, m^7 , which as the disc comes to a stop touches and bears against the pin when the same is at any but its home position. Under such conditions the direction of the current while the disc is rotating is such as will effect the operation of the relay, but when the arm of the reversing key strikes the pin the direction of the current is reversed. The hole for the reception of the pin when at home—that is, at the number on the disc or dial of the station to which it belongs—is out of the circle of the other holes, hence when the disc arrives home the arm of the reversing key does not strike the pin, so that no reversal takes place. The object of the reversal is to provide for calling a distant station by an operating line without operating the relay of the latter. This calling is performed under the reversed current by means of a circuit-closing key or push, Q , in a branch or shunt line, which is normally open, and is only to be closed when the circuit-closing wheel is at rest and the main circuit open at Q^1 . Now when a line is at “home,” and its pin in a “home” position, it is in a condition to be called, but at no other time is it in such condition. Then when a calling current is received the relay of the called line is cut out as previously explained, so that the calling current cannot affect it, as it otherwise would, the direction being suited to such operation.

Now having been called, a call is returned from a distant station by simply pressing the push button at the latter. The return call current is then in the normal direction, that is to say, in the direction under which the called line relay would operate were it in circuit, but it is in the reverse direction relatively to the relay of the calling line, or in the same direction as the calling current of the latter, and hence has no effect on the said relay. This automatic method of reversing the current is desired so as to obviate the possibility of mistake in making and returning calls, growing out of the necessity in calling up a line and returning a call of having the currents in the same direction notwithstanding the peculiar relations of the two lines, the one operating and the other passive. But for such automatic contrivance, relieving the callers of the necessity of exercising selection in manipulating their calls, it would be necessary to provide an independent reversing key, which the caller would have to shift after obtaining a line, while the person called must leave it alone. In this case if the caller were to accidentally or inadvertently omit such shifting he would operate his relay, while if the called subscriber should shift his reversing key he would also operate the caller's relay and so destroy the conditions obtained at the central apparatus as well as the union of the local indicator and the central devices.

The calls are sounded upon bells or gongs having suitable electro-magnetic sounders in circuit with the main lines.

In describing the operations of the central and local stations I have referred to batteries or generators, but I do not wish to be understood as limiting myself to any specific generator such as a voltaic battery, as I may employ magneto-electric currents for all or any of the operations dependent upon an electric current.

In the foregoing description the central machine or apparatus has been described as a means for facilitating telephonic intercommunication, but its application is not necessarily limited to telephonic exchanges. The machine is really a combination of devices through which electrical circuits are determined and produced, and such circuits may be used either for telephonic or telegraphic purposes. The only requirement when the machine is used for telegraphic purposes is that the signals shall be sent by currents running in one direction only, so that such signals shall not affect the polarized relays.

Claims :—

First—In a telephone exchange constructed and adapted for automatically coupling lines, and having a series of nominally disconnected lines grounded at the place of convergence and in circuit with connecting mechanism, the combination with such mechanism of a main battery or equivalent motor, and suitable means for controlling the said battery motor through the said lines and for effecting the necessary movements of such connecting mechanism, substantially as above set forth.

Second—In an automatic telephone exchange comprising a series of lines or conductors leading to a central station and in circuit at such station with automatic connecting mechanism the combination with the same of generators at the local stations or distant termini of the said lines for sending electric impulses over the latter, and a main battery or motor at the central station operating responsively to impulses sent over the said lines from the local batteries to produce the necessary movements of the connecting mechanism for the automatic connection and disconnection of said lines, as above set forth.

Third—In an automatic telephonic exchange system comprising a series of normally disconnected lines converging to a central station provided with mechanism for automatically connecting the said lines, said mechanism being moved by a main battery or equivalent motor located at the central station, and controllable by electric impulses sent from the local batteries located at the remote ends or at distant points on the said lines and operating through the latter, the combination with the said lines, the central connecting mechanism, the main and local batteries of relays located at the central station and operated by the said local batteries to throw on the main battery, and thereby effect the necessary movements of the central mechanism for connecting and disconnecting the lines, as above set forth.

Fourth—In an automatic telephonic exchange system comprising a system of independent lines converging to a central station provided with connecting mechanism, a main battery for operating the said mechanism, relays for throwing on the said battery, and local batteries for operating the said relays; the combination therewith of switches located in each line in the circuit between the local batteries and the relays, and capable of being operated from other lines, whereby one subscriber calling another may cut out the relay of the latter.

Fifth—

Improvements in Telephonic and Telegraphic Apparatus.

- Fifth—The combination in a telephone exchange of electric line-connecting apparatus of a series of conductors normally grounded at a central or common station, each of said conductors having in circuit a relay, an engaging finger sustained on a ring or traveller, a ground and line switch all in circuit, and a movable section or contact bar normally out of circuit but carrying the said switch, whereby, when a given line is worked for calling or connecting, its finger will be carried into engagement with the contact bar of another line, the grounds of both lines being thereby broken, the calling line through the movement of its finger, and the other through the movement of its switch, the lines connected, and a through circuit established over both, substantially as herein described.
- Sixth—The combination in an automatic telephone exchange or line-connecting apparatus of a relay adapted to respond to currents sent over a line in circuit therewith, a battery connected with the said relay so as to be thrown on to a short independent line when the said relay is closed, an electro-magnet in circuit with such battery, a progressive movement connected with the armature of the said magnet, a wheel or traveller in circuit with the relay line but arranged to be moved by the said progressive movement, whereby a working current is sent over the said line through the said relay, the battery is thrown into the short line, and the wheel or traveller caused to move and carry the finger along, substantially as specified.
- Seventh—The combination in an automatic telephonic exchange or electric line-connecting apparatus of a series of relays or keys and switching devices normally in circuit therewith, and arranged to operate substantially as described, whereby when two lines are connected through the medium of such connecting apparatus the relay of a sought or called line will be cut out, while the relay of the calling line or seeking line will remain in circuit, substantially as above set forth.
- Eighth—The combination with an automatic line-connecting apparatus, of the switching or connecting devices and their operative mechanism of relays constantly in the path or circuit of the calling lines, to provide for the restoration to normal of said calling line.
- Ninth—In a telephonic exchange apparatus a movable finger normally in circuit with the ground at the central exchange or connecting device, and forming a portion of the circuit of a line leading from a distant station to such central device, the said finger being mounted on a ring or carrier, and adapted and designed when its carrier is moved to come in contact with sections or bars forming parts of other conductors or lines, and by such contact to break its normal ground and secure circuit to ground at another distant station over the contacted line, substantially as set forth.
- Tenth—In a telephonic exchange apparatus a movable conductor pertaining to a given line and normally out of circuit, in combination with suitable devices whereby the movement of the said conductor by a calling line breaks the normal or central ground of its own line and establishes circuit between the two lines, substantially as above set forth.
- Eleventh—In a telephonic exchange line-connecting apparatus a relay in combination with a switching device which normally completes the circuit to ground at the central device through the said relay, and which upon being duly moved substantially as described cuts out such ground, and leaves a called line in unbroken or continuous circuit with the calling line, as specified.
- Twelfth—In a telephonic line-connecting apparatus a receiving conductor arranged substantially as described, so that it may be moved by the conducting finger of any line and isolated thereby from possible contact of other conducting fingers.
- Thirteenth—In a telephonic apparatus a receiving conductor through which circuit may be made from a calling to a called line, the said conductor being constructed and arranged substantially as described, whereby when the line to which it pertains is employed in seeking or effecting coincidence or connection with another line, such conductor will be shifted beyond the reach of the other operating lines or their travelling contact devices.
- Fourteenth—In a telephonic exchange apparatus adapted for automatic circuiting purposes, the combination of the following elements, namely: a travelling circuiting finger, stud, or contact device normally grounded in circuit with a telephonic line, mechanism for causing the said circuiting finger to travel, a relay to bring the said mechanism into action, a switch between the said finger and a distant line terminal for effecting the diversion of the circuit from ground through another line, and a movable conductor coinciding with the same home or normal position of said finger.
- Fifteenth—In a telephonic or telegraphic line-connecting apparatus the combination with a series of parallel travellers carrying conducting fingers normally grounding the respective lines leading thereto of a corresponding series of receptive conductors traversing the said travellers at intervals and adapted for engagement of the fingers, the said travellers and fingers and the receiving conductors being so constructed and relatively arranged that any finger may engage with any disengaged traversing conductor but that pertaining to its own line, shift the same out of path of the other fingers and switch the said receiving conductor into circuit with its line, and break the central ground of both lines.
- Sixteenth—The combination in an automatic telephonic exchange of a series of lines grounded at independent or local stations and at a central exchange (or a station common to all), batteries at each independent station and at the central station, a switch or connecting mechanism at the central station actuated by the said main battery and operating responsive to currents sent from batteries at the independent or local stations to cut out the grounds of any two lines (or of all the lines in pairs) at the central station and to restore the same, substantially as above set forth.

Seventeenth—

Improvements in Telephonic and Telegraphic Apparatus.

Seventeenth—A local or subscribers' station apparatus adapted for use in connection with an automatic central connecting or switching apparatus, comprising means for transmitting electrical impulses to effect operations in the central apparatus, a register, an electrical alarm, and a reversing switch, for the purposes described.

Eighteenth—A coupling or connecting instrument for converging telephone lines, operating automatically by currents controlled from distant stations, and provided with devices whereby any two independent lines may be directly and immediately coupled or connected, to the exclusion of all others from the same circuit, while permitting the establishment of separate circuits between the lines so excluded.

In witness whereof, I, the said Thomas Anthony Connolly, have hereunto set my hand and seal, this 31st day of August, 1881.

THOMAS ANTHONY CONNOLLY.

Witness—

JOHN T. KNOWLES.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to Thomas Anthony Connolly, this twenty-third day of January, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 30 November, 1881.

We do ourselves the honor to report, in reply to your blank cover communication of the 20th instant, No. 10,087, transmitting Thomas Anthony Connolly's petition for the registration of an invention entitled "Improvements in Telephone and Telegraphic Apparatus," that we are of opinion the prayer of the Petitioner may be granted, in terms of specification, drawings, and claim.

We have, &c.,

E. C. CRACKNELL.
GOTHER K. MANN.

The Under Secretary of Justice.

[Drawings—two sheets.]

Fig. 1.

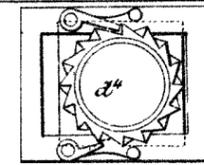
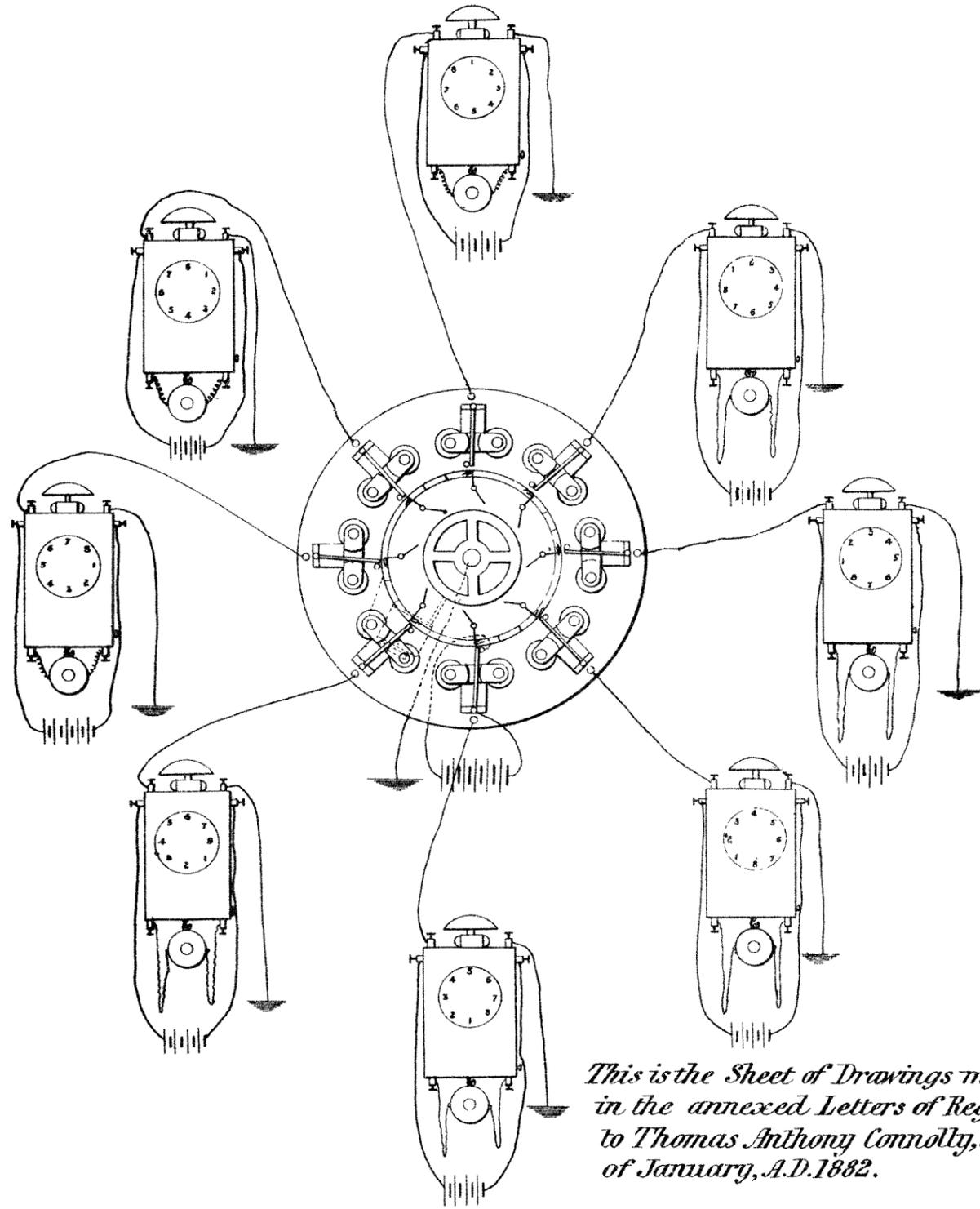
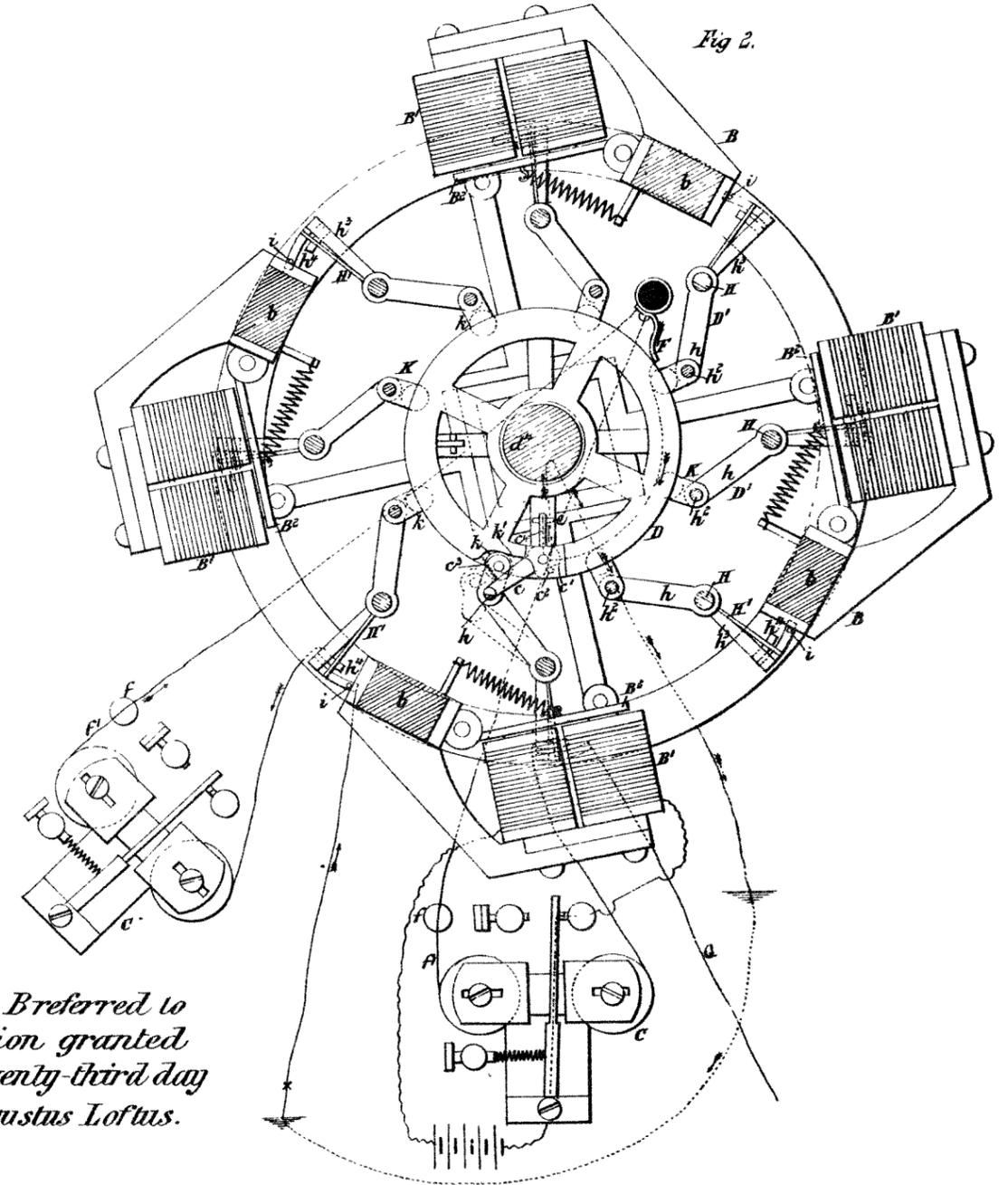
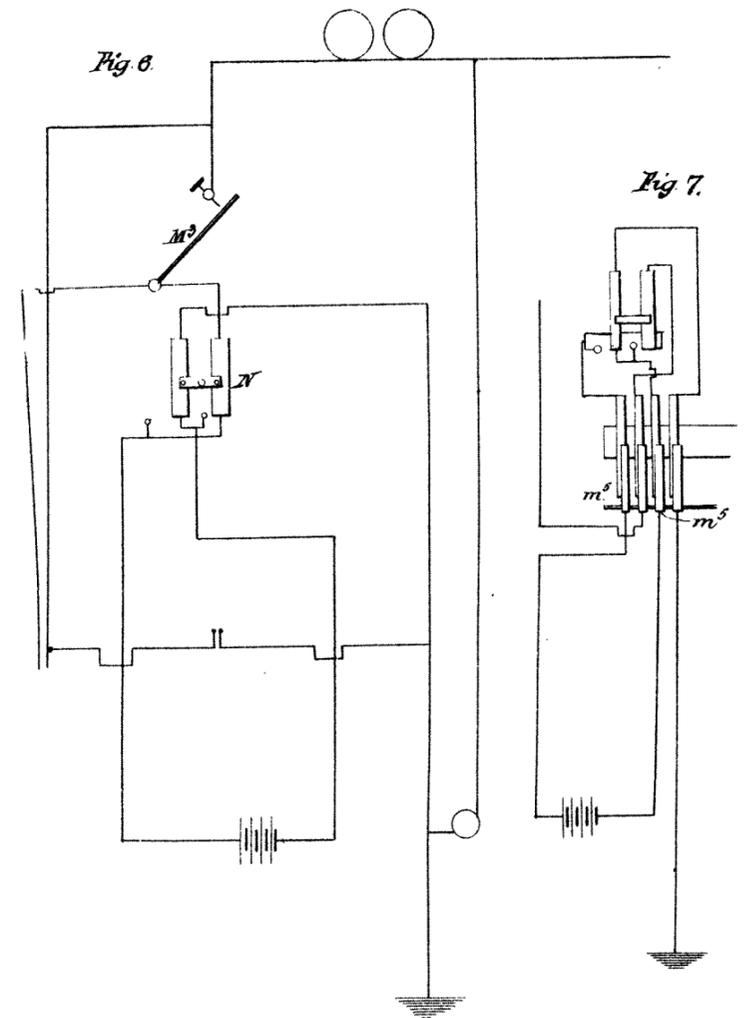
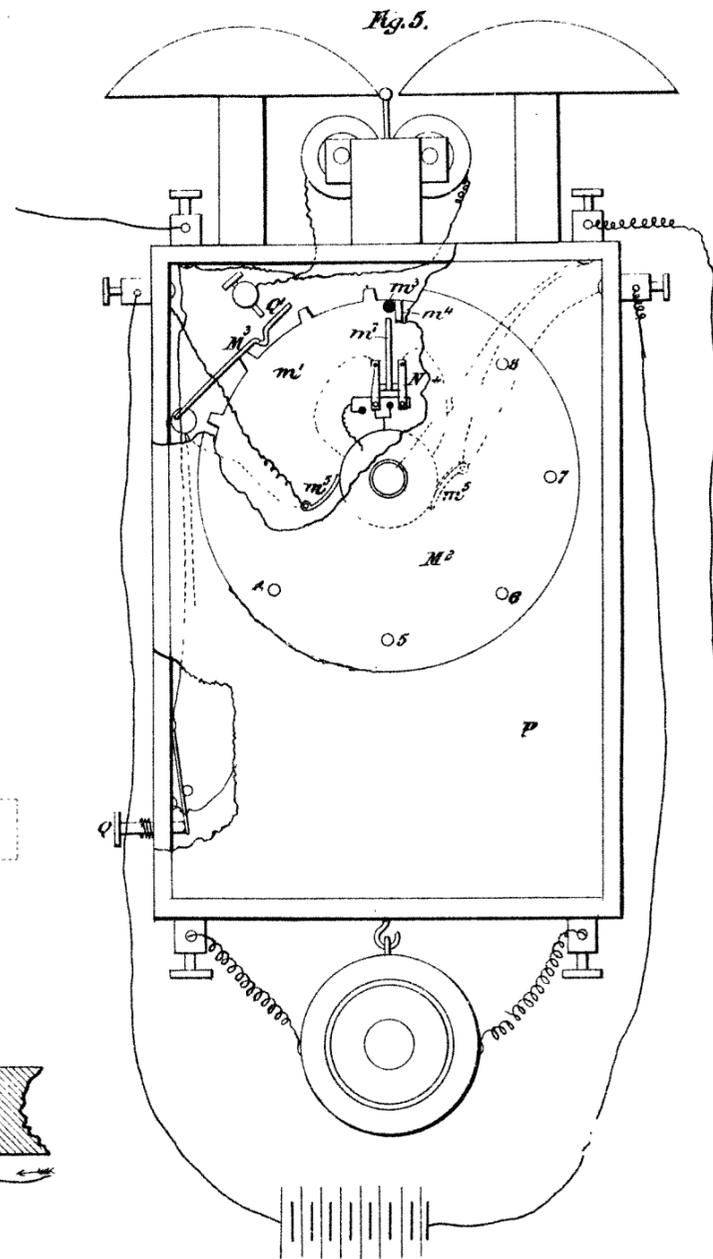
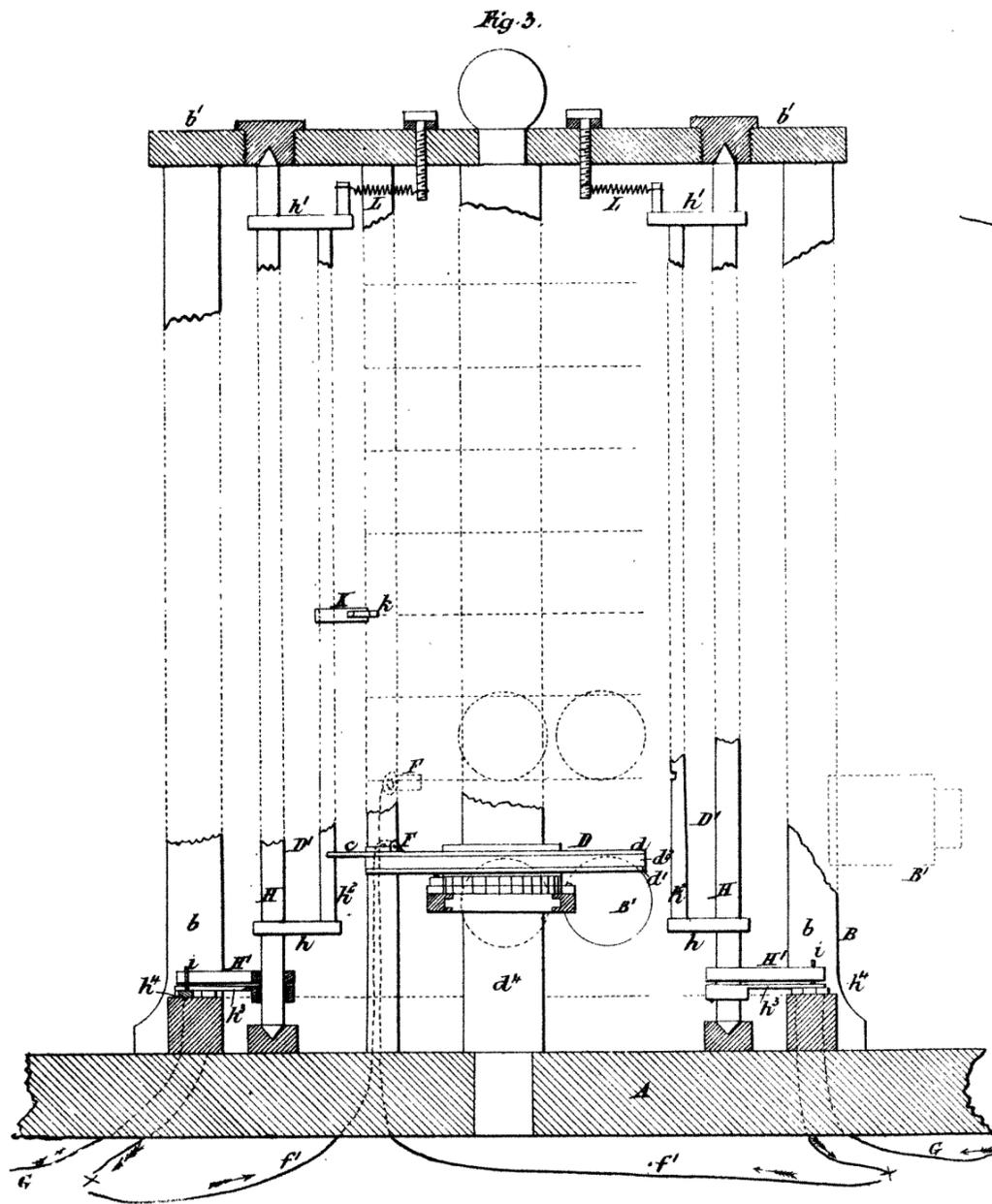


Fig. 4.

Fig 2.



*This is the Sheet of Drawings marked B preferred to
 in the annexed Letters of Registration granted
 to Thomas Anthony Connolly, this twenty-third day
 of January, A.D. 1882.
 Augustus Loftus.*



*This is the Sheet of Drawings marked C referred to in the annexed Letters of Registration granted to Thomas Anthony Connolly, this twenty-third day of January, A.D. 1882.
Augustus Loftus.*



A.D. 1882, 27th January. No. 1032.

AN IMPROVEMENT IN THE CONSTRUCTION OF BLAST FURNACES.

LETTERS OF REGISTRATION to the Honorable John Alston Wallace, M.L.C.,
for an Improvement in the construction of Blast Furnaces.

[Registered on the 28th day of January, 1882, 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 HONORABLE 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 of Victoria, hath by his Petition humbly represented to me that he is the assignee of Thomas Martin, of Bethanga, in the said Colony of Victoria, engineer, 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 the construction of Blast Furnaces," 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 expenses 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 Alston Wallace, 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 Alston Wallace, 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 Alston Wallace 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-two.

[L.S.]

AUGUSTUS LOFTUS.

An Improvement in the construction of Blast Furnaces.

SPECIFICATION of 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, the assignee of Thomas Martin, of Bethanga, in the said Colony, engineer, the inventor of an invention entitled "An Improvement in the construction of Blast Furnaces."

THIS invention of an improvement in the construction of blast furnaces has been designed for the purpose of removing obstructions from the nose of the tuyere or air-passages in blast furnaces. It is well known that one of the difficulties metallurgists and others have to contend with in the use of blast furnaces is the tendency of the metal or ores under treatment to clog around and ultimately close the openings in the nose of the tuyere or air-passages. This is especially felt in the treatment of copper ores and pyrites in furnaces where the air is passed through the molten metal, and it is specially, although not wholly, for the purpose of removing or remedying this difficulty that this invention is designed. The improvement consists in providing a rod or poker for each air-passage in the tuyere, long enough to pass quite through such passage and push away any obstructions that may have gathered in, or in front of, its nose. These rods or pokers I prefer to attach to one common head working in an iron case, such head having a rod—like a piston rod—attached to its other side, which passes through a stuffing-box to prevent the escape of the air-blast. This rod may be worked by any convenient contrivance, say like the pump-rod of a pump is worked. The action should of course be very quick, that is to say, the set of pokers should be forced through the air-passages and back again as quickly as possible.

In my drawings figure 1 shows plan, partly in section, of a blast furnace with the improvement attached; figure 2, sectional elevation of the lower part of such a furnace; figures 3, 4, and 5, longitudinal and cross sections of pokers, with their case and immediate attachments. A is the air-box, and A¹A¹ are the air-passages; BB are the rods or pokers, projecting from a head, B¹, to which is attached rod B², connected by another rod, B³, to lever B⁴, by which it is worked; C is an airtight casing for the pokers, and C¹ stuffing-box through which passes rod B², for which D is a guide standard; E is a standard for carrying lever B⁴. To work this invention, it is only necessary to give the lever B⁴ a rapid to and fro motion—once will generally be sufficient, but the action may be repeated if needed.

Having thus described the nature of this invention and the manner of performing same, I would have it understood that I do not confine the application of this invention to any particular kind of blast furnace, nor to any particular means of giving motion to the contrivance, nor to its application for any particular process; but I claim,—

First—The construction of blast furnaces with a poker or rod for each air-channel through which the blast passes, such poker or rod being sufficiently long to pass quite through and push away any obstructions that may have gathered in or in front of such passage.

Second—The special method of arranging and working such rods or pokers as illustrated in my drawings.

In witness whereof, I, the said John Alston Wallace, have hereto set my hand and seal, this twenty-second day of November, one thousand eight hundred and eighty-one.

JOHN A. WALLACE.

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 the Honorable John Alston Wallace, this twenty-seventh day of January, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Having examined the specification and plan accompanying the petition, we have the honor to recommend that Letters of Registration should be issued to the Honorable John Alston Wallace, M.L.C., for an invention entitled "An Improvement in the construction of Blast Furnaces," as shown in the drawing and described in the specification attached to this petition.

Sydney, 15 December, 1881.
We have, &c.,
E. O. MORIARTY.
JOHN WHITTON.

The Under Secretary of Justice.

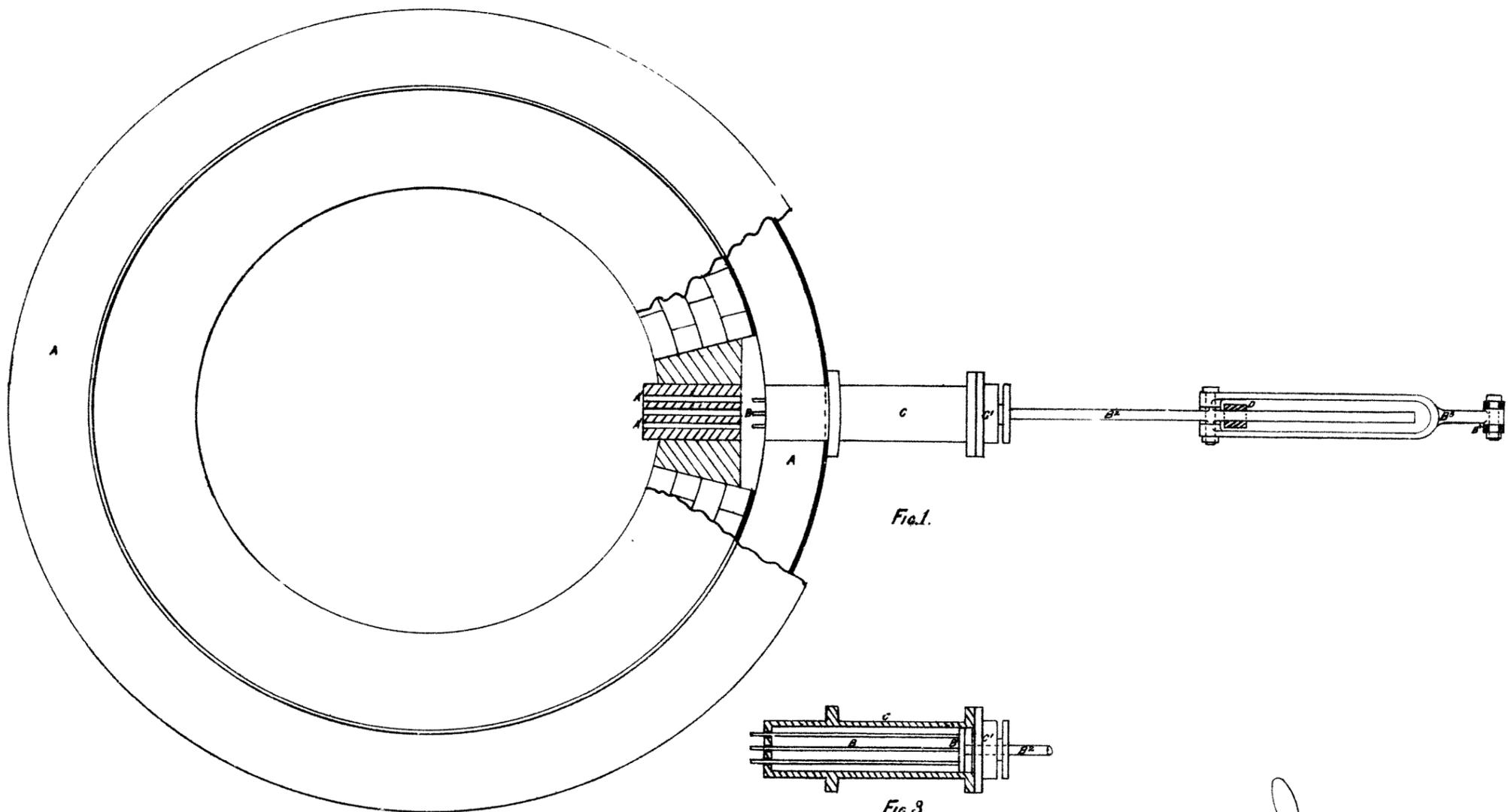


Fig. 1.

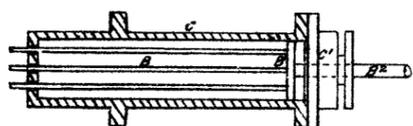


Fig. 3.

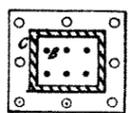


Fig. 5.

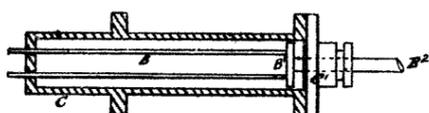


Fig. 4.

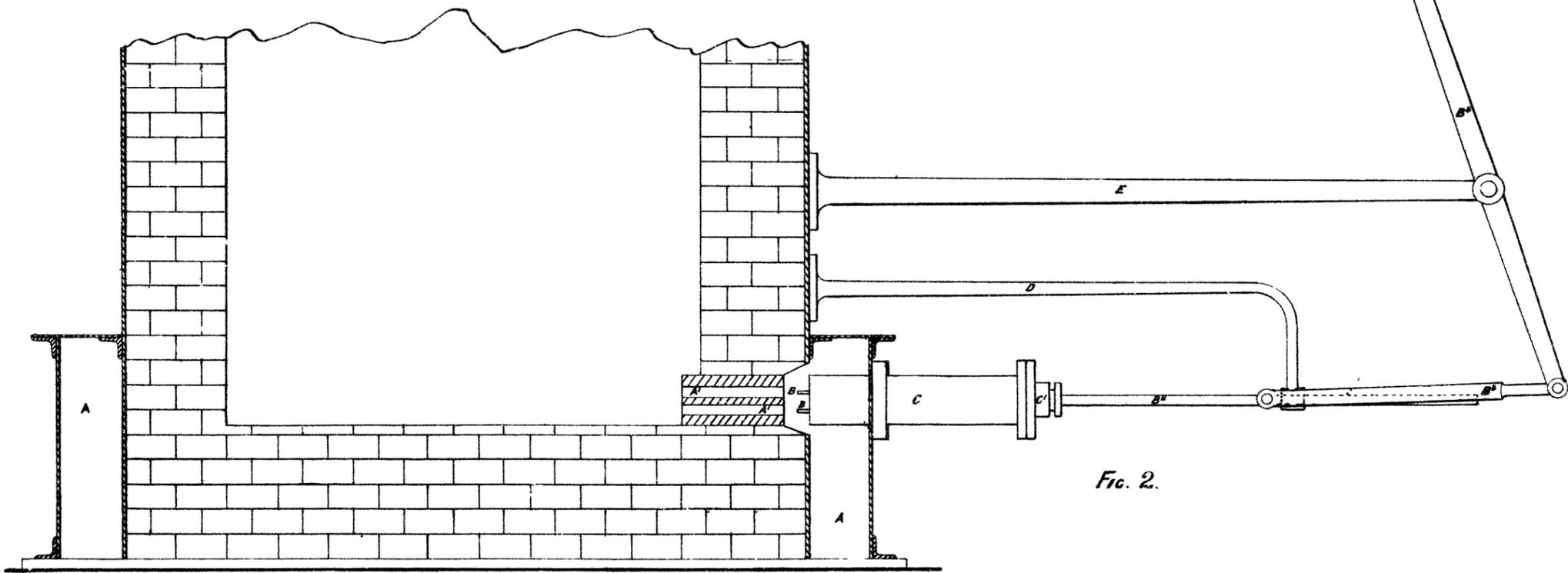


Fig. 2.

*This is the Sheet of Drawings referred to in the
 annexed Letters of Registration granted to The
 Honorable John Alston Wallace, this twenty seventh
 day of January, A.D. 1882. Augustus Loftus.*
 (32)



A.D. 1882, 6th February. No. 1033.

IMPROVEMENTS IN CONTRIVANCES FOR WORKING SEMAPHORES.

LETTERS OF REGISTRATION to Robert Archibald White, for Improvements
in contrivances for working Semaphores.

[Registered on the 7th day of February, 1882, 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 ARCHIBALD WHITE, of Beulah Road, Norwood, in the Province of South
Australia, civil and 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 contrivances for working Semaphores," 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 Archibald White, 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 Archibald White, his executors, adminis-
trators, 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 Archibald White 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 sixth day of February, in the year of
our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in contrivances for working Semaphores.

SPECIFICATION of ROBERT ARCHIBALD WHITE, of Beulah Road, Norwood, in the Province of South Australia, civil and mechanical engineer, for an invention entitled "Improvements in contrivances for working Semaphores."

THE object of this invention is to provide for the automatic taking in and letting out of the expansion and contraction of the signal-wire of semaphores, as they expand or contract by the variation in the temperature of the atmosphere, and is intended to ensure that when a certain given motion is imparted to such wire, it shall at all times be sufficient to give the necessary signal. I accomplish this by attaching a compensator weight or spring at the end of the signal wire, to compensate for the contraction or expansion, and I carry this wire over a pulley, to which motion is imparted from time to time by the signalling lever, but which, in the interim between the signals, is entirely free from such lever, and so is at liberty to move one way or the other, as the necessities of the case may require. I prefer to carry out this principle of construction in the manner shown in my drawings, in which figure 1 shows side elevation of a semaphore, with my improvements attached, whilst figures 2 and 3 show respectively modifications of the same, in which, in the one case, the weight is substituted by a spiral spring, and in the other the weight is used in conjunction with the spring. Figure 4 is plan of the pulley and its toothed wheel; A and A' are the semaphore arm and post, and A² its balance-weight, all of ordinary construction. B is the signalling wire passing over a pulley, C, and terminating in a compensator weight, D. This pulley is cast with or is attached to a toothed wheel, C', so as to move with it. C² is a hook or pin, which pulls the signal wire or chain. E is the operating lever, which is cast with or attached to a toothed quadrant or sector E' or set as to gear with the toothed wheel C' when required. In figures 2 and 3, F is the spiral spring.

The mode of operation is as follows:—When the signal is stationary, the toothed sector E is not in gear with the toothed wheel C', and consequently the weight D is at full liberty to take in or let out any expansion or contraction of the signal-wire B that may take place between the motions of the signals, so that whenever the lever E is actuated, it gives exactly the same degree of motion to the signal, no matter what may be the state of the atmosphere.

In figure 2 a spiral spring, F, is used as an equivalent for the weight D in figure 1, and in figure 3 a spiral spring is used, in conjunction with a weight, for the same purpose.

Friction or other gearing may be used instead of toothed gearing for carrying out my invention, but I prefer toothed gearing.

Having thus described the nature of my invention and the manner of performing same, I would have it understood that I do not claim to be the inventor of semaphore posts or signals, or their balance weights; and, on the other hand, that I do not confine myself to the mechanical devices shown in my drawings for equalizing the tension on the signalling wire and for giving the signals, although in both these respects I have shown what I believe to be the best; but what I believe to be new, and therefore claim as my improvements in semaphores is—

1. The construction of semaphores with the signalling lever altogether independent of and disconnected from the signalling wire, except when the signal arm is being moved.
2. The special mechanical combinations and arrangements herein described and shown in my drawings for working such semaphores.

In witness whereof, I, the said Robert Archibald White, have hereto set my hand and seal, this twenty-first day of November, one thousand eight hundred and eighty-one.

Witness—

U. S. BAYSTON,

Clerk to Edwd. Waters, Patent Agent, Melbourne.

ROBT. A. WHITE.

This is the specification referred to in the annexed Letters of Registration granted to Robert Archibald White, this sixth day of February, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Having examined the specification and plan accompanying the Petition, we have the honor to recommend that Letters of Registration should be issued to Robert Archibald White, for an invention entitled "Improvements in contrivances for working Semaphores," as shown in the drawing and described in the specification attached to this Petition.

We have, &c.,

FRANCIS HIXSON.

E. O. MORIARTY.

The Under Secretary of Justice.

R.A.WHITE'S PATENT.

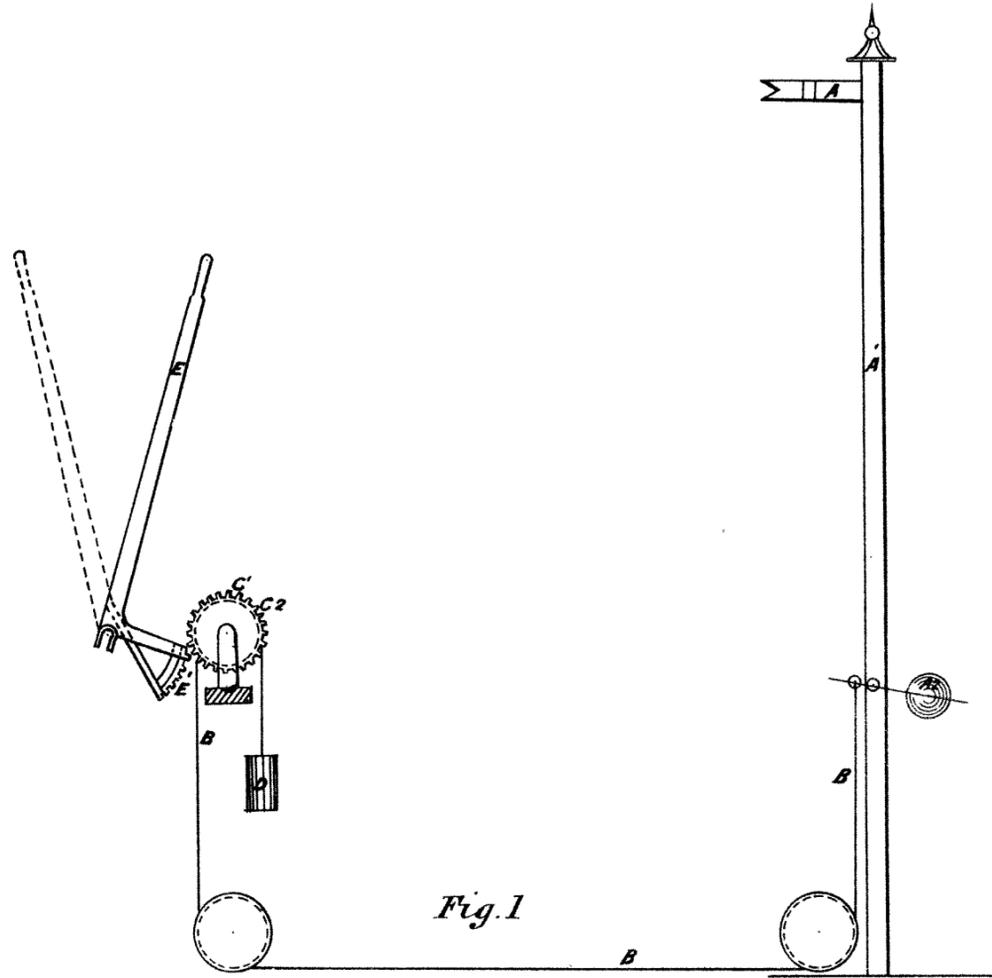


Fig. 1

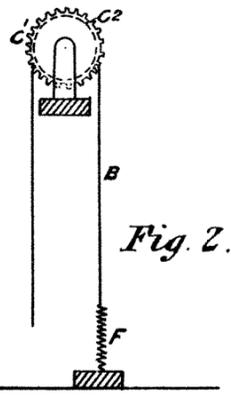


Fig. 2.

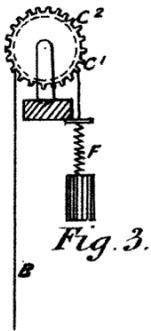


Fig. 3.



Fig. 4.

*This is the Sheet of Drawings referred to in the annexed
Letters of Registration granted to Robert Archibald White,
this sixth day of February A.D 1882.*

Augustus Loftus.



A.D. 1882, 6th February. No. 1034.

IMPROVEMENTS IN MACHINERY FOR UNHAIRING, FLESHING, PARING,
SHAVING AND SETTING HIDES, SKINS, OR PELTS.

LETTERS OF REGISTRATION to John William Janson, for Improvements
in Machinery for unhairing, fleshing, paring, shaving and setting hides, skins,
or pelts.

[Registered on the 7th day of February, 1882, 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 WILLIAM JANSON, of No. 52, St. Mary Axe, in the city of London, England, 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 "Improvements in Machinery for unhairing, fleshing, paring, shaving and setting hides, skins, or pelts," 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 William Janson, 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 William Janson, 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 William Janson 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 sixth day of February, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Machinery for unhairing, fleshing, paring, &c.

SPECIFICATION of JOHN WILLIAM JANSON, of No. 52, St. Mary Axe, in the city of London, England, merchant, for an invention entitled "Improvements in Machinery for unhairing, fleshing, paring, shaving, and setting hides, skins, or pelts."

My invention relates to improvements in machinery for unhairing, fleshing, paring, shaving, and setting hides, skins, or pelts, by means of which both sides of a hide, skin, or pelt may be worked upon simultaneously, and it consists essentially in the use of two knife cylinders, with their respective elastic rollers, instead of a single knife cylinder as hitherto.

The construction of my improved machine will be readily understood by reference to the accompanying sheet of drawings; figure 1 being a front elevation of the machine; figure 2 is a left end view; figure 3, a transverse section on the line 1, 2, showing position of lower roll when in action, and figure 4 is a plan of the whole as seen from above; AA being the end standards; B is the feeding table; C, the upper knife cylinder; D, elastic roll; E, second or under-knife cylinder; F, lower elastic roll; G, clips or draw-bar; H, guide-bars for same; I, treadle for raising roll; K, connecting-rod; L, lever; M, cross-shaft; N, counter lever; O, bearing for roll D; P, counter weight; Q, bearing for lower roll F; R, rod for actuating same; S, cross-shaft; T, cranks; U, hand-lever; V, quadrant; W, bell-crank lever; X, belt for driving shaft; Y, cross-shaft; Z, rope wheels.

It will be seen upon referring to the drawing, that whereas the roll D is capable of a vertical motion, the lower or second elastic roll F is free to move in a horizontal direction, being hung upon two arms or levers, QQ, working upon pins secured in the end standards AA. Two rods, RR, serve to connect these arms QQ to short levers, TT, secured upon a cross-shaft, S, arranged immediately in front of the machine; motion being imparted to the shaft S by means of a hand-lever, U, working around a quadrant, V, as shown.

By this arrangement the roll F can readily be drawn forward, and so brought into action with the lower knife-cylinder F when required. The draw-bar or clips G is connected by a rope passing around a guide-pulley, secured at outer end of guide bars H (not shown in drawing) with the rope wheels ZZ, by which means it is caused to travel in an outward direction, carrying with it the skin or hide to be operated upon.

The skin, hide, or pelt first presented between the top knife cylinder C and the elastic roller D passes over this latter, it is then caught between the roller and the knife cylinder E; the skin is then drawn out by the clips G in the ordinary way; and thus passing between the two sets of cylinders and rollers is treated simultaneously on both sides, the hair and fleshings being separated by a shield, over which the fleshings are carried.

The cylinders will be furnished with knives of various kinds according to the requirements of the particular operation to be performed upon the skin, and each cylinder will not necessarily carry at the same time the same kind of knives, as the two cylinders while working, simultaneously may be performing different operations.

I would also have it understood that I do not limit myself to the exact details of construction herein set forth and shown in the annexed drawings, as such may be varied while retaining the essential characteristics of my invention, nor to the use of any particular material for the elastic rollers or any other part of my machine.

What I claim as of my invention, and desire to secure by Letters of Registration is:—

Firstly—In a machine for unhairing, fleshing, paring, shaving, and setting hides, skins, or pelts, the knife cylinder E and roller F, in combination with the knife cylinder C and roller D, and arranged to operate substantially as and for the purposes hereinbefore specified.

Secondly—The machine hereinbefore described, and shown on the drawing, as and for the purposes specified.

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

Witness—

W. E. GEDGE,
11, Wellington-street, Strand, London, England.

JOHN WILLIAM JANSON.

This is the specification referred to in the annexed Letters of Registration granted to John William Janson, this sixth day of February, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

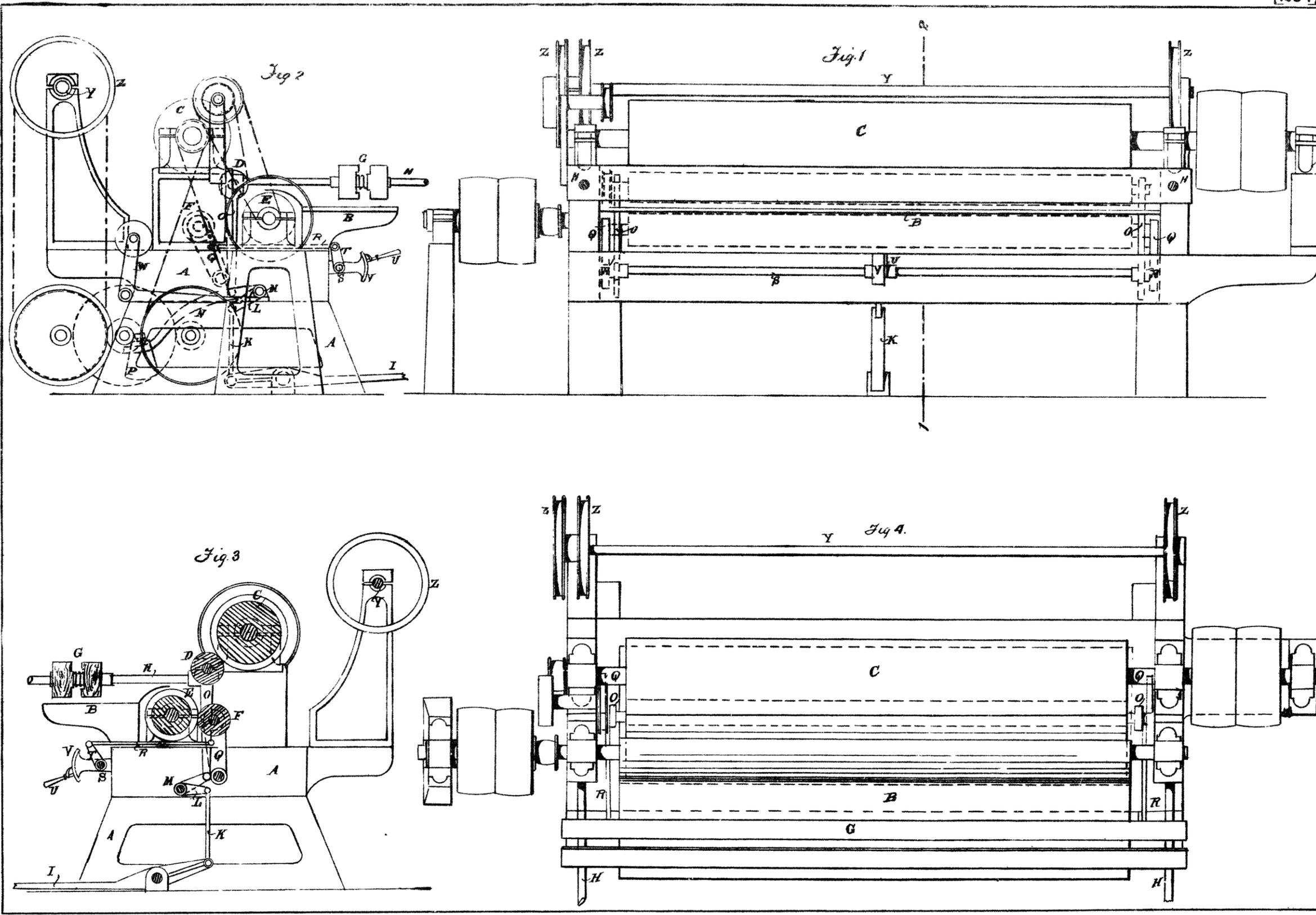
We have the honor to return herewith the petition of J. W. Janson, forwarded to us under your B.C., dated the 19th instant, with accompanying specification and plans in duplicate, descriptive of an invention entitled "Improvements in Machinery for unhairing, fleshing, paring, shaving, and setting hides, skins, or pelts"; and we beg to report that having examined the said plans and specifications and duly considered the application, we are of opinion that there is no objection to the issue of the Letters of Registration applied for.

The Under Secretary of Justice.

Sydney, 21 December, 1881.

We have, &c.,

EDMUND FOSBERY.
ROBERT G. MASSIE.



This is the Sheet of Drawings referred to in the annexed Letters of Registration granted to John-William Janson this Sixth day of February, A.D. 1882.

Augustus Loftus.

(Sig-32-)



A.D. 1882, 8th February. No. 1035.

MACKENZIE AND MACLAREN'S COMBINED EJECTOR AND TORICELLIAN VACUUM PAN.

LETTERS OF REGISTRATION to Alexander Richard Mackenzie and John Frederick Maclaren, for an invention entitled "Mackenzie and Maclaren's Combined Ejector and Toricellian Vacuum Pan."

[Registered on the 8th day of February, 1882, 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 ALEXANDER RICHARD MACKENZIE, engineer, and JOHN FREDERICK MACLAREN, auctioneer, both of Mackay, in the Colony of Queensland, 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 "Mackenzie and Maclaren's Combined Ejector and Toricellian Vacuum Pan," which is more particularly described in the amended 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 Alexander Richard Mackenzie and John Frederick Maclaren, 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 Alexander Richard Mackenzie and John Frederick Maclaren, 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 Alexander Richard Mackenzie and John Frederick Maclaren 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, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Mackenzie and Maclaren's Combined Ejector and Toricellian Vacuum Pan.

SPECIFICATION of ALEXANDER RICHARD MACKENZIE, engineer, and JOHN FREDERICK MACLAREN, auctioneer, both of Mackay, in the Colony of Queensland, for an invention entitled "Mackenzie and Maclaren's Combined Ejector and Toricellian Vacuum Pan," being improvements in the construction of Vacuum Pans.

THIS invention of improvements in the construction of vacuum pans has been designed principally for use in the treatment of sugar-cane and beet-root juice, and is for the purpose of more quickly and economically withdrawing the vapours arising from material contained therein. Hitherto these vapours have been removed either by a pump or a condenser, or both combined, but we use a steam ejector, by which they are withdrawn from the pan and on their way to the ejector are condensed in a surface condenser, by means of copper coils filled with any cooling medium, such as air, water, or the material being treated. We also provide one or more sprays or films of water in the surface condenser for assisting in the condensation, and also another spray or film of water above the ejector, for a similar purpose. A second steam ejector is also provided, for the purpose of removing the cooling medium when acriform, and discharging it with the exhaust steam of the ejector into the heating coils of the vacuum pan.

In our drawing hereto annexed, A is an ordinary vacuum pan body, of any approved form and material, with all necessary receiving and delivering valves, gauges, thermometers, &c. B is the uptake portion of the gooseneck, well lagged. C is the downtake portion of the gooseneck, made preferably of polished copper. D is a surface condenser and juice-heater, made preferably of polished copper. E is a bell-neck receiver for the cooling medium employed—this may be common air, water, or the liquid the pan is required to concentrate. F F' are copper coils in the surface condenser and the vacuum pan respectively used for condensing or heating as required. G is a close receptacle in which the condenser coils discharge. H is a tap through which the cooling medium when liquid is discharged. I is a steam ejector through which the cooling medium when acriform is drawn and discharged with the exhaust steam of the ejector into the heating coils of the vacuum pan A. J is a discharge pipe from the condenser D, used preferably in the form of a Toricellian column. K is a spray or jet condenser body connected with the surface condenser D. K' the jet therein. L is a steam ejector communicating with the interior of the condenser K, through the hooded pipe M, and drawing off the evaporation from the pan A, through both condensers, and discharging the uncondensed portion of such evaporation mixed with the exhaust ejector steam into the heating coils of the vacuum pan A. M is a hooded pipe in the condenser K. N is a spray, jet, or film of water used when necessary for condensing. O' is steam, and O water feed pipe.

The mode of operation is as follows:—The vapours arising from the vacuum pan A pass up to the gooseneck B and then through the downtake portion C of gooseneck, being subjected in their passage to one or more sprays of water, N, then through the surface condenser D, where they come in contact with the condensing coils F, which have been previously filled with some cooling medium, such as air, water, or the material under treatment, said cooling medium being supplied to the coils through bell-neck receiver E. The water of condensation is removed by discharge pipe J from condenser D. The uncondensable portion of the vapours pass up through the subsidiary spray or jet condenser K to a hooded pipe M in upper portion of said condenser, from which they are withdrawn by the ejector L, worked by steam pipe O' and forced into the heating coils of the vacuum pan, and are afterwards removed therefrom as waste in the ordinary way. The vapours, previous to entering hooded pipe M, are further condensed by a spray or jet of water, marked K'. The cooling medium when acriform is drawn into close receptacle G, and discharged with the exhaust steam of the ejector L into the heating coils of the vacuum pan A, by means of ejector I. The cooling medium, when a liquid is used, is withdrawn from chamber G, by means of tap H, into one of the feeding tanks of the vacuum pan or clarifier. The jets or films of water are supplied from feed pipes O. When the cooling medium consists of the material under treatment, it is withdrawn from chamber G by means of pipe H, and delivered into the receiver, not shown.

Having thus described the nature of our said invention, we would have it understood that we do not confine ourselves to any particular form of vacuum pan or ejector, but what we desire to secure by Letters Patent is:—

First—The combination of a steam ejector with a vacuum pan, for the purpose of more effectually, rapidly, and economically removing the vapours arising from any liquids boiling in a partial vacuum therein, by drawing them rapidly into contact with condensing surfaces and through sprays or films of water, and then removing the uncondensed portion of such vapours through the ejector direct.

Second—The combination of a second steam ejector with the surface condenser of a vacuum pan, as and for the purposes substantially as herein described and explained.

ALEXANDER RICHARD MACKENZIE,

By his Attorney,

GEORGE SMITH.

JOHN FREDERICK MACLAREN,

By his Attorney,

GEORGE SMITH.

This is the amended specification referred to in the annexed Letters of Registration granted to Alexander Richard Mackenzie and John Frederick Maclaren, this eighth day of February, A.D. 1882.

AUGUSTUS LOFTUS.

Mackenzie and Maclaren's Combined Ejector and Toricellian Vacuum Pan.

REPORTS.

Sir,

Sydney, 30 November, 1881.
 On examination of Messrs. Alexander Richard Mackenzie and John Frederick Maclaren's application for the registration of a "Combined Ejector and Toricellian Vacuum Pan," we have the honor to report that we find it necessary to recommend that the Petitioners be requested to furnish complete drawings and details, and a concise claim for their invention.

We have, &c.,

E. C. CRACKNELL.
GOTHER K. MANN.The Under Secretary of Justice.

Sir,

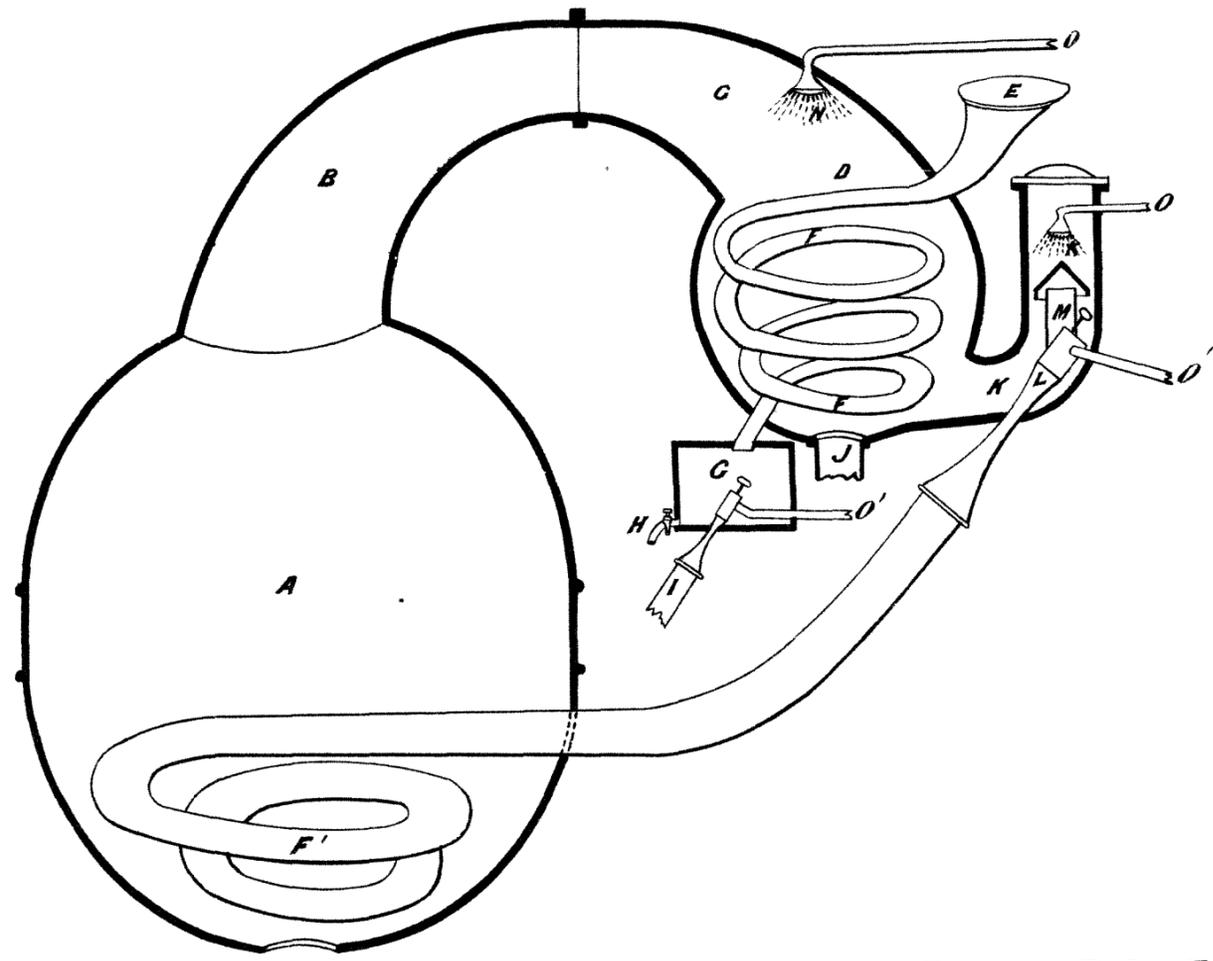
Sydney, 20 December, 1881.
 We do ourselves the honor to report, in reply to your blank cover communication of the 14th instant, No. 11,664, transmitting Messrs. A. R. Mackenzie and J. F. Maclaren's *amended* drawings and specifications of a "Combined Ejector and Toricellian Vacuum Pan," that we are of opinion the prayer of the Petitioners may now be granted.

We have, &c.,

E. C. CRACKNELL.
GOTHER K. MANN.The Under Secretary of Justice.

[Drawings—one sheet.]

MACKENZIE & MACLAREN'S PATENT.



*Alexander Richard Mackenzie.
by his Attorney George Smith.
John Frederick Maclaren,
by his Attorney George Smith.*

*This is the Sheet of Drawings referred to in the annexed
Letters of Registration granted to Alexander Richard
Mackenzie, and John Frederick Maclaren, this eighth
day of February AD. 1882. Augustus Loftus.*



A.D. 1882, 8th February. No. 1036.

**IMPROVEMENTS IN THE CONCENTRATION AND CLASSIFICATION OF DRY ORES
AND AURIFEROUS MATERIAL.**

LETTERS OF REGISTRATION to Charles Phillips, for Improvements in the concentration and classification of dry Ores and auriferous material.

[Registered on the 9th day of February, 1882, 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 PHILLIPS, of Mount Egerton, in the Colony of Victoria, miner, 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 concentration and classification of dry Ores and auriferous material," 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 Charles Phillips, 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 Phillips, 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 Phillips 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, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in the concentration and classification of dry Ores, &c.

SPECIFICATION of CHARLES PHILLIPS, of Mount Egerton, in the Colony of Victoria, miner, for an invention entitled "Improvements in the concentration and classification of dry Ores and auriferous material."

THIS invention has been devised for the purpose of concentrating and classifying dry ores and auriferous material when in a finely divided state, whether such ores and material be so found in a natural condition, or whether they be reduced to that condition artificially by means of crushing or other machines.

The primary feature of this invention lies in the method of concentrating such ores and material. This method consists partly in allowing the finely divided ores or material to fall through or across a horizontal or approximately horizontal air-blast, by which means the lighter particles are blown away, and partly in submitting the product of this and the classifying operation immediately to be described to the action of shaking tables, strakes, or revolving fabric tables, without any current either of air or water.

The secondary feature of this invention lies in the method of classifying the ores and material in question. This consists in providing a series of inverted pyramidal receptacles underneath the flue for the air-blast, commencing from the point where the ores or material are dropped into such flue, and continuing outwards in the direction of the blast, so that the largest particles are caught in the first receptacle, the next largest in the second, and so on in regular gradation. At the bottom of these receptacles I provide discharge outlets, which must be so arranged as to prevent the escape of any material portion of the air-blast. The material discharged is then further concentrated by agitation only, on shaking tables, strakes, or revolving fabric tables, and without any current of either air or water. It is then subjected to such further treatment as may be thought advisable, but which treatment forms no part of this invention.

A subordinate feature of this invention consists in a preliminary concentration of the material under treatment, by passing it through a series of shaking screens or riddles, by which the coarsest and lightest particles are got rid of before it reaches the air-blast, and at the same time some of the heaviest particles are retained by ripples placed across these screens.

The best arrangement of machinery known to me for carrying this invention into practical operation is shown in my drawings, in which figure 1 shows side elevation (partly in section); figure 2, plan; and figure 3, end view of a machine for this purpose; A A being the main framing of the machine, which may be arranged with an axle to receive draught-wheels so as to enable it to be easily moved from place to place if required, although it is evident that this is not a necessary part of the machine. B B¹ B² are shaking screens, such as are used in grain-cleaning machines, and of which there may be two or more, but each screen has one or more ripples, B³, across it; B⁴ are the hanging rods; C is a hopper; D, the shoot for conducting the feed to the flue E of the blast; F is the fan. There is no bottom to the flue beyond the point E¹. G G¹ and G² are the classifiers, in which are valves, H H¹ H², respectively; I I¹ I² are ordinary shaking tables, which may be substituted by revolving blankets or any other well-known contrivance of a similar character.

J is the main shaft, from which all the moving parts of the machine receive their motion. Thus, the shaking screens are actuated by means of adjustable connecting rod K, from crank on rocking shaft J³, which is driven by rod K¹, from shaft J², which the belt K² from shaft J¹ drives; K⁴ is the belt from the main shaft J to shaft J¹. The fan is actuated through the medium of belt K⁵, from the second shaft J¹. The shaking tables suspended by rods I⁴ are actuated by rod K⁶ from a crank on shaft J³.

The valves H H¹ and H² are shown as balance valves, but in practice I think they might be dispensed with altogether, so long as the discharge is about sufficient to keep the orifice closed or nearly closed, the object being to prevent any material escape of the air-blast. The shaking screens B B¹ and B² should be of successively smaller mesh, and in the event of heavy material such as blanketings or crushed quartz from a battery being treated they may be dispensed with altogether.

The mode of operation is as follows:—The machine being set in motion, the material to be treated is fed through hopper C on to the upper shaking screen B, the coarsest and lightest passing down to the end and discharging there, while the finer and heavier pass through to board L, which conducts it to screen B¹, when it is similarly treated, and so on with respect to screen B², the discharge of which being conducted by board L² to shoot D, from whence it falls directly into the flue E of the air-blast, the largest particles falling into classifier G, the next largest into classifier G¹, and so on to as many classifiers as may be found useful or desirable. The material received by each of these classifiers presses out the valves H H¹ and H² respectively just as far as to admit of its discharge, although, as I have before said, I think they might be dispensed with altogether if the orifice were made only just sufficient to allow of such discharge. The discharge from these classifiers is received on shaking tables as shown, or on strakes, or on endless revolving fabric tables, where it is again subjected to a dry process of concentration, the usual currents with which these contrivances have always been previously used being entirely dispensed with, and instead thereof agitation alone being used to run off the lighter particles from an inclined surface and to retain the heaviest and smallest.

Having thus described the nature of this invention and the manner of performing same, I would have it understood that I do not claim broadly the method of concentrating ores and other material by means of an air-blast, nor the use of inverted pyramidal-shaped classifiers or shaking tables, strakes, or endless revolving fabric tables, as I am aware that there is nothing new in either of these propositions; but what I believe to be new, and therefore claim as my improvements in the concentration and classification of dry ores and auriferous material when in a finely divided state is:—

First—The method of concentrating such ores and material by allowing them to fall through or across a horizontal or approximately horizontal air-blast into a receptacle below.

Second—Providing a series of such receptacles in the line of such air-blast, commencing from the point where such ores and material fall, and continuing onwards in the direction of the blast.

In witness whereof, I, the said Charles Phillips, have hereunto set my hand and seal, this eighteenth day of November, one thousand eight hundred and eighty-one.

Witness—

U. S. BAYSTON,

Clerk to Edwd. Waters, Patent Agent, Melbourne.

CHAS. PHILLIPS.

This

Improvements in the concentration and classification of dry Ores, &c.

This is the amended specification referred to in the annexed Letters of Registration granted to Charles Phillips, this eighth day of February, A.D. 1882.

AUGUSTUS LOFTUS.

REPORTS.

Sir,

In reply to your B.C. minute of the 5th instant (81-11,356), we have the honor to inform you that we have examined the drawings and specification accompanying Mr. Charles Phillips's application for Letters of Registration for an invention entitled "Improvements in the concentration and classification of dry Ores and auriferous material," and think that clauses one and two may be granted, but that three and four be disallowed, as they are not sufficiently novel.

Sydney, 14 December, 1881.

We have, &c.,

A. LEIBIUS.

E. C. CRACKNELL.

The Under Secretary of Justice.

Sir,

We have the honor to report that we have received the amended specification from Mr. Phillips, through his agent, Mr. Waters (with B.C. 81-12,034), and see no reason why the amended application should not be granted.

Sydney, 30 December, 1881.

We have, &c.,

A. LEIBIUS.

E. C. CRACKNELL.

The Under Secretary of Justice.

[Drawings—one sheet.]

G. PHILLIP'S PATENT

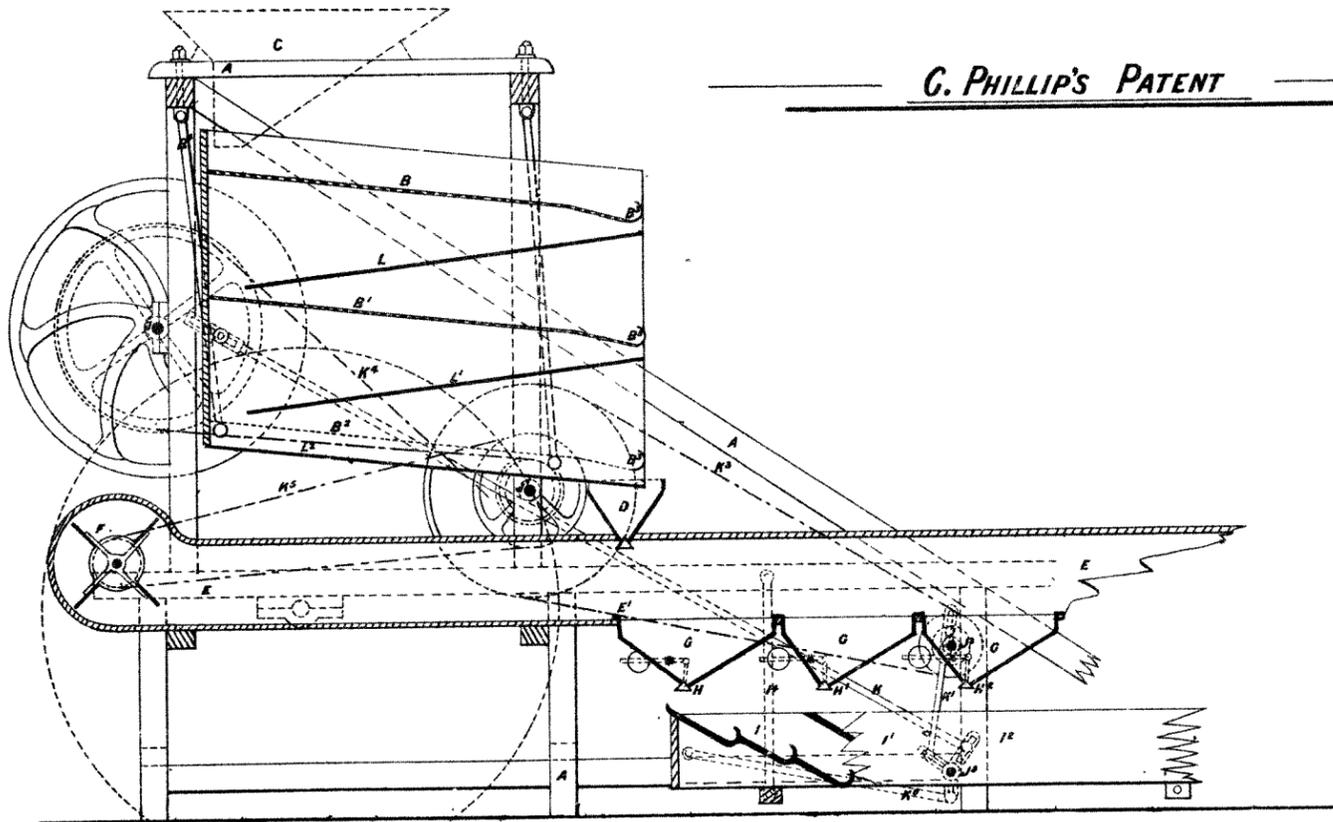


Fig. 1

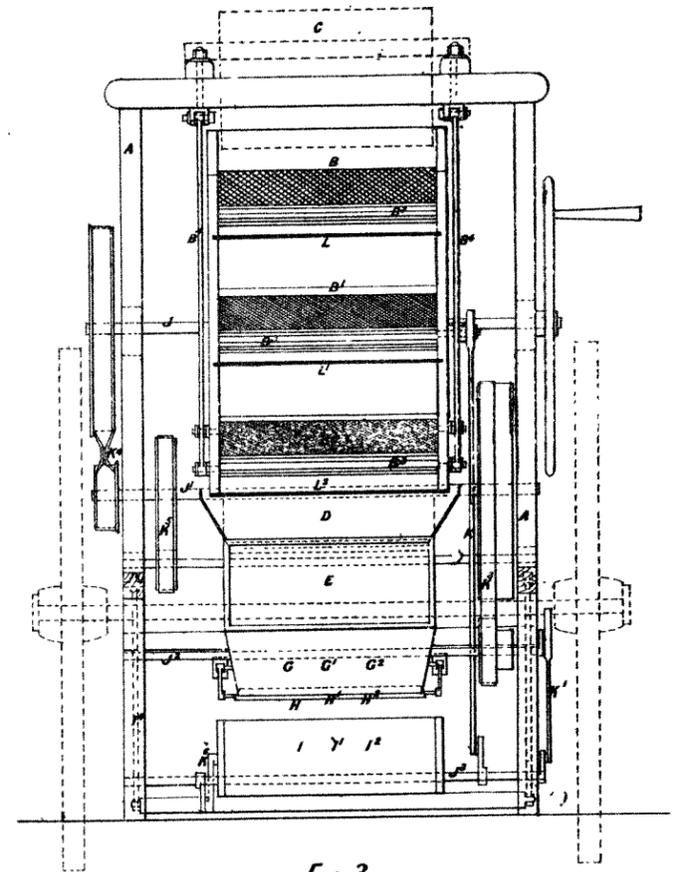


Fig. 3

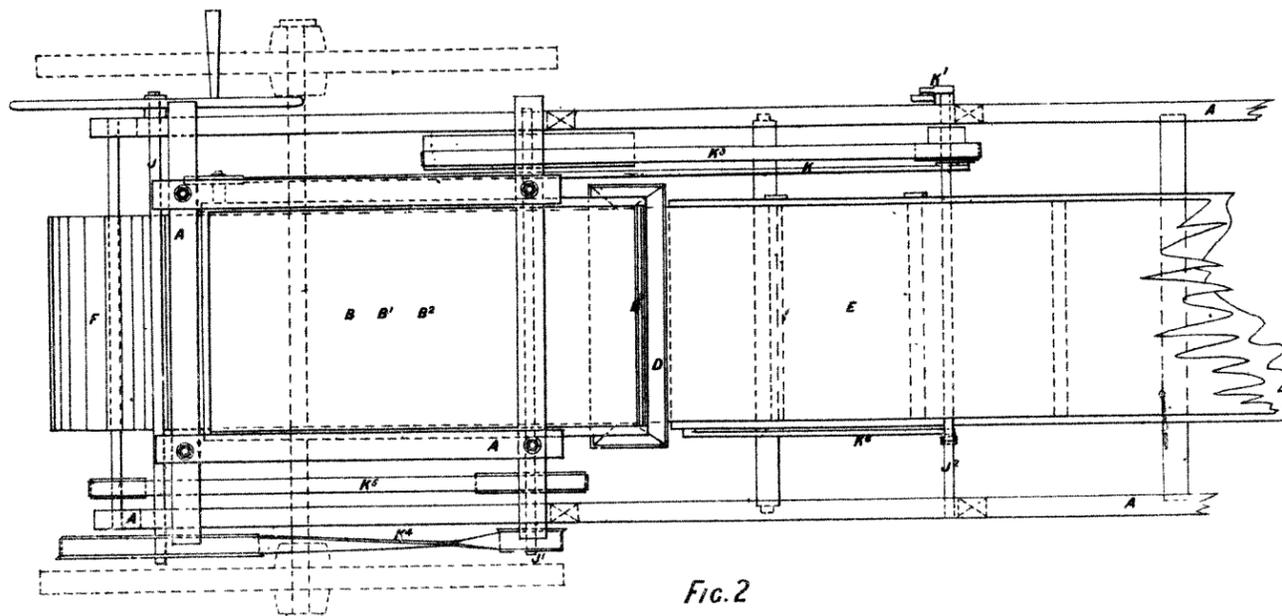


Fig. 2

*This is the Sheet of Drawings referred to in the annexed
 Letters of Registration granted to Charles Phillips, this eighth
 day of February, A.D. 1882.*

Augustus Loftus



A.D. 1882, 8th February. No. 1037.

IMPROVEMENTS IN SELF-ACTING GRABS, &c.

LETTERS OF REGISTRATION to Charles William Maclean, for Improvements in Self-acting Grabs, and in the contrivances used for working same.

[Registered on the 9th day of February, 1882, 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 WILLIAM MACLEAN, of the city 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 Self-acting Grabs, and in the contrivances used for working 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 Charles William Maclean, 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 William Maclean, 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 William Maclean 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, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Self-acting Grabs, &c.

A.

SPECIFICATION of CHARLES WILLIAM MACLEAN, of the city of Melbourne, in the Colony of Victoria, engineer, for an invention entitled "Improvements in Self-acting Grabs, and in the contrivances used for working same."

My improvements in grabs relate to the contrivances through which the grappling portion receives its necessary motions of opening, closing, hoisting, and lowering; and my improvements in the contrivances used for working same consist—first, in the substitution of a counterbalance barrel, supported on pinions running in racks at the back of the crane, for the ordinary counterbalance weight, and in so arranging such counterbalance barrel that it assists instead of retards the engine in all the operations of working the grabs; and second, in a modified construction of crane for working my grabs, in which it is made a portable machine.

In order, however, that my invention may be clearly understood, I will now refer to the drawings hereto attached, in which figure 1 shows side view of crane with my grab and counterbalance barrel attached; figure 2, front view of grab; and figure 3, side view of the forks when they are substituted for the buckets; figure 4 shows front view of crane alone.

The grab A shown on sheet 1 of my drawings has pivoted jaws, $a a^1$, with half-buckets, $b b^1$, or forks, $c c^1$ attached. Four links, $d d^1 d^2 d^3$, connect the jaws with a travelling and rotating shaft, e , which is supplied with a pulley, f , and two smaller warping pulleys, $g g^1$, supplied with stops, 31, and having warping chains, $g^2 g^3$, each secured at one end to their respective pulleys and at the other end to the fixed-jaw pivots 30. The grab is fitted with a frame, h , for keeping centres in position, and guide pulleys $k l$. The hoisting chains $m m^1$ are secured to the pulley f , led to the crane round the jib pulleys $n n^1$ to the hoisting pulleys $o o^1$, which are secured to the shaft p , supplied with driving wheel q and brake r . The engine shaft has a loose spur pinion, s , gearing into the wheel q , and is driven at will by the friction cone clutch t , put into gear by the clutch lever u , working on a fulcrum, v , and screwed shaft, w , supplied with brass nut and hand wheel, x . The ends of hoisting chain are led over pulleys $y y^1 y^2 y^3$ to the counterbalance barrels $z z^1$, which are secured to the shaft 1, supplied with pinions, 2 2¹, gearing into inclined racks 3 3¹. The pinions 2 2¹ and the racks 3 3¹ are shrouded to the pitch line to form a rolling surface, and the guides 4 4¹ keep pinions into gear. The opening and lowering chain 5 is secured to pulley f , and wound round it in a contrary direction to the hoisting chains, thence led to crane round pulley 6 to chain pulley or barrel 7, which runs free on the shaft p ; the barrel 7 is supplied and fitted with a carrier, 8, with pin 9 projecting into friction driving wheel 10, running free on loose eccentric 11 on the shaft p . This eccentric is actuated by a handle, 12, by which the friction wheel 10 can be pressed against the friction driving pinion 13 or against the brake 14, and thus driving or stopping the opening and lowering chain pulley 7. The friction driving pinion 13 is secured to engine shaft 15. The jib 16 is tied by the rods 17 17¹, secured to the wrought-iron cheeks 18 18¹, connected by the tie-rods shown, the table with roller path 19 and the water tank 20, formed to support the boiler 21, supplying steam to the engines 22 22¹. The whole is supported by the Smeaton's ring of rollers, 23, kept in position by a centre wrought-iron pin 24, which is bored out to allow boiler feed pipe passing down below carriage, and rolling on the lower roller path on the fixed spur wheel 25, secured to the sole plate 26, which is provided with bearings, wheels, and axles, 27, if required. Traversing is performed by the gearing shown at 28, which is all easily accessible for repairs. The cheeks with a roof, 29, afford ample protection from weather.

The various operations of closing and digging, hoisting, opening, lowering, and counterbalancing the grab jaws $a a^1$ are effected in a novel and improved manner, by the mechanical contrivances herein described as follows:—

Assuming that the grab A is resting in the open position (shown by dotted lines in figure 1) on the material to be lifted, the grab is then closed by putting chain pulleys $o o^1$ into gear with the engines when in motion in the proper direction, thus pulling the hoisting chains $m m^1$, which, being wound round the pulley f , causes the warping pulleys of grab $g^1 g$ to revolve, drag down the shaft e by the warping chains $g^2 g^3$ winding round their respective pulleys, and closes the jaws $a a^1$ with their attached half-buckets $b b^1$ or forks, $c c^1$. During the operation of digging above described, the counterbalance barrels $z z^1$ take in the slack of the two hoisting chains $m m^1$, and assists, instead of retards, as in other machines, the engine while performing the operation of digging. The opening chain 5 being left free winds round the pulley f , and thus gets ready for the opening process during the operation of digging. The pulling of the hoisting chains being continued after the jaws are closed, the grab with its load is raised, the counterbalance barrel still taking in the slack of the hoisting chains and assisting the operation of hoisting. When the grab has attained the required height, the foot brake r is applied to stop the chain pulleys $o o^1$, and the engine is thrown out of gear by the mechanical contrivances shown. The lever 12 is next used to put the opening chain pulley 7 into gear with the engine to pull the opening chain 5, which, being wound round the pulley f , causes it to revolve until stopped by the stops 31, thus unwinding the warping chains $g^2 g^3$ from their respective pulleys, and dragging up and opening the jaws $a a^1$, with their attached half-buckets $b b^1$, or forks $c c^1$. When the grab is open the lever 12 is used to brake the opening pulley 7 by the gearing herein described, and the grab remains suspended half by the opening chain 5 and half by the hoisting chain $m m^1$; and as the latter chains are always acted on by the counterbalance barrels $z z^1$, with a force equal to half the weight of the grab, the foot brake r can now be left free, and the grab will remain open, ready to be lowered by the opening chain, checked by the brake lever 12. While the grab is being lowered the counterbalance barrels $z z^1$ let out sufficient hoisting chain from their circumferences to allow the grab to fall to any required depth, and at the same time roll up the shrouding of the inclined racks 3 3¹, ready for rolling down when the grab is again raised, wrapping the hoisting chains again on their circumferences, and acting as a counterbalance to the grab and crane.

The weight of lever 12 acting sufficiently on the friction wheels when the load is being raised, takes in the slack opening chain 5, along with and at the same speed as the hoisting chains.

Having

Improvements in Self-acting Grabs, &c.

Having gone through the above-described operations, it will be observed that unlike other machines for effecting a similar purpose, the digging in any material of the jaws of the grab is not interfered with by the counterbalance, which assists instead of retards the engine in performing this operation, while the whole weight of the grab bears on the points entering the material to be lifted. In other machines the counterbalance acts on the opening chain, and therefore counteracts the process of closing the grab and digging the material to be lifted. In other machines the grab cannot be raised open, but in the machine herein described the grab jaws can be opened by the opening chain 5, when the grab is in any position whatever, and the grab can be raised while open to any required height, which is often useful in dredging operations, where the grab is frequently closed by accident on immovable objects below water, in which case other machines are troublesome to open. Again, in other machines when opening the grab, the load is suddenly transferred from the hoisting chain to the opening chain, which is a severe strain on the chains and other parts of the crane, causing frequent breakages. It will be seen that in the machine herein described, the load is discharged while all the chains are taking part of the strain, and there is no sudden or great strain at any time on either of them.

In order to make the crane in a portable form, the boiler, engine, and counterbalance shown on sheet 1 of my drawings may be left out, and the various operations of digging, hoisting, opening, traversing and lowering the grab without these, may be performed by a modified form of crane shown on sheet 2 of my drawings, in which figure 1 is side elevation of my portable crane, figures 2 and 3 are front and back end views of same, and figure 4 is front view of the grab. In this modification, arrangement is made for driving by a belt from either the fly-wheel of a separate portable engine or other motive power, working a pulley, *a*, keyed to a horizontal shaft, *b*, which, by bevil wheels *d d'* drives the vertical shaft *e*, passing up through the centre pin of the turn-table, and driving by the bevil wheels *f f'* the barrel shaft *g*, which has a friction disc, *h*, keyed to it. The hoisting chain pulley *k* and the opening chain pulley *l* (each with special friction face plates) are loose on the barrel shaft *g*, except when pressed against the friction disc *h*, which gives them motion, or against the brake discs *m n*, which stops them, the discs *m* and *n* being secured to the cheeks of the crane *o p*. The hand-wheels *q r* are secured to nuts working on the screwed shaft *s*, carrying the forked levers *u v*, with fulcrums on the shaft *w*, in such a manner that by turning their respective hand-wheels, either the hoisting chain pulley *k* or the opening chain pulley *l* can be moved endways along the shaft sufficiently to gear into the driving friction disc *h* or the brake discs *m n*, thus starting or stopping them at will when the barrel shaft *g* is in motion. The hand-wheel *x* is for actuating an eccentric, which, by the rod *y* and lever *z*, gives the cone clutch 1 sliding on the feathered shaft 2, sufficient up and down motion to gear into and drive either of the cone clutches 3 or 4. The cone clutches 3 4 are respectively cast or secured to the wheels 5 6, and when driven, traverse the crane either way in the usual manner by the gearing shown. Hand driving gear is also shown at 7, by which all the operations required for working the gear can be performed by one or two men standing on the platform 8. The platform 9 is for the one operator required when the crane is driven by a separate engine. The jib 10 is supported by the tie rod 11 attached to the wrought-iron cheeks. A digging grab fork is shown at 12. The whole is mounted on a Smeaton's ring, 13, on a carriage, 14, having two large wheels on a fixed axle, 15, and two smaller ones on a swivel axle, 16, with drag poles, 17. One hoisting chain, 18, led over pulleys 20 and 21 to the chain pulley *e*, does the work of closing and hoisting the grab in a similar manner to the two shown in No. 1 drawing. The opening chain 19, led over pulleys 22 and 23 to the chain pulley *k*, acts in a similar manner to the one in No. 1 drawing.

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 use of cranes for working self-acting grabs, nor yet the grabbing portion of the buckets and forks herein described and illustrated in my drawings, but what I believe to be new, and therefore claim as my invention is:—

First—Constructing self-acting grabs with a travelling shaft, working vertically in guides in the framing, and carrying—first, a drum, to which are attached the closing and hoisting chains, as well as the opening and lowering chain; and secondly, two warping pulleys for winding and unwinding the chains which open and close the two halves of the bucket, and to which are also attached the links or levers *d* and *d'*, all substantially in the manner and for the purposes described.

Second—Connecting the counterbalance-weight or otherwise to the closing and hoisting chains, so that it assists instead of retards the engine in this portion of its work.

Third—Constructing the counterbalance of a barrel, supported by pinions, running in a rack set preferably on an incline and at the hinder part of the crane, so that it may counterpoise it as well counterbalance the grab, substantially as herein described and explained.

Fourth—The special combination and arrangement of machinery shown on sheet 2 of my drawings, and constituting my improved portable crane.

In witness whereof, I, the said Charles William Maclean, have hereto set my hand and seal, this fifth day of December, one thousand eight hundred and eighty-one.

Witness—

EDWD. WATERS,
Melbourne, Agent.

C. W. MACLEAN.

This is the specification marked A referred to in the annexed Letters of Registration granted to Charles William Maclean, this eighth day of February, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Improvements in Self-acting Grabs, &c.

REPORT.

Sir,

Sydney, 23 December, 1881.

We do ourselves the honor to report, in reply to your blank cover communication of the 13th instant, No. 11,563, that we are of opinion the prayer of Mr. Charles William Maclean's Petition for the registration of certain "Improvements in Self-acting Grabs, and in the contrivances used for working the same," may be granted, in terms of his specification, drawing, and claim.

We have, &c.,

E. C. CRACKNELL.
GOTHER K. MANN.

The Under Secretary of Justice.

[Drawings—two sheets.]

C. W. MACLEAN'S PATENT

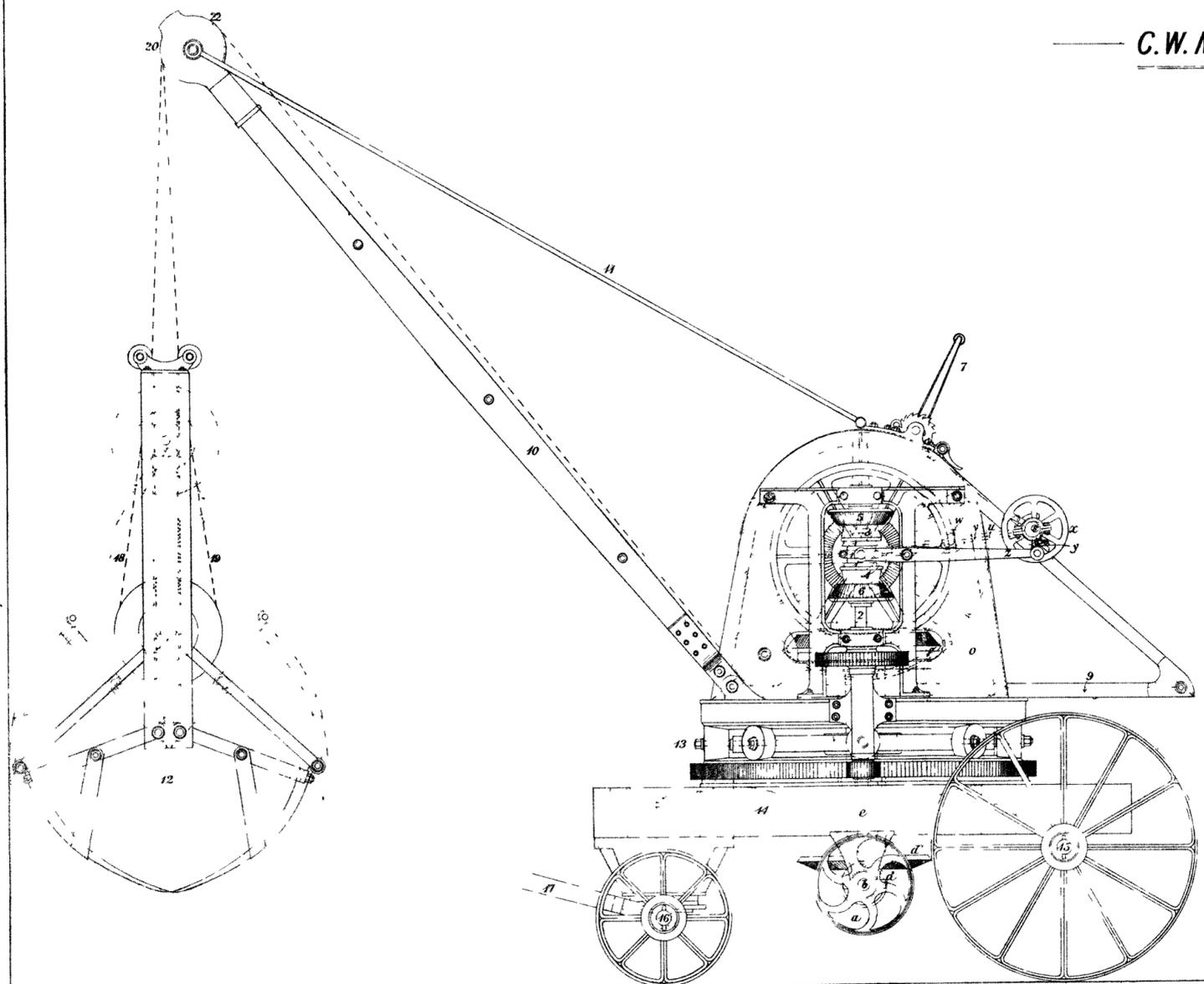


Fig. 1

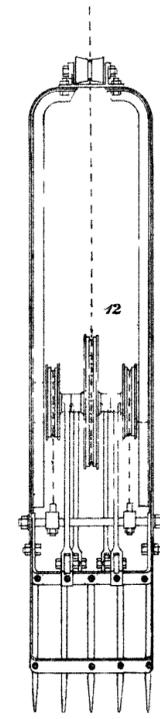


Fig. 4

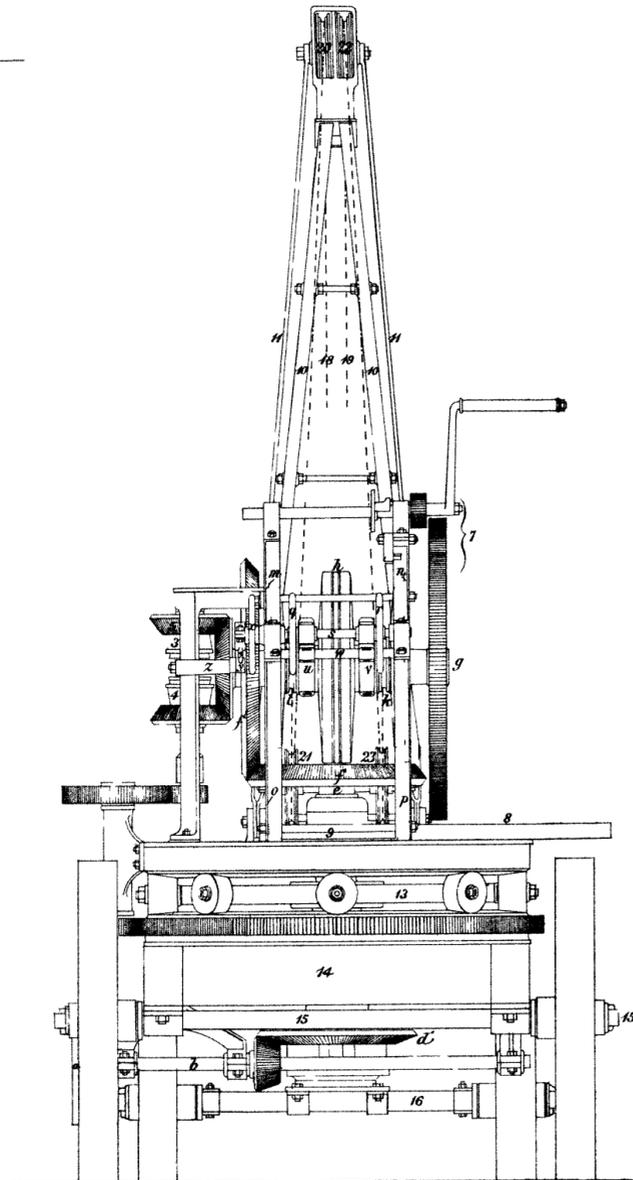


Fig. 3

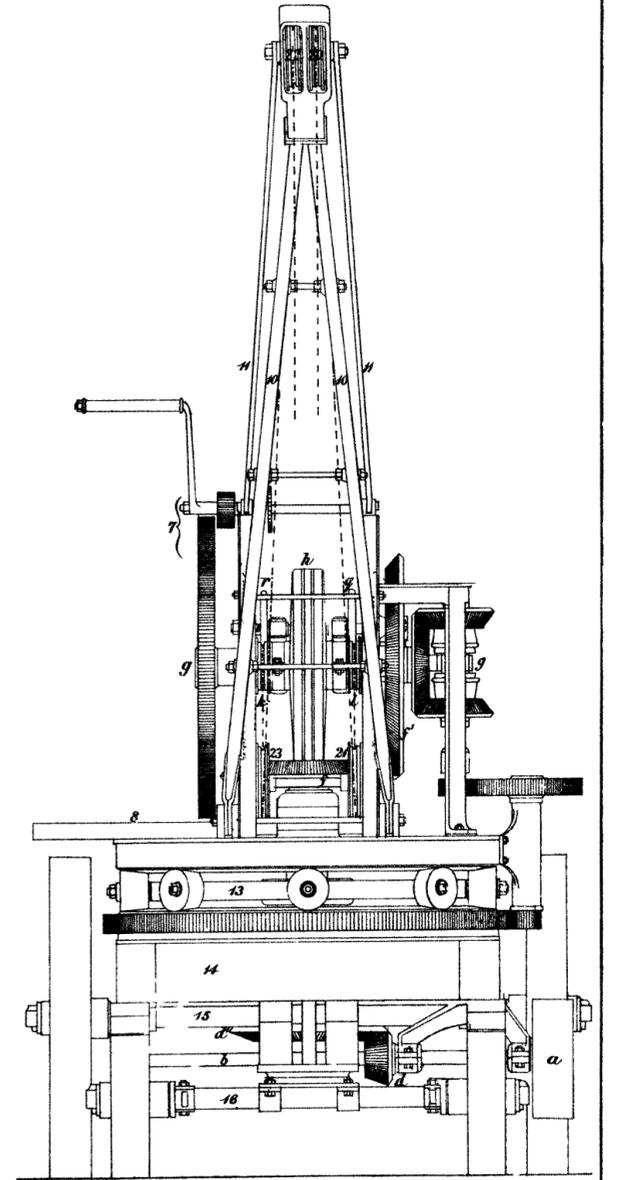


Fig. 2

This is the Sheet of Drawings marked C referred to in the annexed Letters of Registration granted to Charles William Maclean, this eighth day of February, A.D. 1882. Augustus Loftus.



A.D. 1882, 8th February. No. 1038.

IMPROVEMENTS IN MACHINERY FOR OPENING AND CLOSING RAILWAY GATES.

LETTERS OF REGISTRATION to Robert Archibald White, for Improvements in Machinery for opening and closing Railway Gates.

[Registered on the 9th day of February, 1882, 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 ARCHIBALD WHITE, of Beulah Road, Norwood, in the Province of South Australia, civil and 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 for opening and closing Railway Gates," 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 Archibald White, 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 Archibald White, 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 Archibald White 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, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Machinery for opening and closing Railway Gates.

SPECIFICATION of ROBERT ARCHIBALD WHITE, of Beulah Road, Norwood, in the Province of South Australia, civil and mechanical engineer, for an invention entitled "Improvements in Machinery for opening and closing Railway Gates."

MY invention relates to those kinds of railway gates which are opened and closed by means of machinery worked by hand, from what is termed the signalman's cabin. The object of the invention is to simplify the construction of such machinery, and so lessen its cost and make it more accessible and convenient. As at present constructed, these gates are made with one set of rods and other contrivances for opening and closing them, and another set for working the stops by which they are locked. Now, the essential feature of my invention is that I dispense with one of these sets of rods and other contrivances, and work both stops and gates with one set of rods, whilst a subordinate feature consists in the special contrivances which I have devised by which this may be accomplished. According to my invention, the motion of the crab-winch, windlass, &c., inside the signalman's cabin, works a rod, which operates two bell-cranks, one on each side of the line of railway, and also a rod which runs across such line. Each of these bell-cranks works a rod, through which the two halves of the gate on either side of the line are opened and closed, and the gate-stops on either side of the line are raised and lowered, whilst at the other end of that rod which is on the opposite side of the line to the signalman's cabin is a third bell-crank, which operates another rod that runs a little more than half-way across the line; these cross-rods being for the purpose of raising and lowering the gate-stops in the centre of the line.

In order, however, that my invention may be clearly understood, I will now refer to the drawings hereto attached, which illustrate the best method I know of putting my invention into practice. Figure 1 shows a plan of my invention for working a pair of railway gates, and figure 2 side elevation thereof. Figure 3 shows an elevation of the stops when down, and figure 4 the same when raised. A is the rod from the signalman's cabin, which runs across the railway line, operating the two bell-cranks B. The other arm of each of these bell-cranks is attached to a rod, B¹, having a crank continuation, B², at either end of which are stops or bolts, B³, fitting when required into sockets, B⁴, into a toothed sector, B⁵, at the foot of one of the hanging posts, B⁶, of the gates. Said rods B¹ then continue past such rack continuations until they approach the side-stops B⁶, for the gates, where a double prong, B⁷, with inclined planes, B⁸, is inserted, such double prong passing through holes in arms, B⁹, which arms work on centres at bottom, and are fitted with links, B¹⁰, at top, so that when the inclined planes are forced through such holes, the arms will be spread out or closed, and cause the stops to rise or fall, as the case may be (see figures 3 and 4), by making them swivel on their pivots or centres C¹; said rod B¹ then again continuing its length until it reaches a second rack and toothed sector exactly the same as the former ones, except that they are on opposite sides of the rod B¹, said rod being guided and kept in position by rollers, B¹¹. This second toothed sector is at the heel of the post of the half of another set of gates, and each sector is enclosed by a peculiar shaped casting or box, F.

In the centre of the cross-rod A is an inclined prong, A¹, for working in the longitudinal centre rod D, the other end of which is attached to a crank-pin on one of the centre stops D¹, so as to raise and lower it by making it swivel on its own pivot or centre; and at the end of that rod B¹ which is on the opposite side of the line to the signalman's cabin, is a third bell-crank operating a second cross-rod terminating in an inclined rod, A¹, similar to that on the cross-rod A; and this inclined rod is for precisely the same purpose as the other, viz., to raise and lower one of the centre stops (in this case marked D²), in precisely the same way as before. It must of course be understood that the whole of this apparatus is enclosed in suitable boxes underground, as in other swing gates of a similar character, provision being made by lids and openings for lubrication and repair. E E are the gates shown across the railway. E¹ are gate-posts, and dotted line *a a* shows the rail level.

The mode of operation is as follows:—Suppose the gates to be closed across the line, as shown in the drawing, and the machine in the signalman's cabin moved for the purpose of opening them, the motion imparted to the rods would be simultaneous and in the direction of the arrows, but the prongs A¹ and B¹ would first partially rotate the stops D¹ and D² so as to lower them out of the way of the gates. This would occur before, but only just before the racks B² reached the toothed sectors B⁵. The immediately following action would be that, as said racks gear into said sectors, the gates would commence and continue to open until they reached the outside stops at the side of the line, which outside stops have been raised simultaneously with the opening of the gates, when a still further combination of the motion would cause the inside stops B⁶ at the side of the line to rise into position in front of the gates, and so lock them; the stops or bolts B³ having meanwhile entered their respective sockets in the toothed sectors, and so, with the assistance of the flat surface of said sector pressing against the flat surface of the stem of the rack, keeping the whole apparatus firmly fixed until the reverse motion is given. When this is given, it is effected by the opposite motion of the same lever which gave the first motion, and in that case the opposite stops or locks and the flat surfaces on the opposite sides of the toothed sectors, and the opposite ends of the rack stems will hold the whole apparatus as firmly in the opposite position.

In my drawings I have shown the toothed sectors with flat sides exactly alike, because the travel of the gates is exactly alike; and this is quite correct where they cross the line at right angles, but at skew crossings these racks and toothed sectors will have to be made to suit the circumstances that is to give the necessary travel to the gates. I wish also to state that it is evident that mechanical equivalents may be used for the mechanical details I have described; for instance, cranks could be substituted for the toothed sectors, and so on.

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 the improvements in machinery for opening and closing railway gates for which I am desirous of securing Letters Patent is—

First—So constructing the machinery for opening and closing railway gates as that by means of one set of rods the stops in front of the gates may first be lowered, and by the continuous travel of such rods the gates may be either opened or closed (as the case may be), and by the still further travel of the rods the inside or lock stops of the gates in their new position may be raised.

Second—

Improvements in Machinery for opening and closing Railway Gates.

Second—The special combination and arrangement of mechanism herein described, and illustrated in my drawings, by which the results set forth in the preceding claim are effected.

In witness whereof, I, the said Robert Archibald White, have hereunto set my hand and seal, this twenty-first day of November, one thousand eight hundred and eighty-one.

Witness—

W. S. BAYSTON,
Clerk to Edwd. Waters, Patent Agent, Melbourne.

ROBT. A. WHITE.

This is the specification referred to in the annexed Letters of Registration granted to Robert Archibald White, this eighth day of February, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Having examined the specification and plans accompanying the petition of Mr. Robert Archibald White for an invention entitled "Improvements in Machinery for opening and closing Railway Gates," we have the honor to report that we see no objection to Letters of Registration being issued as prayed for.

Sydney, 22 December, 1881.

We have, &c.,

JOHN WHITTON.
E. O. MORIARTY.

The Under Secretary of Justice.

[Drawings—one sheet.]

— R. A. WHITE'S PATENT —

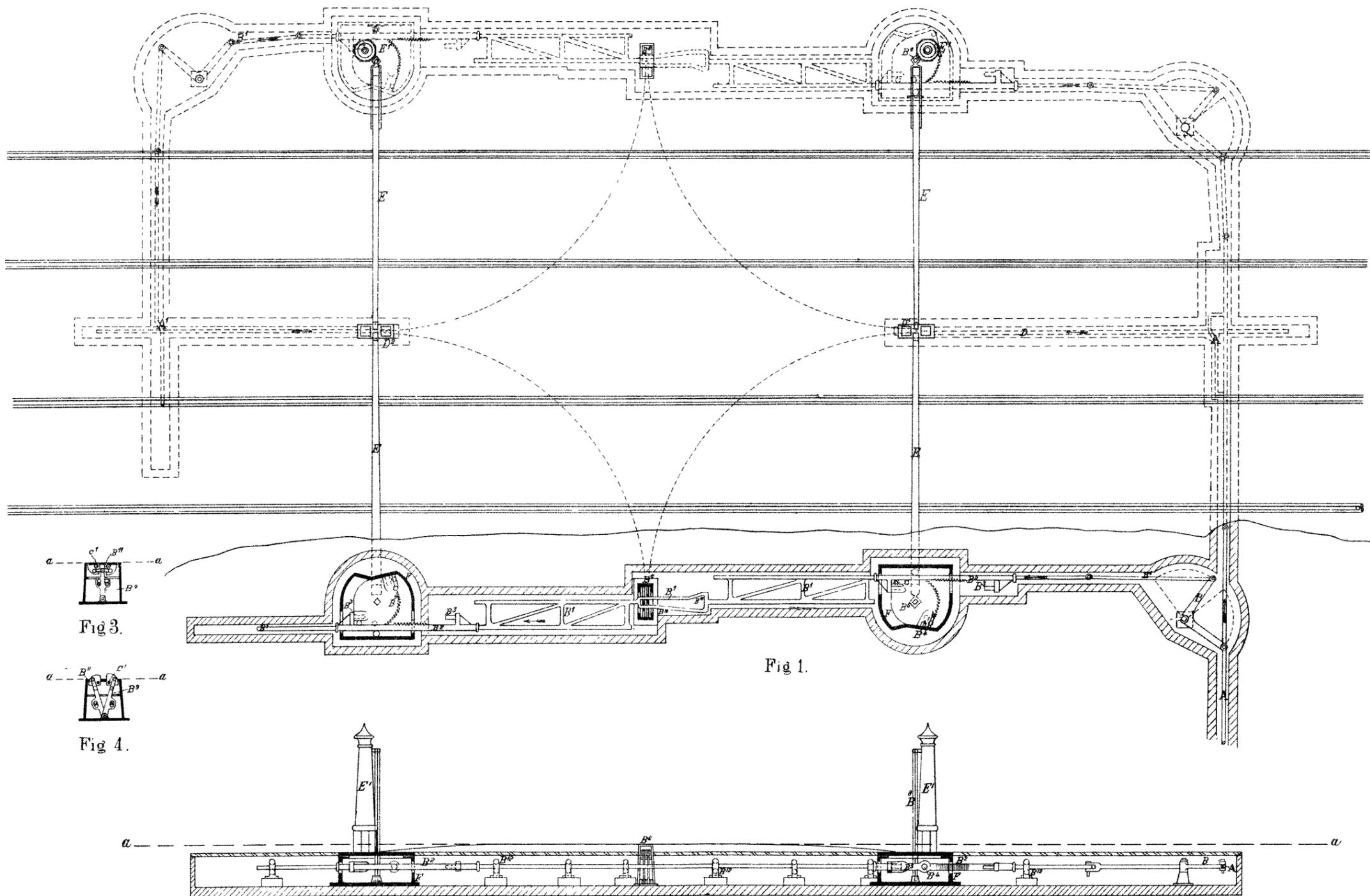


Fig 3.

Fig 4.

Fig 1.

Fig 2.

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 Robert Archibald White,
 this eighth day of February, A.D. 1882. Augustus Loftus.*
 (Sig 32.)



A.D. 1882, 2nd March. No. 1039.

IMPROVED MEANS OF TRANSMITTING ROTARY MOTION.

LETTERS OF REGISTRATION to Stephen Dennis, Antonio Samper, and Julio Valenzuela, for Improved means of transmitting Rotary Motion.

[Registered on the 3rd day of March, 1882, 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 STEPHEN DENNIS, ANTONIO SAMPER, and JULIO VALENZUELA, all of the United States of Columbia, in South 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 "Improved means of transmitting Rotary Motion," which is more particularly described in the amended 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 Stephen Dennis, Antonio Samper, and Julio Valenzuela; 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 Stephen Dennis, Antonio Samper, and Julio Valenzuela, 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 Stephen Dennis, Antonio Samper, and Julio Valenzuela 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 March, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improved means of transmitting Rotary Motion.

SPECIFICATION of STEPHEN DENNIS, ANTONIO SAMPER, and JULIO VALENZUELA, all of the United States of Columbia, in South America, for an invention entitled "Improved means of transmitting Rotary Motion."

THE object of this invention is to transmit rotary motion with a minimum loss by friction, and without the intervention of belts, gearing, and the like.

The invention consists of two pulleys, one on the driving and the other on the driven shaft, that are connected by an endless cord, rope, or chain, which makes one or more complete turns or coils around each, and is drawn to the ordinary tension of a driving belt, while in front and rear of each pulley, and nearly in contact with their faces, are fixed grooved rollers, either running loosely on shafts or keyed on freely revolving shafts, each one of whose grooves covers a turn or coil of the cord or rope, and thus keeps it in its perpendicular plane, and prevents the cord or rope from running off at the side of the pulley.

It will be obvious that by this device power can be transmitted from one point to another without the friction incident to the use of belts; and without the loss of power attendant upon the invariable slipping of belts when running at any but very low speed. Indeed, it has been fully demonstrated that an economy of from twenty to twenty-five per cent., which is convertible into like saving in fuel, may be assured by substituting this frictionless and non-slipping transmitter for the ordinary device of the belt. It will be seen, too, that by the aid of the grooved rollers power can with equal ease be transmitted from a horizontal to a vertical shaft, or *vice versa*, thus enabling one to dispense with the use of gear wheels, and that the power can be transmitted to any distance whatever, with less loss of the original force than by any other means.

In the accompanying drawings figure 1 is plan of the device, figure 2 is a sectional side elevation of the same on line *x x*, figure 1; figure 3 is a sectional plan of loose pulley and clutch. Similar letters of reference indicate corresponding parts.

A represents the frame supporting the working parts of the device. B is the driving pulley, and C the driven pulley; the former keyed to the shaft *a*¹, while the latter runs loosely on the shaft *b*¹ but can be thrown in gear by the action of the clutch D that is keyed on shaft *b*¹. EE are the grooved rollers on shafts *c c*¹. The cord, rope, or chain F is turned, it is seen, several times around the pulleys B and C, and its tendency to run sideways off the faces of the pulleys is checked by the grooves of the rollers EE, in which the turns or coils of the cord or rope run, and the rollers revolve so freely that there is no appreciable friction between them and the cord. G is a cross-bar for stiffening the frame. The simplicity, effectiveness, and durability of this device must be obvious to all who have had experience with the common belt and cog-wheel system.

Having described the nature of the said invention and the manner of performing the same, we declare that what we claim as new and desire to secure by Letters of Registration is:—

First—The small pulleys EE to guide the rope or chain, and keep it from running off the large pulleys B and C, substantially as herein described, and

Second—The specific arrangement of parts forming our complete device for transmitting motion as herein described, and as illustrated in our drawings.

STEPHEN DENNIS.
ANTONIO SAMPER.
JULIO VALENZUELA.

By their duly authorized Attorney, EDWD. WATERS.

This is the amended specification referred to in the annexed Letters of Registration granted to Stephen Dennis, Antonio Samper, and Julio Valenzuela, this second day of March, A.D. 1882.

AUGUSTUS LOFTUS.

REPORTS.

Sir,

Sydney, 24 December, 1879.

There is no novelty in the application of two pulleys or drums for the transmission of rotary motion by winding chains or cables, whether spirally or otherwise, on them. The application of the small pulleys to guide the rope or chain and keep it from running off the large pulleys or drums is novel; and, without expressing any opinion as to its value, we see no objection to Letters of Registration being issued for it, and for the specific arrangement shown on plan, but no more.

We have, &c.,

E. O. MORIARTY.
WILLIAM C. BENNETT.

The Principal Under Secretary, Sydney.

Sir,

Sydney, 18 January, 1882.

In reference to your B.C. minutes of 5th instant, on Mr. Waters' letter of 22nd ult., forwarding amended specification, &c.,* *in re* application of Messrs. Dennis, Samper, and Valenzuela for Letters of Registration, we have the honor to state that we see no reason why the letters applied for should not be issued.

We have, &c.,

WILLIAM C. BENNETT.
E. O. MORIARTY.

The Under Secretary of Justice.

* Improved means of transmitting rotary motion.

Fig. 1.

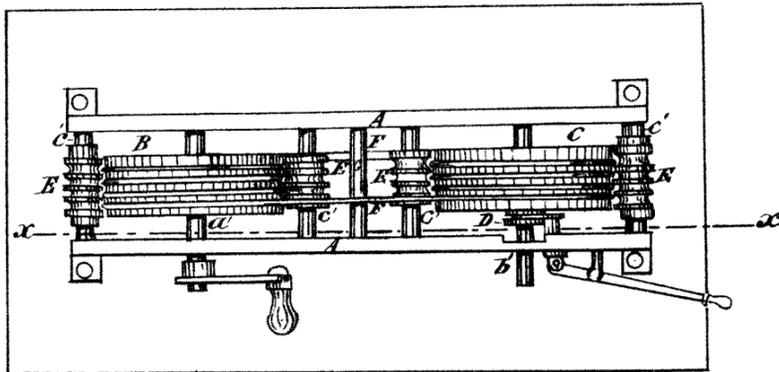


Fig. 2.

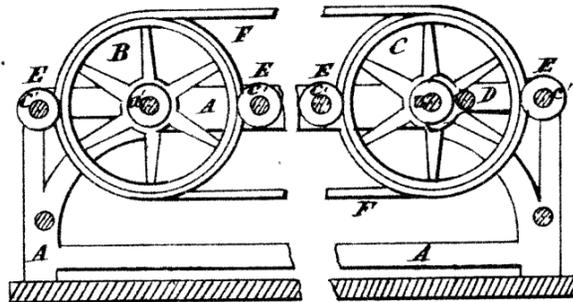
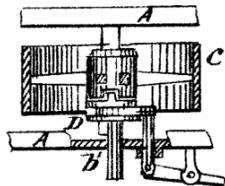


Fig. 3.



*This is the Sheet of Drawings referred to in the annexed
Letters of Registration granted to Stephen Dennis Antonio
Samper; and Julio Valenzuela, this second day of March
A.D. 1882.*

Augustus Loftus.



A.D. 1882, 9th March. No. 1040.

IMPROVEMENT IN SYSTEMS OF ELECTRIC LIGHTING.

LETTERS OF REGISTRATION to Thomas Alva Edison, for Improvements in Electric Lighting.

[Registered on the 9th day of March, 1882, 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 systems of Electric Lighting," 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 ninth day of March, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvement in systems of Electric Lighting.

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 an "Improvement in systems of Electric Lighting," of which the following is a specification.

IN a system of electric lighting wherein very many lamps are to be supplied from one central station, as I have described in prior Letters Patent, it is essential that the electro-motive force or pressure throughout the system be maintained constant. In such systems, the lamps are so proportioned, as to radiating surface and resistance, that all the lamps in a system shall give a standard amount of light.

Under some conditions, it seems desirable that provision should be made enabling lamps giving less than the standard amount of light to be used in a system with standard lamps without any additional devices, such as resistance, &c. That is, supposing that a lamp giving, under the normal pressure of current in the system, 16-candle power be taken as the standard, it may be desirable to use in the same system lamps giving 4, 6, 8, or 10-candle power.

The object of this invention is to furnish a method for attaining this object.

This method may be briefly stated as consisting in diminishing the radiating surface, and increasing the resistance of the lamp in the ratio which the diminished lamp bears to the standard lamp.

In the drawing, suppose 1, 2, to be main conductors, upon multiple arcs thereto, 3, 4, 5, the lamps 4, 8, 16, being placed.

Suppose that the conditions are such that, with the standard radiating surface and resistance of the lamps and standard pressure of the system, the lamp 16 gives 16-candle power, then if in 8 the radiating surface is diminished one-half, while the resistance is doubled in comparison with the standard lamp, this lamp may be used in the same system with the standard lamp, but will give only 8-candle power; or to put it in figures, suppose the resistance of the standard lamp to be 100 ohms, and its radiating surface 10 millimeters, to use in the same system the lamp 8, its carbon *c* must have a resistance of 200 ohms, and a radiating surface of 5 millimeters. Applying the same method, the lamp 4 may be made to give 4-candle power, and other lamps may be introduced giving any desired candle power.

What I claim is,—

First—In a system of electric lighting in which a constant and uniform pressure of current is maintained, the combination of lamps varying in radiating surface and resistance, substantially as set forth.

Second—The method of varying the light-producing power of electric lights for use in one system, consisting in diminishing the radiating surface and increasing the resistance in proportion as they are to vary from the standard lamps, substantially as set forth.

Signed by me, this seventh day of November, 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 ninth day of March, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

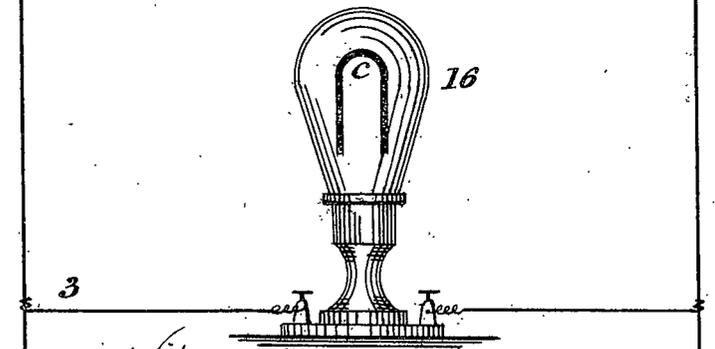
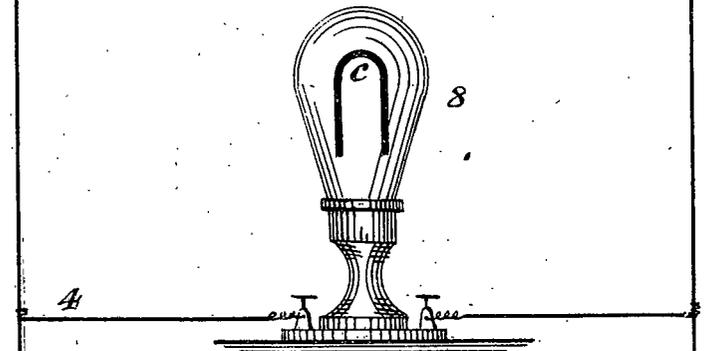
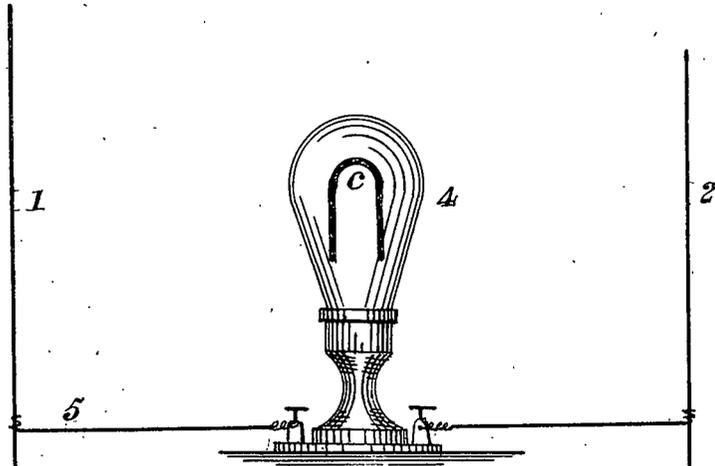
We do ourselves the honor to report, in reply to your blank cover communication of the 19th instant, No. 959, transmitting Mr. Thomas Alva Edison's application for the registration of an invention entitled, "Improvements in systems of Electric Lighting," that we are of opinion the prayer of Mr. T. A. 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—one sheet.]



Witnesses.

Chas. F. Smith
Geo. T. Bruckner

1

Thomas Alva Edison
Inventor.

2

This is the Sheet of Drawings referred
to in the annexed Letters of Registration
granted to Thomas Alva Edison, this
ninth day of March A.D. 1882.

Augustus Loftus.



A.D. 1882, 9th March. No. 1041.

IMPROVEMENTS IN METERS FOR MEASURING ELECTRIC CURRENTS.

LETTERS OF REGISTRATION to Thomas Alva Edison, for Improvements in Meters for measuring electric currents.

[Registered on the 9th day of March, 1882, 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 Meters for measuring electric currents," 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 ninth day of March, in the year of our Lord one thousand eight hundred and eighty-two.

[L.s.]

AUGUSTUS LOFTUS.

Improvements in Meters for measuring electric currents.

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 Meters for measuring electric currents," of which the following is a specification.

THIS invention relates to the electro-plating or metal-depositing cell electric meter for measuring the amount of electrical energy consumed in a system of electric lighting, in which meter the metal is taken from one electrode of the cell and is deposited upon the other by the action of the current. This depositing cell is arranged so that only a small part of the current will pass through it, the total current being determined by the measurement of a definite fractional portion thereof.

The object of the first part of the invention is to produce an electric meter of this character which will produce a correct deposit of metal by the use of a much weaker current (or smaller portion of the entire current) than is possible with the employment, as heretofore practised, of simple copper electrodes, thus causing a considerable saving in electrical energy.

This is accomplished by using amalgamated electrodes in the depositing cell. The electrodes preferred for this purpose, and which are the most accurate, are made of metallic zinc placed in a strong solution of sulphate of zinc. It is preferable that such electrodes before being used in the meter should have a heavy coating of deposited zinc placed on them by the action of an electric current, which zinc will be thoroughly amalgamated while being deposited.

Plates thus prepared are precisely alike, and give accurate results.

Other metals which can be amalgamated, such as cadmium, lead, and tin, are capable of being used in this connection when immersed in solutions of their salts not acting upon the mercury, such as the sulphate of cadmium and acetate of lead, but none are as accurate as zinc treated as described.

The depositing cell meter is arranged in a shunt from one of the conductors of a house or other consumption circuit, a resistance being placed in the line to shunt a definite small portion of the entire current through the meter.

A wire resistance is placed in the same shunt as the depositing cell, and is arranged to compensate for the effect of changes in temperature on the resistance of the cell, the wire being increased in resistance by a rise of temperature, and the cell proportionately decreased; and a fall of temperature having exactly the opposite effect on the wire and cell, the total resistance of the shunt will always be the same, and consequently the same fraction of the current will always pass through it.

Two or more depositing cells may be used instead of one cell in the same shunt, or two cells may be placed in separate shunt circuits so that one will act upon the other.

To prevent the establishing by the cell of a counter current, and the recomposition of the solution when no lamp is on and no current is flowing through the house or consumption circuit, a device is provided for automatically breaking the shunt when the circuit of the last lamp is broken, and for closing such shunt when the first lamp circuit is completed. This device may consist of an electro-magnet placed directly in the house or consumption circuit, or in a multiple arc circuit therefrom, or in a shunt from one of the conductors of the consumption circuit, and operating a lever arranged to make and break the meter shunt at its front contact; or this magnet may be the resistance around which the meter shunt is placed.

The object of another part of this invention is to produce a vebermeter of the above described class, which will have the temperature within the enclosing case so automatically regulated that the solution in the electrolytic cells cannot reach the freezing-point, which low temperature would render the cells inoperative; and a further object is to produce a simple and cheap construction of cells for use in vebermeters of this character, which will not necessitate the employment of glass jars.

The first object is accomplished by placing in the box which encloses the meter a carbon or metallic resistance, situated in a space common to both cells of the meter, if more than one cell is used, and arranged in a derived circuit, in which is placed an automatic thermo circuit regulator, which closes the circuit when a definite low temperature is reached (for instance, ten degrees above the freezing-point of the solution contained in the cell.) The carbon resistance is heated by the passage of the current, but not sufficiently to be destructive of the same, and the temperature of the meter is maintained above the freezing-point of the solution.

The thermo circuit regulator may be a spring carrying a lever on its free end, which lever is thrown by the contraction of the spring against a contact point, completing the circuit in which the carbon resistance is placed.

When the temperature rises the spring expands and the circuit is broken, and it is closed again by the fall of the temperature. The plates of the electrolytic cells are maintained at a definite distance apart by simple means.

For this purpose, there are placed between the plates blocks of non-conducting material which are of a definite thickness, representing the distance it is desired to keep the plates apart, and such plates are removably clamped upon the blocks by means of a screw, also of non-conducting material, hard rubber being suitable for this purpose.

The meter is preferably provided with two cells, one of which having its plates placed further apart, and having a smaller proportion of the current shunted through it, will deposit only a small proportion of what the first cell deposits, and may be used as a check upon the first cell.

To accomplish the second object mentioned above (the production of a simple cell without the use of glass) the jar is made of copper, and within it is placed removably, upon a block of non-conducting material, an inner and smaller cylinder of copper. The jar is connected to one pole and the inner cylinder to the other, the deposition taking place upon said inner cylinder. The jar has a removable cap which allows the inner cylinder to be removed and replaced at will.

The first part of this invention is illustrated in figure 1 of the drawings, which is a diagrammatic view of a meter and connections.

Improvements in Meters for measuring electric currents.

1 2 are the conductors of the house or consumption circuit, and L, lamps or other translating devices placed in multiple arc or cross circuits. R is resistance in either conductor 1 or 2. 3 4 represent the meter shunt. M is the depositing cell forming the meter, having amalgamated zinc electrodes, E E', and a solution of sulphate of zinc. S R' is the wire resistance in shunt 3 4, to compensate for the varying resistance of S. A is the electro-magnet in one of the conductors 1 2, operating lever B placed in shunt 3 4, and making and breaking said shunt at contact c.

The second part of the invention is shown in figures 2, 3, and 4, of which figure 2 is a view showing the arrangement of the cells and carbon resistance; figure 3, a separate view of the plates of one cell and the stopple connections; and figure 4, a vertical section of the modified construction of cell.

1 2 are the main conductors, in shunt circuits from which are arranged the two electrolytic cells A B. The resistances $a'b$ (preferably of German silver) shunt portions of the current through the cells. In the shunt circuit of the cells are fine wire resistances, a', b' which counterbalance the increase and decrease in the conductivity of the cells due to variation of the temperature. The plates C D of the cells are separated by non-conducting blocks or strips, e, and are clamped removably upon such blocks or strips by screws, d, of non-conducting material.

The plates of cell B are placed farther apart than those of A, and the resistance b is made less than a , so that the deposit in cell B is made in proportion to that in A. For instance, B may be arranged to deposit in six months the same amount A will deposit in one month, and B can be examined at the end of that time and used to check the accounts based on the monthly examination of A.

In the meter box is placed the carbon resistance E, which is made of carbonized paper or of other suitable material, or of a suitable metal.

This carbon resistance is in the derived circuit 3 4, in which is also placed the lever F and contact e. The lever F is carried by the free end of a coiled spring, G, which is adjusted to throw F against e, when a certain low temperature is reached, as for instance, ten degrees above the freezing-point of the solution.

In the modified form of cell not employing glass, H, fig. 4, is the copper vessel in which is placed the copper cylinder I, resting removably on a block F, of non-conducting material. J is the removable cover, and $g h$ are the connections with the outer and inner cylinders. It is obvious that instead of carbon resistance exposed to air, an incandescent electric lamp, containing a filament of carbon, may be used to heat the electrolytic cells.

What I claim is,—

- 1st—In an electric meter, an electro-depositing cell, provided with amalgamated metallic electrodes.
- 2nd—In an electric meter, an electro-depositing cell having amalgamated zinc electrodes.
- 3rd—The combination with an electric circuit having a definite and known resistance, of a shunt circuit around such resistance, containing one or more electro-depositing cells, provided with amalgamated metallic electrodes for determining the current in the main circuit, substantially as set forth.
- 4th—The combination with an electric circuit, having a definite and known resistance, of a shunt circuit around such resistance, containing one or more electro-depositing cells, provided with amalgamated zinc electrodes for determining the current in the main circuit, substantially as set forth.
- 5th.—A meter for measuring the current in any electric circuit, consisting of a known resistance in such circuit, around which is a shunt circuit containing one or more electro-depositing cells, with amalgamated metallic electrodes and resistances for compensating for the effect of changes of temperature on the resistance of such cells, substantially as set forth.
- 6th—The combination with an electro-depositing cell acting as a meter, of a circuit closer and breaker, arranged to break the meter circuit when no translating devices are in operation, and to close such meter circuit when a single translating device is put in operation, substantially as set forth.
- 7th—The combination with an electric circuit having a definite and known resistance, of one or more electro-depositing cells arranged in a shunt around such resistance, and an electro-magnet in the main circuit, or in a shunt or multiple arc circuit therefrom, operating to open and close the meter shunt, substantially as and for the purpose set forth.
- 8th—In an electrolytic cell vebermeter, a carbon or other resistance heated by an electric current, and arranged in proximity to the cell or cells, for maintaining the temperature of the solution above the freezing-point, substantially as set forth.
- 9th—In an electrolytic cell vebermeter, the combination of a carbon or other resistance arranged in proximity to the cell or cells, and an automatic thermo circuit regulator for making and breaking the circuit of the resistance, substantially as set forth.
- 10th—In an electrolytic cell vebermeter, the combination of a carbon or other resistance arranged in proximity to the cell or cells, and an automatic thermo circuit regulator composed of a spring and contact lever, for making and breaking the circuit of the carbon or other resistance, substantially as set forth.
- 11th—In an electrolytic cell vebermeter, the plates of the cell retained a definite distance apart, by means of non-conducting blocks or strips, and removably clamped upon such blocks or strips, substantially as set forth.

Improvements in Meters for measuring electric currents.

12th—An electrolytic cell for voltmeters, composed of a copper vessel and a removable copper cylinder placed in such vessel and insulated therefrom, the connections being made with such vessel and cylinder, substantially as set forth.

13th—The method of maintaining the solution of an electrolytic cell above the freezing-point, consisting in heating the same from a carbon or other resistance, the circuit of which is made or broken automatically by the fall and rise of the temperature, substantially as set forth.

Signed by me, this 7th day of November, 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 ninth day of March, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 31 January, 1882.

We do ourselves the honor to report, in reply to your blank cover communication of the 9th inst., No. 962, transmitting Mr. Thomas Alva Edison's application for the registration of an invention entitled "Improvements in Meters for measuring electric currents," that we are of opinion the prayer of Mr. T. A. 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—one sheet.]

Fig. 2.

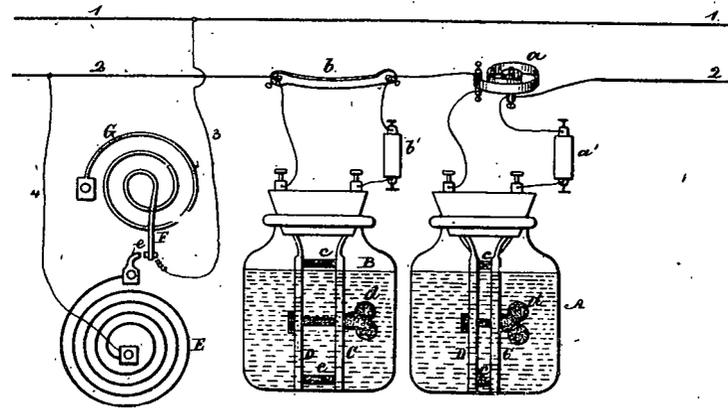


Fig. 1.

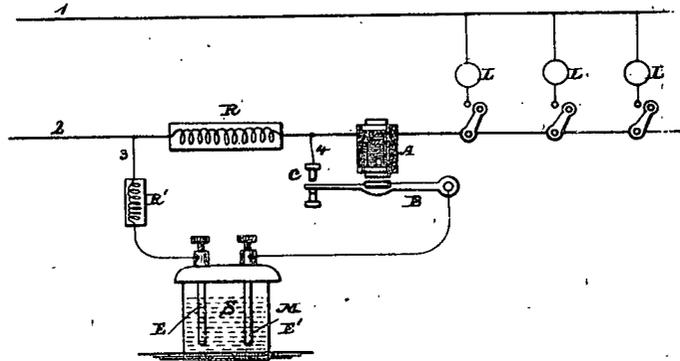


Fig. 3.

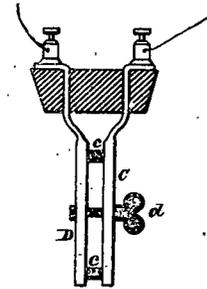
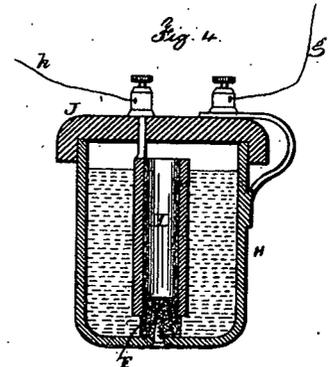


Fig. 4.



Thomas Alva Edison
Inventor

Witnesses

Chas. Smith
Geo. D. Snicker

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 ninth day of March, A.D. 1882. Augustus Loftus.*
(Sig. 32.)



A.D. 1882, 9th March. No. 1042.

IMPROVEMENTS IN AND CONNECTED WITH DYNAMO OR MAGNETO ELECTRIC MACHINES AND ELECTRO MOTORS.

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

[Registered on the 9th day of March, 1882, 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 and connected with Dynamo or Magneto Electric Machines and Electro Motors," 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 ninth day of March, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in and connected with Dynamo or

A.

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 and connected with Dynamo or Magneto Electric Machines and Electro Motors," of which the following is a specification.

THE current of electricity used in my system of electric lighting is generated at and distributed from a central station to and through the district of such station.

At the central station are massed a number of generators, sufficient to supply the wants of the entire district. These generators are connected in multiple arc, and the generative capacity of those in use is regulated and controlled by regulating and controlling the current passing through the coils of the field of force magnets.

The object of a part of this invention is to furnish means and methods for accomplishing this regulation.

One method consists in arranging equal resistances in the circuit of each field of force coil, and cutting in or out equal portions of each simultaneously, by hand or automatically, the result being accomplished in the latter case by the use of a special electric engine placed in a derived circuit to the main circuit, and provided with a governor which, on lessening or increase of speed, actuates a switch cutting in or out a portion or all of the resistance.

This is illustrated in figures 1 and 2 of the drawings, which are mainly diagramatic.

Figure 1 is a view of the automatic arrangement, and figure 2 a view of the arrangement wherein the resistances are controlled by hand.

1 2 represent the main circuit conductors at and leading from a central station, where is shown a battery of four dynamo-electric machines, A, A¹, A², A³, which number may be greater or less as desired.

The connections from the field of force coils only are shown, but what is unnecessary to be shown is to be understood—that the revolving armatures are also connected to the same main conductors.

From each field coil one conductor, 3, leads directly to main conductor 2.

From conductor 1 a wire, 4, leads in one instance to the hand switch S, in the other to the switch lever L.

Sets of resistance, R, R¹, R², R³, are used, one for each generator, a conductor leading from each set of resistances to its appropriate generator; for instance, 10 from R to A, 11 from R¹ to A¹, 12 from R² to A², and 13 from R³ to A³.

Each set of resistances may consist of as many resistance boxes as desired; for illustration four only are shown, r, r¹, r², r³, conductors being arranged in connection with the hand switch S or switch lever L to cut more or less out of circuit. If either be turned to 9, all the resistances are cut out of circuit; at 8, r only is placed in circuit; at 7, r and r¹; at 6, r, r¹, and r²; while at 5 all are thrown into circuit.

The path of the circuit to the field coils then is from 1, *via* 4, to S or L; thence through one of the conductors, 5, 6, 7, 8, or 9, when it divides and passes by 10, 11, 12, and 13, to A, A¹, A², and A³, to 2.

By this arrangement the resistance of all the exterior field circuits is always equally increased or diminished, their relative resistances remaining unchanged, while each field is accurately, rapidly, and delicately adjusted, correspondingly affecting the generative capacity of the machine.

In figure 1, B is an electric engine in a derived circuit, *b b*, to the main circuit. Upon the shaft of its armature is a governor, G, to which is connected the switch lever L pivoted at *l*.

The speed of the armature and of its attached governor depends upon the current passing through *b b*. If an insufficient amount is generated, the speed falls, the governor balls drop, moving L so that it contacts with 8 or 9, causing an increased current through the field coils, and a consequent increase of strength of magnetic field and of generative capacity.

If an excessive amount of current is generated, the reverse takes place.

While the generators here shown are connected as dynamos, it is evident that the same arrangement is equally applicable to and efficacious with magneto-electric generators, and that the wires 3 might lead to a special generator set apart for the work of supplying current for the fields only, the wire 4 of course being led to the same machine.

Another arrangement by which the generative force of a dynamo or magneto-electric machine may be regulated so that only the amount of current needed in a special circuit may be supplied thereto, and the pressure or electro-motive force maintained constant in the circuit, is as follows:—

A resistance and switch or lever, by which the circuit may be made independently of or through more or less of the resistance, are included in the circuit energizing the field of force magnets.

The switch or lever is attached to a magnet playing within a longitudinal opening in a helix, the magnet and helix preferably being longitudinally the segment of a circle and forming an axial magnet, the interior magnet tending when both are at a maximum of intensity to place itself so that its centre and the centre of the coil correspond, in which position it places the switch or lever so that the field circuit is through all the resistance, while a spring attached to the switch serves, when unresisted, to hold the switch or lever so that it cuts the resistance out. Both coils of the axial magnet are in a circuit derived from the main or consumption circuit.

No translating devices being in circuit, the entire exterior circuit is through the coils of the axial magnet only, and it acquires a maximum magnetization, putting all the resistance in the field circuit, thereby keeping production of generation down to a given point.

If now translating devices be put in circuit, more exterior circuits are closed and the amount of current flowing through the axial magnet circuit is lessened, weakening the force of the electro-magnet so that the spring causes the lever or switch to move so as to cut out a portion of the resistance, which is equivalent to strengthening the field circuit, thus arresting the diminution of current due to putting on more lamps.

This is illustrated in figure 3 of the drawings, in which one generator of the dynamo type is shown; but it is to be understood that the principle and means are equally applicable to any type of generator, and to them used singly or to a number used as a battery.

G

Magneto Electric Machines and Electro Motors.

G is a generator, from whose commutator brushes or springs, 1 2, leads the main or consumption circuit 3 4, a derived circuit, 5, therefrom being led around the field magnets of the generator, in which circuit are included a resistance, R, and switch or lever, L.

In a derived circuit, 6, is included the helix M, in which plays, forming the core thereof, the magnet *m* attached to and moving in one direction the switch or lever L against the resilience of the spring S. In derived circuits 7, lamps or other translating devices are placed.

If these latter circuits be open, whatever current is generated finds its only exterior circuit through 6 M *m*, magnetizing them strongly, hence *m* is drawn up within M, causing L to contact with R at about *a* or *b*, so that all or nearly all of R is included in the field circuit 5, so weakening it that the generative force of G is kept at a given point. If 7 be closed, it takes a part of the current, lessening the amount through 6, weakening the force of M *m* and the spring pulls L to (say) *c*, cutting out part of the resistance, strengthening the field circuit, which results in a proportionate increase of generation of current. As more circuits are closed, L is carried from contact to contact of R, until finally all, or nearly all, or as much of R is cut out as is necessary to compensate for the increased demand.

Upon cutting out of 7 the reverse operation takes place.

Another object which I have in view in this invention is an improvement in electro-magnetic motors for driving light machinery, such as sewing-machines, lathes, &c., but especially designed for sewing-machines, which improvement will enable the speed of the motor to be readily regulated so that the driven machine can be run fast or slow as desired, without breaking circuit, and so that in stopping or starting the motor the resistance of its circuit will be regulated in order to prevent any noticeable effect upon the electric lamps in the system, the motor and lamps being worked upon the same conductors.

This I accomplish by including in the motor circuit an adjustable resistance and a lever operated preferably by a foot treadle, such devices enabling the operator to throw resistance into and out of the circuit by the movement of a foot treadle, and thereby to run the driven machine at a slower or faster speed. The lever is also adapted to stand normally so that, upon closing circuit, all the resistance will be thrown in, and the necessary degree of magnetization will be attained before any resistance will be thrown out, so that, as the wire resistance is thrown out, the motor will increase in speed and give a counter electro-motive force in its own derived circuit, and compensate for the lessening of actual wire resistance.

In this way a nearly constant resistance will be maintained, and lamps connected with the same main conductors will not be appreciably affected. A suitable switch, conveniently located, is provided for making and breaking circuit.

In figure 4 of the drawing a sewing-machine is represented in end elevation with my improvement attached thereto.

A is the frame of a sewing or other light machine, and B is the motor mounted thereon and driven by the circuit 1 2, derived from the main conductors of the system. C is the wire resistance, and D is a lever pivoted to the frame A, through which resistance and lever the circuit 1 2 passes.

This lever is drawn in one direction, so as to throw all the resistance into the circuit by a spring, E, and it is connected by a rod, *a*, with a foot-treadle, F; G is the switch for making and breaking the circuit.

Another way of preventing any effect upon the lamps when a motor is thrown into or out of circuit is as follows:—

Resistances are placed in the derived circuit of the motor, which resistances are gradually thrown out of circuit as the speed of the motor increases.

These resistances are connected with movable contact blocks or plates located in line with each other, and forced together in succession by the movement of a centrifugal governor run by the motor, and returned to their normal position by springs or by gravity. The governor for this purpose works a pivoted lever, having at its free end a contact block or plate in line with the contact of the resistances.

The contact blocks or plates of the resistances can be arranged in a number of different ways. They can be carried by parallel spring arms secured rigidly at one end, or by pivoted levers thrown in one direction by springs or by gravity, or they may be in the form of sliding pins forced in one direction by springs or by their own or additional weight, or other constructions could be devised for accomplishing the same end.

When the motor is out of circuit, the contacts will be separated and all the resistances will be connected with the line. The motor being thrown into circuit, the resistances in the derived motor circuit will be sufficient to prevent any effect upon the lamps of the system; and as the speed of the motor increases, the governor lever will force the contacts together, one after another, cutting out the resistances in succession as the counter electro-motive force established by the speed increases, until the maximum speed is reached, when all the resistances will be cut out, or one or more may be allowed to remain, to give the proper resistance to the motor circuit.

When the motor circuit is broken, the stopping of the motor and governor will allow the contact to separate, so that the resistances will be in the circuit when the same is again completed.

By reversing the arrangement the device could be used to control the field circuit of a generator or battery of generators, the motor being driven by a circuit derived from the main circuit, and the governor throwing resistance into the field circuit when its speed exceeds the normal rate.

This part of my invention is illustrated in figures 5, 6, 7, and 8 of the drawings.

Figure 5 is a top view of the governor and movable contacts, such contacts being carried by spring arms; figure 6, a view showing the contacts carried by pivoted levers; figure 7, a view showing the contacts in the form of spring pins; and figure 8, a diagrammatic view showing the device arranged for regulating the resistance of the field circuit of a battery of generators.

A is a centrifugal governor, either horizontal or vertical, which is driven by an electro-motor, A¹ (shown in figure 8). R, R¹, R² are resistances in the derived motor circuit 1 2. These resistances can be of any desired number; they are connected with movable contact blocks, plates, or points, C, C¹, C², C³, which are placed in line with each other and held normally a short distance apart. The pivoted governor lever D has a contact, C⁴, placed in line with the resistance contacts, and adapted when moved by the governor to force the resistance contacts together in succession or allow them to separate in succession and assume their normal positions.

These

Improvements in and connected with Dynamo or Magneto Electric Machines.

These contacts, C, C¹, C², C³, may be carried by parallel spring arms, B, B¹, B², B³ (as shown in figures 5 and 8, or by pivoted levers, E, E¹, E², E³, figure 6), which levers are moved in one direction by springs or by gravity.

Stops, b, are used to limit the movement of the pivoted levers in one direction, and may also be employed in connection with the spring arms.

The resistance contacts could also be made in the shape of pins (figure 7), which could be returned to their normal positions by springs or by their own or additional weight.

I do not limit myself to the means shown for carrying the movable contacts, since other means could be employed for the same purpose.

The device shown in figure 8 is arranged for regulating the generative force of a battery of Faradic generators, by controlling the resistance of the field or exciting circuit.

The governor is shown as running at a speed higher than the normal rate, all the resistance being thrown into the field circuit 3, 4, of the generators G. The main or consumption circuit is shown at 5, 6, while the derived circuit, in which the governor motor A¹ is placed, is shown at 7, 8. As the electro-motive force of the current decreases, the speed of the motor A¹ and governor A will lessen, and the contacts C, C¹, &c., will be made in succession by the governor lever D, so as to cut out the resistances.

What I claim as my invention is—

First—The combination with each generator of a battery of magneto or dynamo electric machines arranged in multiple arc, of a resistance in its field circuit, and a switch controlling equally and simultaneously all the resistances of the generators of the battery, substantially as set forth.

Second—The combination of a battery of magneto or dynamo electric machines, a series of equal resistances, one series for each generator, a switch, a circuit to the switch and resistances and special circuits, one for the field of each generator, from the resistances to the field of force coils of the generators, substantially as set forth.

Third—The combination of a battery of magneto or dynamo generators, a series of resistances in the field circuits, one for each generator, and means for automatically controlling equally and simultaneously the resistances of the field circuits of all the generators, substantially as set forth.

Fourth—The combination with a generator of a variable resistance in its field circuit, a magnet in a derived circuit to the main or supply circuit of the generator, and a movable contact arm controlled by the magnet for effecting an automatic regulation of the field of the generator, substantially as set forth.

Fifth—The combination of a generator, a resistance in its field circuit, an axial magnet composed of a helix, an electro-magnet as a core thereto, both included in one circuit derived from the main or supply circuit, and a movable contact arm controlled by the magnet and contacting with the resistance, substantially as set forth.

Sixth—The combination with an electric motor of a resistance, a lever included in the motor circuit and adapted to be operated by hand or foot, for throwing the resistance in or out of circuit, and means for normally holding the lever at the point to throw in the maximum resistance, substantially as described.

Seventh—The combination with the electric motor of the resistance, the lever, the retracting spring, the foot treadle and switch, substantially as set forth.

Eighth—The resistances having movable contacts in line with each other, in combination with a governor driven by an electro-motor and acting to force the contacts together in succession, and means for breaking the contacts in succession as the force of the governor is removed, substantially as set forth.

Ninth—A centrifugal governor driven by an electro-motor, and moving a lever in combination with a plurality of resistances and movable contacts, said contacts being forced together in succession by the governor lever and returned to their normal positions by springs or by gravity, substantially as set forth.

Signed by me, this 25th day of October, 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 ninth March, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

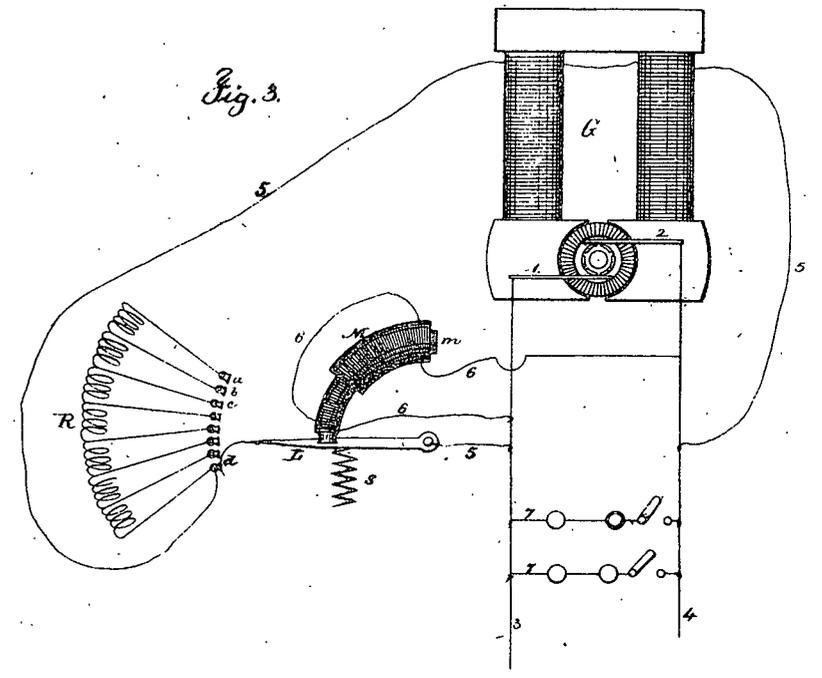
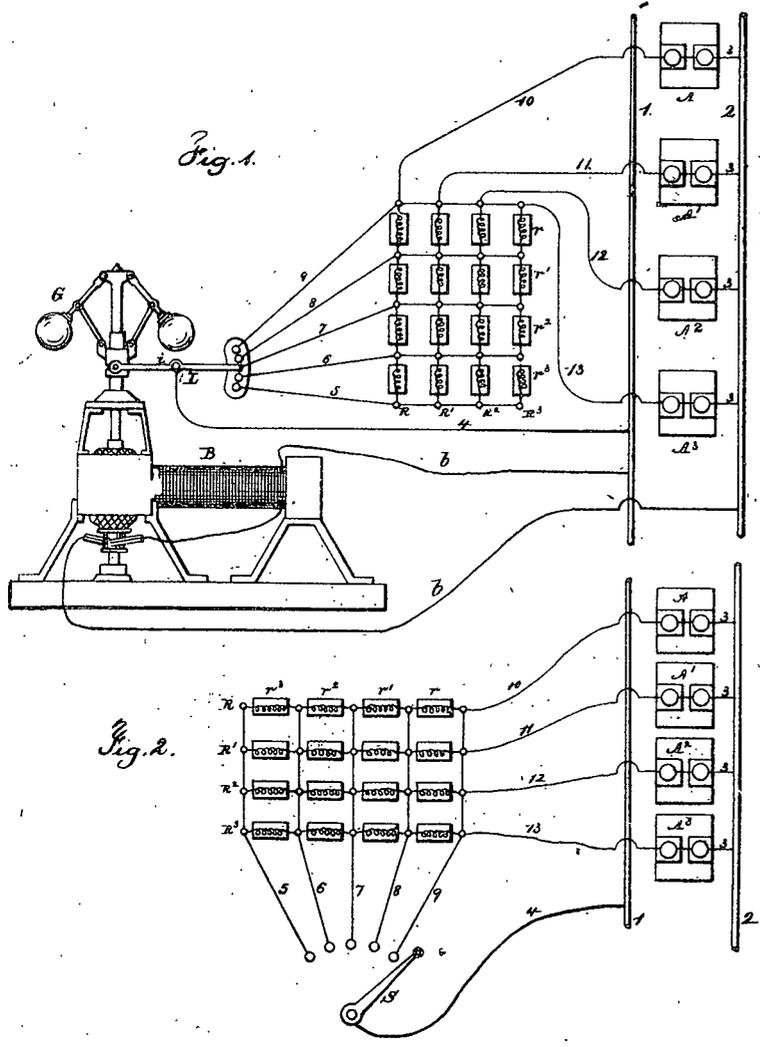
We do ourselves the honor to report, in reply to your blank cover communication of the 9th instant, No. 12,163, transmitting Mr. Thomas Alva Edison's application for the registration of an invention entitled "Improvements in and connected with Dynamo or Magneto Electro Motors," that we are of opinion the prayer of Mr. T. A. Edison's Petition may be granted, in terms of his specification, drawing, and claim.

We have, &c.,

E. C. CRACKNELL.
GOTHER K. MANN.

The Under Secretary of Justice.

B.



Thomas Alva Edison
Inventor

Witness
Chas. Smith
Co. J. Pinckney

This is the Sheet of Drawings marked B referred to in the annexed Letters of Registration granted to Thomas Alva Edison, this ninth day of March, A.D. 1882. Augustus Loftus.

(Sig. 32-)



A.D. 1882, 9th March. No. 1043.

IMPROVEMENTS IN DYNAMO OR MAGNETO ELECTRIC MACHINES.

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

[Registered on the 9th day of March, 1882, 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," 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 ninth day of March, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Dynamo or Magneto Electric Machines.

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, have invented certain "Improvements in Dynamo or Magneto Electric Machines," of which the following is a specification.

THE object of one part of my invention is to produce such improvements upon my dynamo or magneto electric machines, wherein are employed inductive bars running lengthwise of the armature, and connected at their ends by discs, that a better connection between the ends of the bars and the discs will be formed, so as to prevent heating at those points; the connections between the discs and the commutator bars will have a larger conducting area, and be more rigid than in constructions previously employed by me, in order to prevent the heating of such connections, and also to prevent their breakage by vibration; the contacts of bars and rods with discs will be reduced in resistance and prevented from oxidizing; the copper discs for connecting the ends of the bars will be located outside of the field of force, or nearly so, and will not be heated by the circulation of currents induced in them when the circuit is open at the commutator by movement in the magnetic field; means will be provided for preventing electrical creeping between the edges of the copper discs; and finally, the copper inductive bars will be so insulated that the insulation cannot be pierced by the electricity, and at the same time the heat will be conducted off and not allowed to accumulate in the bars.

In my dynamo or magneto electric machines the copper bars are connected at their ends to ears or lugs on copper discs insulated from each other, which ears are arranged in a spiral line, extending twice or nearly so around the circumference of the cylinder formed by the discs at each end of the armature. Heretofore I have made these ears of the same size as the unenlarged ends of the copper bars, and have separated them the width of a bar, every alternate bar passing between two ears of the first line to an ear of the second line.

By my present invention these ears are widened so as to close up the spaces between them, and the copper bars are provided with T-shaped ends, which are secured to said ears. The alternate bars are curved outwardly so as to pass over the first line of ears, and inwardly again to make connection with ears of the second line. This construction provides a larger contact between the bars and discs. To lessen the resistance of this contact and prevent oxidation I plate the surfaces with gold or silver, or amalgamate them with mercury, or I may first plate with silver and then amalgamate the surfaces. In addition, to give strength and a larger conducting area, I use washers, which are placed on the outside of the ears, and are secured by the same bolts that pass through the ears and the ends of bars.

For commutator connections I dispense with the tongues heretofore used by me, and extending from the open centres of discs to the commutator bars, and employ instead thereof exterior rods, which have the same or nearly the same conducting area as the inductive bars.

These rods have T-shaped ends, and are secured to alternate ears of the discs by the same bolts that secure the inductive bars thereto. This gives one commutator connection for each disc, of great strength and low resistance. The rods that are secured to ears of the inner line are curved outwardly, to avoid ears of the second line. The surface contacts of these rods and the ears are also plated with gold or silver, or amalgamated, or plated with silver and then amalgamated.

To secure the benefits of locating the copper discs outside of the field of force, or nearly so, I place thimbles upon the bolts which secure the discs to the armature core, which thimbles are situated between the core and discs, and separate the discs a certain distance from the core. Since the polar extensions of the exciting magnet or magnets terminate at the ends of the armature core, the copper discs will be wholly outside of such polar extensions, and consequently outside of the magnetic field, or nearly so. An air space is also formed between each end of the armature core and the discs by this construction, through which space air circulates and serves to conduct off heat generated in the parts.

To prevent electrical creeping between the edges of the copper discs, such discs are bevelled on both sides at their edges, and the paper sheets which are used to insulate the copper discs from each other are extended a short distance beyond the edges of the discs and are pressed down into the angular spaces formed by the bevelled edges.

For insulating the copper inductive bars I wrap them with parchment paper. The parchment paper I find is not only a good insulator, but is also a good conductor of heat, on account of its compactness, and is tough and durable, and otherwise well adapted for the purpose.

Ordinary paper or other fibrous material may be made a good conductor of heat by filling the air spaces therein by any suitable substance, such as Japan varnish or linseed oil, and such prepared paper or fibrous material I consider the equivalent of the parchment paper.

I prefer to use in connection with the wrapping of parchment paper a layer of mica, which is wrapped with the parchment paper, being held by the same and prevented from breaking into pieces and falling from place. The bars may also be japanned or covered with rubber, which is afterwards vulcanized.

This part of the invention is illustrated in figures 1 and 2 of the drawings.

Figure 1 is a perspective view from the commutator end of my machine, showing a few of the parts separated, for clear illustration; figure 2 is a side elevation of some of the parts at the commutator end of the armature.

With reference to these figures, A is the core of the armature; B B' are the copper inductive bars, extending longitudinally along the core A, and connected at their ends to copper discs, C, insulated from each other; the bars B extend straight to the ears *a* of the discs, while the alternate bars B' are curved over the first line of ears to ears *b* of the second line; D is the commutator, and E represents the rods extending from alternate ears to the bars of the commutator.

The contacts of B and B' and of E with the ears of discs C are plated or amalgamated, or both, as before described. The thimbles *c* on bolts *d* separate the discs C from the ends of the core A, for the purpose before set forth. The copper discs C have double bevelled edges, *e*, forming angular spaces, into which the projecting edges of paper sheets *f* are pressed, to prevent electrical creeping between the edges of discs. F is the insulating wrapping of parchment paper, and G the mica.

The object of another part of my invention is to produce means for cooling the armature of a dynamo or magneto electric machine.

In

Improvements in Dynamo or Magneto Electric Machines.

In carrying out this part of my invention, I close the spaces between the polar extensions of the existing magnet or magnets at the sides of the armature by means of brass plates or other non-magnetic metal or material. At the non-commutator end of the machine the shaft is surrounded by an air-chamber which is a drum having an open side secured to the ends of the polar extensions, and covering the ends of the armature, so as to enclose the space between the inductive portion of such armature and the polar extensions. To this air-chamber is connected, by a pipe, the case of an air-blower, which blower is driven preferably by the armature shaft, by means of a belt and pulleys, or the blower may be driven by power from the same source applied in a different manner, or by power from another source.

During the operation of the machine the blower is driven and air is forced from end to end of the armature through the space between the same and the polar extensions of the exciting magnet or magnets. By connecting the edges of the polar extensions the space around the armature is closed, except at the ends, causing the currents of air to traverse the whole length of the armature.

Instead of having the air-chamber at the end of the armature, the polar extensions of the field magnets may be divided at the centre and the space covered by exterior plates. A number of pipes (say three) will lead from the blower to this space, and the air will be forced in both directions from the centre towards the ends of the armature. This latter construction has the advantage that there is but one-half the resistance to the passage of the air that there is with the first construction, and consequently, with same power, four times the amount of air can be forced over the armature. In addition, the air will not be heated to such an extent, and both ends of the armature will have the same temperature.

To allow the currents of air, supplied in either way before described, to circulate freely around the inductive portion of the armature and between such inductive portion and the core, I have devised the following construction:—

The copper inductive bars, which are arranged parallel upon the armature core, are spaced a certain distance apart, and are raised off of the core, and separated by small blocks or by projections either on the core or bars.

The bars are held in this position by their end connections and by being bound at a number of points by wire drawn tightly around the armature. In this manner air spaces are formed entirely around the inductive bars, through which the currents of air from the blower pass.

Air passages are also made longitudinally through the core of the armature, and radial passages extend from the longitudinal passages to the exterior of the core at various points. A portion of the air from the blower is forced through these passages, and assists to cool the armature.

This part of the invention is illustrated in figures 3 and 4 of the drawing.

Figure 3 is a perspective view of the principal parts of a dynamo or magneto electric machine embodying my invention; figure 4, a cross-section, showing spacing of the copper inductive bars.

With reference to these figures: A B are the polar extensions of the exciting magnet or magnets, and C is one of the plates for closing the spaces between the side edges of such polar extensions; D is the armature shaft; E is the air-chamber or drum enclosing the non-commutator end of armature; F is the air-blower driven by belt *a*, and pulleys *b c* from armature shaft D, and having its case connected by pipe *d* with air-chamber E; G represents the wrapped copper inductive bars, supported off of the armature core H by blocks or projections, *e*, and *f* is the wire wrapping for holding bars in place.

Another part of my invention is as follows:—

In the use of dynamo or magneto electric machines having commutators formed of copper bars and brushes, strips, wheels, or other collectors, also made of copper and bearing on the commutators, I have found that, no matter how smooth the surfaces are made, the resistance of the surface contact of the brushes on the commutators is considerable, and sparks are formed, which, in powerful machines such as I design to use in connection with my system of electrical distribution, are exceedingly large, and keep increasing in size as the commutator is roughened by the destructive influence of the sparks. The great resistance of copper surfaces in contact I have found is due rather to a physical than a mechanical action of the metal.

The object of my invention is to produce commutators and brushes, or other collectors, for dynamo or magneto electric machines, the surface contacts of which will have a very low resistance, so as to reduce the spark to such a degree that it will not burn the commutators or brushes.

This I accomplish by amalgamating the face of the commutator, and also the brushes, strips, wheels, or other devices used for collecting the electricity, where they bear upon such commutator. The amalgamated surfaces have such an affinity for each other that the resistance of the contact to the passage of the current is low, and the spark is very much reduced.

The commutator bars and the brushes are made, as usual, of copper, which is preferred for its good conducting properties, and the surfaces are amalgamated directly with mercury, or (the preferred way) the commutator bars and the brushes are faced with silver, and afterwards amalgamated.

It is evident that the invention could be applied to the commutators of electro motors and to other moving surface contacts where it is desired to lessen the resistance.

What I claim is—

- First—In a dynamo or magneto electric machine, the inductive bars broadened at their ends for connection with the discs, substantially as set forth.
- Second—In a dynamo or magneto electric machine, the combination of the discs having a double spiral line of projecting ears, with the inductive bars connected with such ears, the alternate bars being curved outwardly to avoid the first line of ears, substantially as set forth.
- Third—In a dynamo or magneto electric machine, the combination of the inductive bars and cross connecting discs, having their contacts plated or amalgamated, substantially as and for the purpose set forth.
- Fourth—In a dynamo or magneto electric machine, having cross connecting discs, the outside rods connecting the discs with the commutator, substantially as set forth.
- Fifth—In a dynamo or magneto electric machine, the combination of the inductive bars and the discs having projecting ears, with the outside rods extending from alternate ears to the commutator bars, substantially as set forth.

Sixth—

Improvements in Dynamo or Magneto Electric Machines.

- Sixth—In a dynamo or magneto electric machine, the cross connecting discs located outside the magnetic field, substantially as set forth.
- Seventh—In a dynamo or magneto electric machine, the combination with the armature core, of the cross connecting discs separated from the ends of such core; leaving air spaces and removing discs from magnetic field, substantially as set forth.
- Eighth—In a dynamo or magneto electric machine, the cross connecting discs having bevelled edges, in combination with intermediate insulation, substantially as set forth.
- Ninth—In a dynamo or magneto electric machine, the copper inductive bars wrapped with parchment paper or its equivalent, substantially as set forth.
- Tenth—In a dynamo or magneto electric machine, the copper inductive bars having an insulation of mica held by an exterior wrapping, substantially as set forth.
- Eleventh—In a dynamo or magneto electric machine, the copper inductive bars having an insulation of mica and parchment paper, or its equivalent, substantially as set forth.
- Twelfth—In a dynamo or magneto electric machine, an air-blower situated outside of the machine and forcing air through the space around the armature, substantially as set forth.
- Thirteenth—In a dynamo or magneto electric machine, the air-blower driven by the armature shaft and forcing currents of air through the space between the armature and the polar extensions of the exciting magnet or magnets, substantially as set forth.
- Fourteenth—In a dynamo or magneto electric machine, the polar extensions of the exciting magnet or magnets connected at their side edges so as to form a chamber surrounding the armature, and open only at the ends of such armature, in combination with a blower forcing air through said chamber, substantially as set forth.
- Fifteenth—In a dynamo or magneto electric machine, the inductive bars supported off of the armature core and separated from each other, leaving spaces entirely around said bars, substantially as set forth.
- Sixteenth—In a dynamo or magneto electric machine, the combination of the inductive bars supported off of the armature and separated from each other, with a blower for forcing air into the space between the armature and the polar extensions of the exciting magnet or magnets, substantially as set forth.
- Seventeenth—The method of reducing the resistance of moving surface contacts, consisting in amalgamating the contacting surfaces, substantially as set forth.
- Eighteenth—The method of reducing the spark at the commutator of a dynamo or magneto electric machine, consisting in amalgamating the contacting surfaces of the commutator and the brushes, strips, wheels, or other collectors, substantially as set forth.
- Nineteenth—The combination of a commutator and its brushes, strips, wheels, or other collectors, having amalgamated contacting surfaces, substantially as set forth.

Signed by me, this twenty-fifth day of October, 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 ninth day of March, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

We do ourselves the honor to report, in reply to your blank cover communication of the 9th instant, No. 12,164, transmitting Mr. Thomas Alva Edison's application for the registration of an invention entitled "Improvements in Dynamo or Magneto Electric Machines," 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—one sheet.]

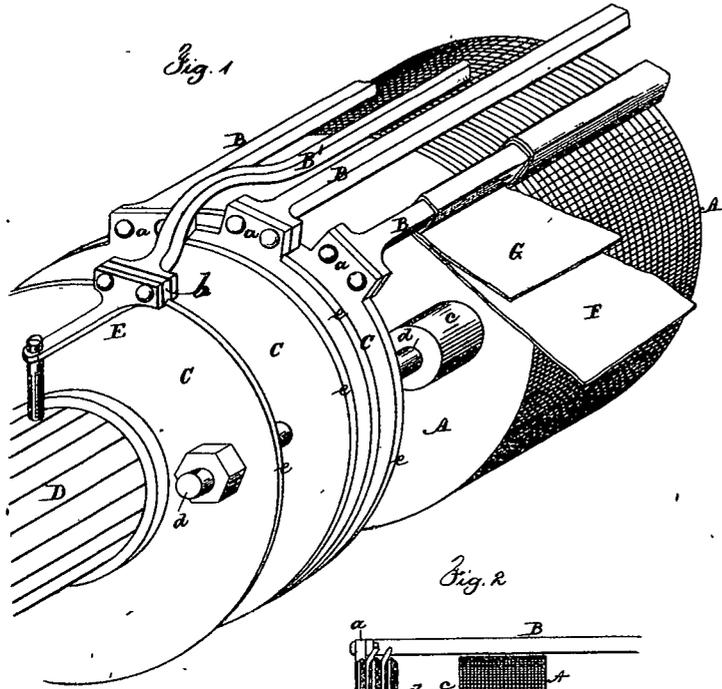


Fig. 1

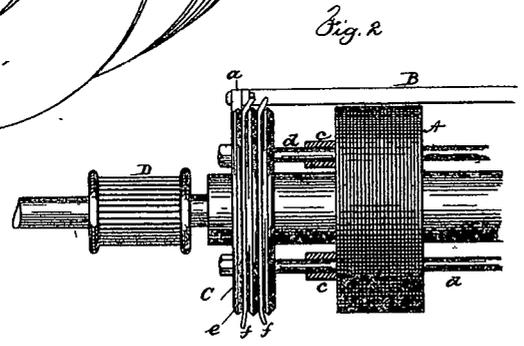


Fig. 2

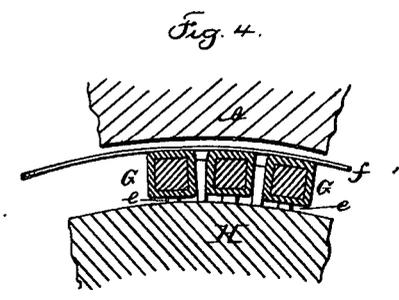


Fig. 4.

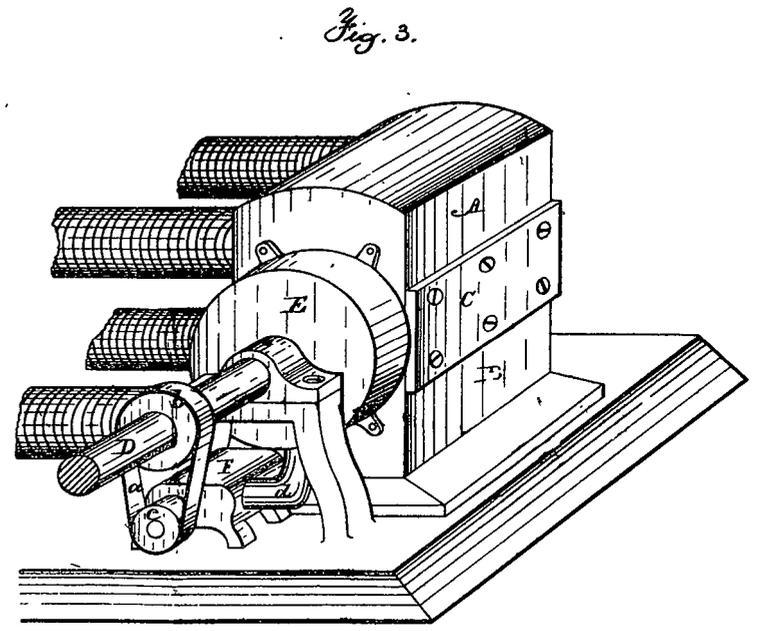


Fig. 3.

Thomas Alva Edison
 Inventor

Witness
Charles Smith
L. T. Pinterney

*This is the Sheet of Drawings referred to in the annexed
 Letters of Registration granted to Thomas Alva Edison,
 this ninth day of August, A.D. 1882. Augustus Loftus.*

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

(Sig. 32-)



A.D. 1882, 9th March. No. 1044.

IMPROVEMENTS IN ELECTRICAL DISTRIBUTION SYSTEMS.

LETTERS OF REGISTRATION to Thomas Alva Edison, for Improvements in Electrical Distribution Systems.

[Registered on the 9th day of March, 1882, 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 Electrical Distribution Systems," 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 ninth day of March, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Electrical Distribution Systems.

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 Electrical Distribution Systems," of which the following is a specification.

THE object of one part of my invention is to produce such an improvement upon systems for the distribution of electricity for translation into sensible effect, such as light, power, or heat, that an accidental cross between the main wires at any point will only affect the house circuits upon the side or face of the block where the cross occurs.

In laying the conductors for my system, I run along each side or face of a block two conductors. These are termed "positive" and "negative" conductors, the "positive" conductor being the one through which the positive current flows to the lamps or motors, while the "negative" conductor returns the current to the feeding circuit and thence through the negative feeding conductor back to the generators. In front of each house or at any other point where it is desired to make connection with the main conductors they are run into a service box, which is a square iron box in which the conductors are laid bare for connection with the house wires.

At each corner of a block is a junction box into which the conductors on the meeting sides of the block pass, and also conductors which cross the streets from the opposite junction boxes. Thus at the intersection of two streets will be placed four junction boxes, into each of which will run eight main conductors. In each of such junction boxes all the positive conductors are connected together, and likewise all the negative conductors, so that a network of intersecting wires is formed.

On each face of a block anywhere between the points of intersection of the main conductors in the corner junction boxes, the conductors are run through a small junction box, or one of them only may pass through the same. In this box one conductor is severed and its ends connected to conductors leading to a safety catch box located at some point where it can be conveniently reached to replace the safety-catch wire when necessary, or both conductors may run through this box and be provided with safety-catches.

In this box the requisite amount of safety-catch wire or material is placed in circuit, and is burnt out when a cross on the main conductors occurs on the particular side of the block where the box is located, thus breaking the circuit and preventing damage.

By placing safety-catches in this manner, in the main conductors on each face or side of a block, the accidental cross connection can be readily located, and by connecting all the main conductors of each class together at the corners only the translating devices on the particular side of the particular block are affected by the breaking of the circuit.

The foregoing will be better understood from the drawings, in which figure 1 is a top view of the conductors at the intersection of two streets, the covers of a corner junction box, and a safety catch-box, being removed; figure 2, a separate view of a corner junction box with the cover removed; and figure 3, a similar view of a safety catch box; like letters denote corresponding parts in all three figures.

A and B are two intersecting streets, and *a b* the curb. C D are the tubes or pipes enclosing the conductors. These tubes or pipes run along the faces of the blocks and enter the corner junction boxes E, while similar tubes C' D' placed in line with C D cross the streets and connect the junction boxes; each of these tubes carries two main conductors in the manner hereinafter described, or the conductors may be enclosed in separate pipes, as will also be set forth.

The house service boxes are shown at F, and from these are led the house wires or conductors 5 6. In the corner junction boxes the four conductors intersect each other, the positive conductors 1 3 and the negative conductors 2 4 being electrically connected.

G represents the safety catch boxes, one being situated on the face of each block, as before explained, and having a piece of safety catch wire, *g*, placed in the line of one or each of the main conductors.

These safety catch boxes are preferably located inside of the curb, and are arranged so that they can be readily reached to replace the safety catch wire.

The object of another portion of this invention is to produce a method of and means for independently controlling and indicating the electricity furnished to each floor of a single building, or, if there are several consumers on each floor, the electricity furnished each consumer. For making each floor independent, I run the conductors from the house service box, located in the street, into the house, and vertically to the upper floor of the same. At each floor the conductors pass through a service box, within which wires are connected with such conductors, such wires running where needed throughout that story of the building, and having the translating devices connected therewith in multiple arc.

Close to the floor service box is situated a meter, connected with the positive floor wire, for measuring the quantity of electricity furnished that particular floor, and between the meter and floor service box or within such box a safety catch is placed in one floor wire to break the floor circuit if a cross occurs therein.

Where there are several consumers on a floor, a floor main will be run out from each floor service box, and the wires for the consumers will run from service boxes on this main, each consumer having an independent circuit with meter and safety catch.

The foregoing will be better understood from figure 4 of the drawings, in which the view represents the house-pipes and connections in side elevation, while the house service box is seen from above, the covers of the boxes being removed.

1 2 are the main conductors located in the street; A is the house service box; 3 4 are the conductors running from the house service box into the house, and vertically therein to the top floor of the same.

C D represents the floors of the house; E F are floor service boxes; 5 6 are floor wires; G H are floor meters; and *a b*, safety catches; L represents lamps placed in multiple arc or cross circuits from floor wires 5 6.

Another part of my invention relates to the construction of main conductors and the junction boxes for the same. The construction I prefer for main conductors is as follows:—Two copper rods are taken

Improvements in Electrical Distribution Systems.

taken of the desired size, and having in cross-section the form of a segment of a circle, and these are fixed the desired distance apart, with their flat sides turned towards each other by means of washers of pasteboard. Each washer has two segmental openings made through it to receive the rods, and its periphery is notched. The rods and washers are entered into a metal tube or pipe of proper size, the washers fitting the tube closely and holding the curved faces of the rods concentric with the walls of the tube, and at a certain regular distance therefrom. The tube is then filled with asphaltum, tar, or other insulating material or compound, the same flowing through the notches on the edges of the pasteboard washers, and filling completely the unoccupied space of the tube. When the insulating material or compound hardens, the conductors will be held rigidly in place, and will be properly protected by the surrounding tube. The sections of these tubes are coupled together so as to make a good connection of the conductors, and at junction boxes the tubes are secured to or into the sides of the boxes, while the conductors are extended bare across or through the same.

Instead of using two segmental rods, the main conductors may be formed by a copper tube and a rod, both placed concentrically within the enclosing tube of metal. The conducting tube would be surrounded by notched pasteboard washers, which would keep it a regular distance from the walls of the enclosing tube, while the solid round rod would have strung upon it smaller notched pasteboard washers, which would fit the bore of the conducting tube. The spaces would then be filled with an insulating material or compound, as before described.

If it is desired to place four conductors within a single enclosing tube, the pasteboard washers would be provided with four quadrant-shaped openings for receiving the similarly shaped copper rods, the round faces of the rods being turned outwardly.

Each main conductor may however be placed in a separate enclosing tube, in which case the notched pasteboard washers would have single circular openings in their centre to receive round copper rods. With this last construction two kinds of house service boxes may be used. The separate pipes may enter one box, or each pipe may enter a separate box, from which the house conductors will be led.

Feeding circuits are run from the central station directly to different points of the system, to the conductors forming which circuits no translating devices are connected. These feeding circuits are for making the system symmetrical, and giving an equal electro-motive force or pressure at all points. The feeding conductors are constructed like the main conductors, the two conductors forming each feeding circuit being placed together in a single enclosing tube or in separate tubes. The feeding conductors are run into certain of the large corner junction boxes, and are connected with the positive and negative main conductors at the two points where the main conductors of each class are coupled together.

This portion of my invention is illustrated in the drawings, figures 5 to 16 inclusive; figure 5 is a view in perspective of a street main, a portion of the enclosing tube being removed to afford a view of the conductors; figure 6, an elevation of the insulating washer of figure 5; figures 7 and 9, sections of other forms of mains; figures 8, 10, and 11, elevations of washers used therewith; figure 12, a top view of the main conductors in separate pipes, and separate house service boxes, with a house circuit running therefrom; figure 13, a top view, showing a double service box; figure 14, a cross-section of one of the mains and its enclosing pipe; figure 15, a top view of a corner junction box used as a feeder-box; and figure 16, a top view of a safety catch box and connections.

With reference to figures 5, 6, 7, 8, 9, 10, and 11, A is a pipe or tube of iron or other suitable metal; BB, figure 5, are copper bars or rods, whose diameters vary according to the number of translating devices to be supplied, but together are much less than the internal diameter of the enclosing pipe A.

CC are washers of some such insulating material as paper or pasteboard, what is known as Manilla board being very suitable therefor, it being as effective as glass for this purpose, with the advantage of more easy manipulation and great economy in cost.

These have apertures, CC (see figure 6), of the same shape as the conductors, which pass through them, fitting closely therein. These washers are of such size that they also fit closely within the tube A, and prevent contact between the conductors and the inside of the tube.

The space D which surrounds the conductors within the washers is filled with any suitable insulating material—asphalt or an asphalt composition being appropriate substances for this purpose. This also fills the spaces between the conductors themselves, the edges of the washers containing notches, *d d*, so that apertures are left to enable the insulating compound to flow through the entire length of the tube. Various-sized completed conductors may be made; but as the sizes vary, the arc of the circular portion of the conductors is always concentric with that of the enclosing tube, securing a uniform thickness of insulating material between the two.

By using the form of washer C shown in figure 8, four conductors, B, may be placed in one tube, as in figure 7.

Instead of both conductors being solid rods, the arrangement shown in figure 9 may be used. In this case one conductor is a tube as E, through which passes the other, a round rod, F; a pasteboard washer, G, (figure 11), is placed between them, and a larger washer, H (figure 10), between E and A, the remaining spaces being filled with an insulating substance as above described.

It is evident that any number of different forms of conductors, washers, &c., may be used in addition to those herein described, as may be desired.

By these devices I am enabled to obtain a complete and permanent insulation between the conductors themselves and also between the conductors and the exterior tube, the latter at the same time preventing any injury from moisture or dampness or other causes, which might affect the conductors or the insulation thereof from reaching the same.

Referring now to figures 12, 13, 14, 15, and 16, A B are the main conductors, and C D the inclosing pipes. The notched pasteboard washers are shown at *a* (figure 14); E F are the separate service boxes; G the double service box; and 1 2, the house circuits, the conductors of which are enclosed in separate pipes; H is a house meter; I is a corner junction box used as a feeder box; 3 4 are the conductors of the feeder circuit; K is the safety catch box; and K¹ the box into which the conductors are run for making connection with safety catch; L is the piece of safety catch wire or material.

What

Improvements in Electrical Distribution Systems.

What I claim is,—

- First—In a system of electrical distribution, a safety catch for the main conductors located on the face of each block, substantially as set forth.
- Second—In a system of electrical distribution, the intersecting positive and negative conductors connected together in pairs as described.
- Third—In a system of electrical distribution, the combination with the intersecting positive and negative conductors, connected together in pairs as described, of the safety catches between the points of intersection, substantially as set forth.
- Fourth—In a system of electrical distribution, the combination with the main conductors and house service box located in the street, of the house conductors running vertically through the house, a service box on each floor, through which said vertical conductors pass, and separate meters for independently measuring the current furnished each floor or each consumer within the building, substantially as set forth.
- Fifth—In a system of electrical distribution, the combination with the conductors running through the house and floor service boxes of the floor wires or conductors, translating devices arranged in multiple arc or cross circuits, and a meter and safety catch for each floor or for each consumer within the building, substantially as set forth.
- Sixth—The combination with an enclosing tube and electrical conductors contained therein of washers made of Manilla or pasteboard supporting the conductors, and separating them from the tube and from each other, and notched upon their exterior edges to permit the flow throughout the tube of liquid insulating material, substantially as set forth.
- Seventh—A compound electric conductor, in which the individual conductors consist of solid metallic bars, segments of a circle, separated and supported by discs or washers of insulating material, substantially as set forth.
- Eighth—A circuit for electric currents in which one conductor is a hollow tube, and the other a solid circular rod passing through the said tube, insulated therefrom, and supported therein and separated therefrom by insulating discs or washers, substantially as set forth.
- Ninth—A street main for an electric lighting system, as shown in figure 5, consisting of the tube or pipe A, conductors BB, provided with washers CC and the insulating material D, substantially as set forth.
- Tenth—A metallic circuit for electric lights, consisting of two semi-circular rods, supported by and separated from each other in a metallic pipe by a series of insulating washers, the pipe being filled with a suitable insulating material, substantially as set forth.
- Eleventh—A metallic circuit composed of semi-circular rods secured within but insulated from a metallic containing tube, the arcs of the conductor and the tube being concentric, substantially as set forth.
- Twelfth—In a system of electrical distribution, the conductors A B forming a complete metallic circuit enclosed in separate pipes C D (figures 12 to 16 inclusive), substantially as set forth.
- Thirteenth—In a system of electrical distribution, the conductors A B forming a complete metallic circuit, in combination with separate enclosing pipes C D, and notched pasteboard washers *a* (figures 12 to 16 inclusive), substantially as set forth.
- Fourteenth—In a system of electrical distribution, the corner junction box wherein the main conductors of like kind are coupled together in pairs, in combination with the feeding conductors entering such box, and connected with the positive and negative main conductors, substantially as set forth.

Signed by me, this 25th day of October, 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 ninth day of March, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

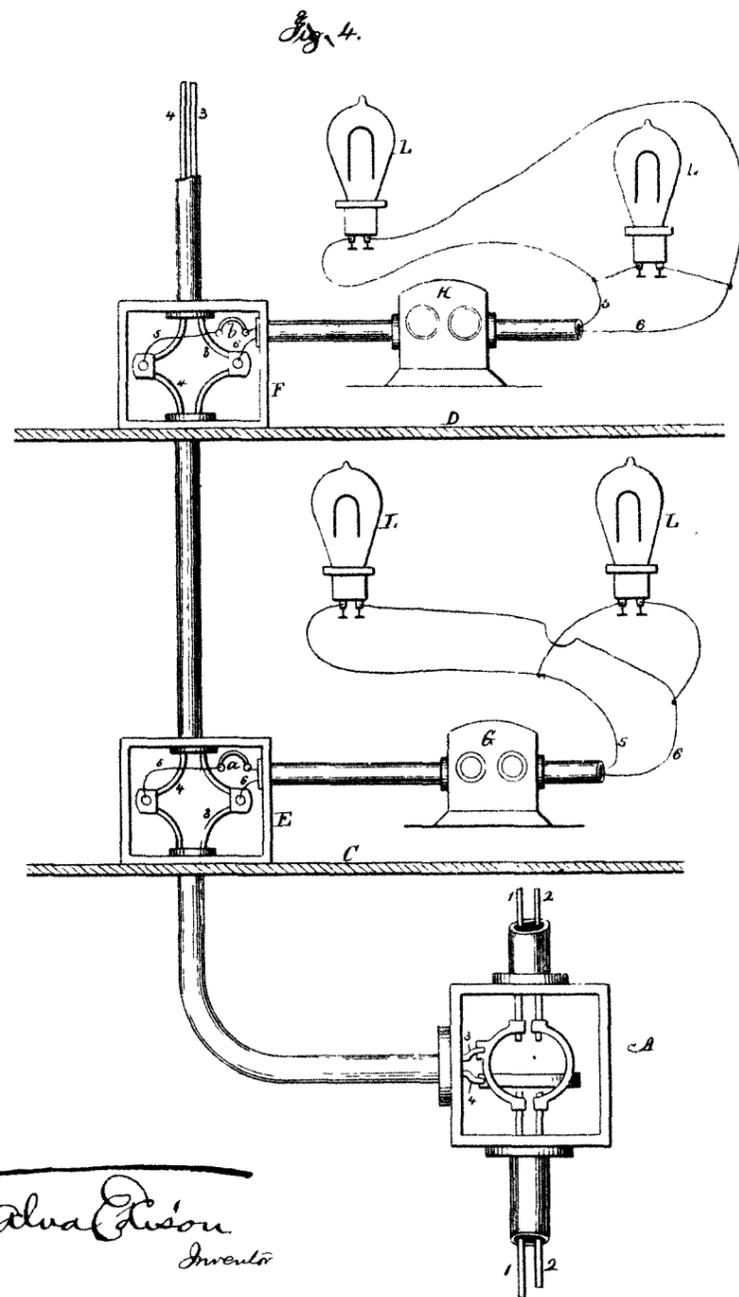
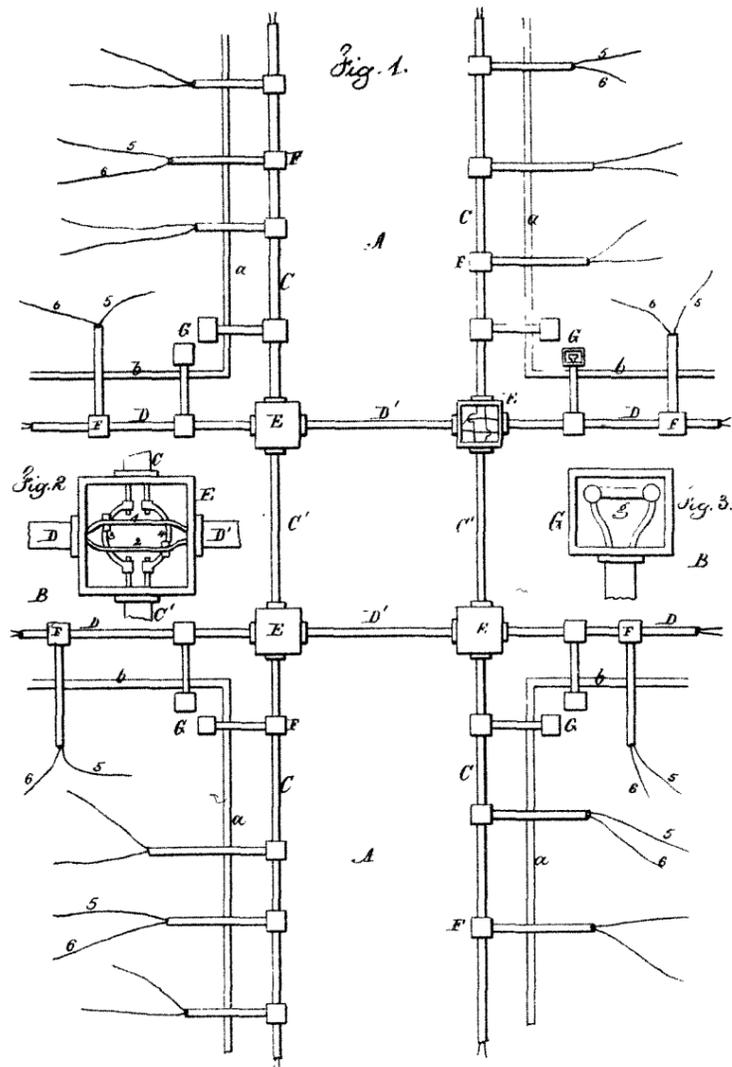
We do ourselves the honor to report, in reply to your blank cover communication of the 9th instant, No. 12,161, transmitting Mr. Thomas Alva Edison's application for the registration of an invention entitled "Improvements in Electrical Distribution Systems," that we are of opinion the prayer of Mr. Edison's 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.]

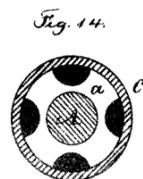
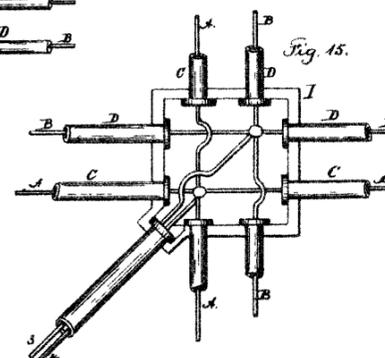
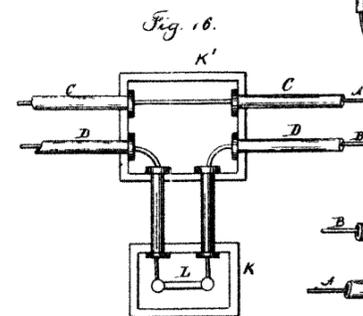
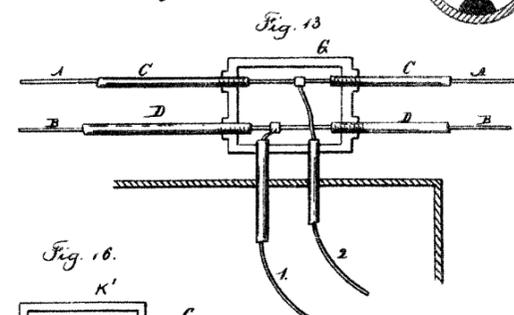
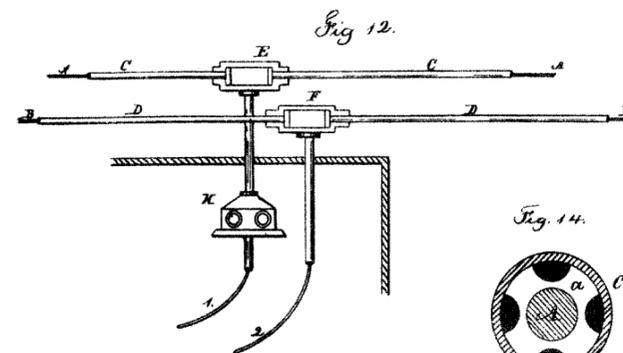
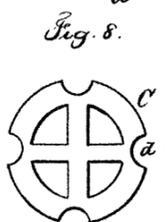
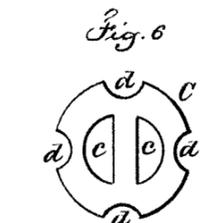
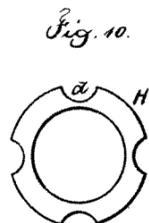
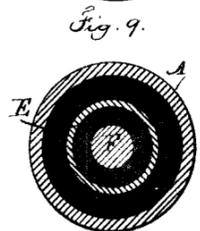
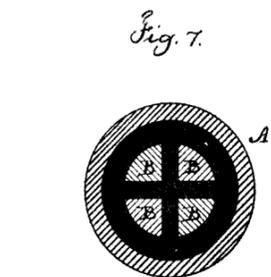
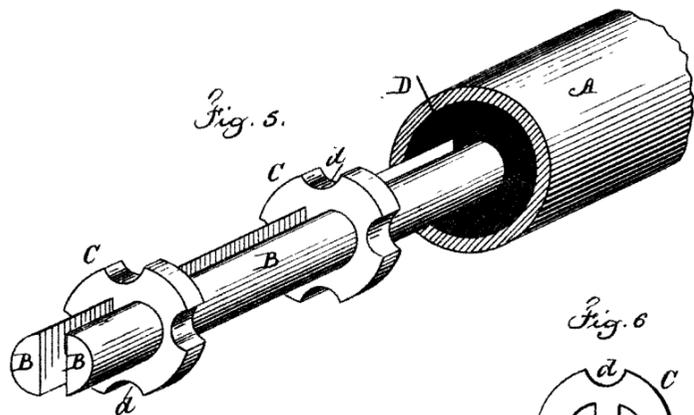


Thomas Alva Edison
Inventor

Witness
Chas. Smith
Geo. J. Pinckney

This is the Sheet of Drawings marked Preferred to in the annexed
Letters of Registration granted to Thomas Alva Edison, this
ninth day of March, A.D. 1882.

Augustus Lof tus.



Thomas Alva Edison
Inventor

Witness
Chas. N. Smith
Geo. T. Pritchney

This is the Sheet of Drawings marked C referred to in the annexed Letters of Registration granted to Thomas Alva Edison, this ninth day of March, A.D. 1882. Augustus Loftus.



A.D. 1882, 9th March. No. 1045.

IMPROVEMENTS IN AND RELATING TO DYNAMO-ELECTRIC MACHINES.

LETTERS OF REGISTRATION to Hiram Stevens Maxim, for Improvements in and relating to Dynamo-Electric Machines.

[Registered on the 9th day of March, 1882, 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 HIRAM STEVENS MAXIM, of Brooklyn, 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 and relating to Dynamo-Electric 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 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 Hiram Stevens Maxim, 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 Hiram Stevens Maxim, 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 Hiram Stevens Maxim 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 ninth day of March, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in and relating to Dynamo-Electric Machines.

A.

SPECIFICATION of HIRAM STEVENS MAXIM, of Brooklyn, New York, United States of America, for an invention entitled "Improvements in and relating to Dynamo-Electric Machines."

My invention relates to a device for regulating Dynamo-Electric Machines, in respect to the amount of electricity generated, so as to render the electro-motive force of the current constant at each point of consumption. It also relates to improvements in the construction of the armature and commutator of such machines.

Dynamo-electric machines as usually constructed heretofore have had no means for regulating the current, and this deficiency has constituted a serious objection to their use for many purposes to which electricity is applied.

When the current is all used in a single circuit and for a single purpose such machines have served the purpose reasonably well, but they do not answer where many branches from a common circuit are used and each requires a definite and constant amount of current, as in plating, telegraphing, and those systems of electric lighting where lamps are worked in branches off the main circuit.

In plating fine goods much difficulty has been experienced from changes of polarity as well as from variations of quantity and intensity of the current, even where a single bath has been used in a circuit. The electricity generated in the bath by the operation of plating is sometimes sufficient to overcome the force of the field magnets of the machine upon any slackening of its speed and reverse the current, and the removal of a part of the articles in course of plating frequently injures the remainder by causing too rigid a deposition of metal upon them. It is extremely desirable, in plating, telegraphy, electric lighting, and other applications of electricity, to generate a large current at a single central point, and to distribute it much as water and gas are distributed by mains and branches, in such a manner that the electro-motive force of the current shall not vary at any point of consumption however much its consumption may fluctuate. Devices of various forms have been used for varying the resistance in the circuit, to compensate for changes of strength in the current and for diverting a part of the current upon its increasing beyond its normal strength; but these systems of regulation involve great waste of power, and the devices employed are not sufficiently sensitive to fluctuations in the current to act efficiently. When increased resistance is thrown into the main circuit to compensate for the removal of a lamp or branch, it is obvious that the power consumed in generating the current remains the same whether many lamps or branches or only one or two are in use, and the power represented by the lamps or branches not in use is wasted. It is also obvious that the regulating device should be applied to the source of supply rather than to the current after it is generated, and it is the object of the present invention to provide for the dynamo-electric machine a regulator or governor that will automatically control the generation of the current, so as to make the amount of electricity generated at all times equal to the amount required for use, without appreciable variation of intensity. I may apply this system of regulation in a variety of ways; but according to the present invention, so far as it concerns the regulation of the current, I use an auxiliary machine to excite the main field magnets and turn the brushes of the auxiliary machine towards and from the neutral points of their commutator, by mechanism automatically controlled by a sensitive electro-magnet in a branch of the main circuit.

Another source of difficulty in the operation of such machines has been the rapid heating of the revolving armature and its coils, by reason of the frequent changes of polarity of the parts and the resistance of the coils. Such heating is very objectionable, as it impairs the efficiency of operation of the machine and injures the insulation of the wire in the coils.

Attempts have been made to provide for a circulation of air through the armature and its coils, by boring holes and cutting openings of various forms in the core of the armature,—by making the armature shaft hollow with a draught of air through it, by constructing the armature core of plates affixed directly to the armature shaft and slightly separated from each other by collars, with openings from the hollow shaft into the spaces between the plates, and by applying fans and other similar devices to the armature; but all such connections and devices have worked imperfectly. The holes destroy the continuity of the ring and do not expose surface enough to the air, and the hollow shaft does not give sufficient room for the ingress of air, while the fans acting by centrifugal force throw out the cold air and retain the hot, on account of the difference in density.

In my improved armature the parts are so divided and arranged that there is no considerable unbroken mass of iron or of wire at any place in the armature, but both the iron core and the coils are divided by air-passages and a rapid circulation of air is kept up through such passages while the machine is in use.

Another source of difficulty in the operation of such machines arises from the imperfect action and rapid wear of the commutator.

Such commutators are commonly made of cylindrical form, and are composed of a series of plates or strips of conducting material, corresponding in number to the divisions or coils of the armature, and separated from each other by insulating material. The conducting strips have heretofore been arranged in straight lines parallel to the axis of the cylinder, or in a spiral direction, and both these arrangements are subject to serious objections.

Where the strips are straight and parallel to the axis, the commutator brush often breaks contact with one strip before it comes into contact with the succeeding one; thus not only interrupting and weakening the current but greatly increasing the wear of the commutator, by reason of the large spark produced and the consequent burning of the metal. When the plates are arranged in spiral form this objection is overcome, but the shrinkage of the insulating material between them allows the pitch of the spiral to increase and shortens the cylinder, thus loosening the plates in their clamps.

Moreover, the wear of the commutator takes place for the most part at the point where the spark passes between the commutator strips and the brush, and as this must always take place at the same end where the plates are made spiral in one direction, one end of the commutator so constructed wears much more rapidly than the other end.

Improvements in and relating to Dynamo-Electric Machines.

I obviate these objections by making the commutator plates of such form that they are parallel to the axis of the cylinder on the inside and take the direction of a double spiral on the outside. This construction secures all the advantages of the spiral arrangement, and at the same time prevents the working loose of the plates and secures an even wear for the two sides of the commutator.

In the accompanying drawings, figure 1 is a plan of the top of a machine embodying this invention; figure 2 is a longitudinal vertical section of the said machine; figure 3 shows the arrangement and connection of the wires; figure 4 shows the position of the commutator-brushes of the exciting machine; figure 5 is a perspective elevation of the armature and commutator, showing the arrangement of the parts and the method of winding the coils; figure 6 is an end view of the armature; figure 7 is a side view of one of the larger plates composing the armature; figure 8 is a similar view of one of the smaller plates; figure 9 is an end view of the commutator; and figure 10 is a view of one of the metallic sections of the said commutator. Similar letters indicate the same parts throughout the drawings.

AAA are electro-magnets forming the magnetic field of the main machine. The three on the left (as shown in figure 3) have their south poles attached to a curved piece of iron, which extends nearly half around the armature, and the three on the right have their north poles attached to a similar piece of iron diametrically opposite.

B is an armature carrying coils of insulated wire, and revolving between the field magnets AAA.

C is the commutator of the main machine; it conveys the current generated by the revolution of the armature B, through proper connections, to the conductors 20 and 24.

The main field magnets are not in the main circuit, but are excited by the smaller or auxiliary machine, of which DD are the field magnets and E is the armature.

F is the commutator of the auxiliary machine.

GG are the brush-holders, and HH are the brushes.

II are arms carrying the brush-holders GG, and affixed to a sleeve surrounding the shaft of the machine.

J is a toothed sector affixed to the same sleeve, and engaging with the bevel gear-wheel on pinion K.

LL represents a double disc wheel mounted upon the shaft M, which carries the gear-wheel K; it is attached to the shaft so as to turn with it, but is free to move vertically upon it a short distance. N is a wheel mounted upon the shaft Q, and revolving between the edges of the discs LL, so that either of them may be made to engage with it. The shaft Q is mounted in the bearings OO, and is revolved continuously in the same direction by the pulleys P and j and the band k.

R is a lever controlling the vertical position of the discs LL.

T is a strong electro-magnet in the circuit of the auxiliary machine, and S is its armature.

U is a spring applied to push up the armature end of the lever R, and V is its adjusting screw.

h is an electro-magnet of high resistance, placed in a branch of the main conductors, and i is its armature.

Z is a lever carrying the armature i, and having a spring a to balance the pull of the magnet h.

The construction of the revolving armature of the machine is best shown in figures 5 to 8.

I usually construct the body of the armature of thin plates of iron, of the form shown in figure 8 and at A³ in figure 6.

These plates should be of the best annealed iron, and are provided with a series of "lodial" projections which serve as pole extensions. Part of the plates of the armature are made of the form shown in figure 7 and at B³ in figure 6. These are provided with longer projections corresponding to the "lodial" projections of the other plates, and also with additional projections both on the outside and on the inside, for the purpose of holding the wire of the coils in position. An armature is constructed by placing a sufficient number of plates alongside of each other, and fastening them together by means of pins or rods, H³H³, made of some diamagnetic material, passing through all the plates, as shown in figure 6. The plates, however, are not placed directly in contact with each other, but are separated by washes upon the rods H³H³, of about the thickness of the plates, and interposed between them, or between pairs of them, so as to leave air-spaces between the plates. Where the tension of the current is very great, as in machines for supplying electric lamps, I prefer to make the larger plates of some strong insulating material, and to use a few of them, say one to each end and one in the middle, and they may be made to project so as to keep the wire at some little distance from the iron and prevent all danger of a short circuit.

Where a current of low tension is required I prefer to make all the rings of iron, and it is advantageous under some circumstances to use more of the larger rings, or even to construct the whole armature of them. The manner of winding the coils is shown in figures 5 and 6, where C³C³ represents the coils wound upon the armature and held in position by the projections on the large plates B³, so as to leave air-passages between the coils both upon the inside and upon the outside. The armature is attached to its shaft by means of a hub, with spokes fitting into recesses in the rings, or by any other suitable device. It is important, however, that the space between the armature and its shaft should be left substantially open so as to permit the free ingress of air, and a sufficient number of plates shown at B³, having the larger exterior and interior projection, should be used to keep the coils separated throughout their entire course, so as to leave an open passage for air between them. In order to secure the greatest advantages from this construction the plates composing the armature should be made thin, and a considerable number of them used.

To obviate a sharp bend at the end of the coil, and the consequent injury to the insulation and increase of resistance, I construct the end rings of the cylinder of half-round iron; this presents an easy curve for the wire at all points.

In other respects than those mentioned, my armature is similar in construction and operation to those which are now well known and in common use.

The construction of the commutator is best shown in figures 5, 9, and 10. In figure 10 one of the metallic plates forming the commutator is shown separately. These plates are made straight upon the edge toward the centre of the commutator-cylinder, but V-shaped upon the side forming the circumference, and each plate is made thicker upon the outside, so that a cross section would be sector-shaped. The double

Improvements in and relating to Dynamo-Electric Machines.

double spiral or V-shaped arrangement of the plates at the circumference is best shown in figure 5. $I^3 I^3$ are the metallic plates, and $K^3 K^3$ are divisions of insulating material between them. Each plate has an arm, L^3 , projecting radially, to which the coils are electrically connected in the usual way. As the brushes overlap several plates of the commutator when arranged in this way, there is no danger of interruption or weakening of the current from the brush leaving one plate before making contact with another, and the plates do not work loose in their clamps or wear unevenly.

The armatures and commutators of both the main and the auxiliary machines are constructed in the manner above described, but such construction is not essential to the operation of the regulating device, nor is the regulating device essential to the proper operation of the armature or commutator, as either may be applied independently of the other to machines of various forms now in use.

The operation of the said invention is as follows:—

Upon the revolution of the shaft the auxiliary machine, the circuit of which is always closed, generates a current of electricity which passes through the main field-magnets, through the shunt 17-18 or the magnet T , according as the shunt is closed or opened, and finally through the field-magnets of the auxiliary machine, as shown in figure 3. When the shunt 17-18 is open the path of the current is from 1 to 16 inclusive in the order of the numbers, but when the shunt is closed the magnet T is cut out and the current follows 17-18, instead of 5-6-7. The opening and closing of the shunt is effected by the magnet h with its armature and lever placed in the branch 21-22-23 of the main circuit 20-24. The position of the shunt obviously determines the magnetic condition of the magnet T , and consequently the position of the armature S . The lever R is so arranged that when the armature S is depressed the lower disc L is brought into contact with the friction-wheel N , and when S is raised the upper disc L engages with N . The brush-holders GG are so arranged with reference to the sector J that when the lower disc engages with the wheel N the brushes will be turned toward the position shown in the full lines in figure 4, while with the upper disc in contact they will be turned toward the position shown by the dotted lines in the same figure. A stop (D^1 in figure 2) prevents the turning of the sector far enough to unmesh the gearing. There are two points diametrically opposite to each other on the commutator, where the brushes receive no current from the machine. It is convenient to designate these as the neutral points of the commutator, although they correspond to the magnetic poles of the armature. The position of the brushes when at such neutral points of the commutator is represented by the dotted lines in figure 4. At or about 90 degrees from these are two points where the current of greatest power will pass to the brushes, and at which points the latter are shown by the full lines in figure 4; between these the current varies from zero up to its greatest power, and while the machine is running at uniform speed its current may be increased or diminished at will by changing the position of the commutator-brushes. It is evident that the magnet h effectually controls the amount of current generated by the main machine, by shifting the commutator-brushes of the auxiliary machine, for the amount of electricity generated by the main machine depends upon the degree of excitement of the field-magnets by the current of the auxiliary machine, and that depends upon the position of its commutator-brushes.

The magnet T is made of low resistance, so as not to weaken the current of the auxiliary machine too much, but the magnet h is made of high resistance, both to prevent any considerable part of the main current from passing through it and to render it very sensitive to fluctuations in the strength of the main current. The lever Z is mounted like a scale-beam upon knife-edge supports, and its vibrations are kept within narrow limits by means of the screws XY . To make an electrical connection between the lever Z and the conductor r I use a cup of mercury and a pendant of iron directly under the centre of the lever, as this does not throw the lever out of balance or require any appreciable power to move it. One connection of the shunt is carried to the cup of mercury through the conductor r , and the other to the set-screw Y through the conductor p and the post d , so that the shunt is closed when the spring end of the lever Z is raised. The tension of the spring a is so adjusted, by means of its adjusting screw b , that it exactly balances the pull of h when a current of normal strength is passing, and the machine is then self-adjusting to any fluctuations of consumption of the current. The adjustment of the spring a determines the normal intensity of the current.

The particular form of the parts shown is not essential, and it is obvious that various adjustable devices, other than the spring a and lever Z , may be used for balancing the pull of the magnet h . When branches are put in between the main conductors, or the work of the main circuit is otherwise increased, the current is momentarily weakened very slightly, the pull of the magnet h is diminished, and the spring a draws down its end of the lever and opens the shunt, the magnet T being excited throws the lower disc L into gear and revolves the brushes GG toward the point of maximum current on the commutator, and the current is strengthened until equilibrium is again established between the magnet h and the spring a . When the work of the main circuit is diminished the reverse operation takes place. This device is very sensitive to variations of strength in the main current, and it acts at once with great efficiency to increase or decrease the amount of electricity generated, for at the first operation of opening the shunt the magnet T is thrown into the auxiliary circuit and weakens it by increasing the resistance, and the rapid revolution of the brushes toward the neutral points still further weakens the auxiliary current. This not only directly decreases the power of the main-field magnets, but reacts upon the auxiliary field-magnets to still further weaken the auxiliary current and the main-field. Upon closing the shunt corresponding increments are accumulated. The electro-motive force of the current at any point of consumption is thus kept constant, by causing the machine to generate precisely the amount required for use. Accidental changes of polarity in the main circuit are obviously impossible, as the magnetic field of the main machine is independent of the main circuit.

The mode of operation of the armature, as regards the prevention of heating it, is as follows:— Upon rapid rotation of the armature the air contained in the interstices of the core and the coils is thrown out by centrifugal force, and fresh cool air continually flows in at the open ends of the cylinder, to take its place, and passes into the interior of the armature through the openings between the coils on the inside; the air not only moves radially through the annulus, but is made to move around in the direction of its circumference and impinge upon all sides of the different parts and carry away their heat. The operation of the commutator has already been sufficiently described.

It

Improvements in and relating to Dynamo-Electric Machines.

It is obvious that the essential features of the regulating device above described are—the automatic revolution of the brushes of the auxiliary machine relatively to the maximum and neutral points of its commutator, and the automatic control of the direction of such revolution by the magnet *h*, or its equivalent, acted upon by the main current. The particular arrangement of the toothed sector, friction-wheels, and magnet which I have described as used for revolving the brushes is not essential, as various other mechanical devices may be used under control of the magnet *h* for imparting a reversible revolving movement to the brushes, and I do not wish to be limited to the particular devices shown. Other devices may also be used in place of the magnet *h* for opening and closing the shunt, as for instance a metallic rod expanding and contracting according as more or less heat is imparted to it by the main current; but I prefer the electro-magnet, on account of its greater sensitiveness to changes in the strength of the current.

Having thus fully described the said invention and the manner of performing the same, I wish it understood that I am aware that regulators of various forms have been applied to an electrical circuit consisting of shunts or resistance-coils operated by the heating effects of the current upon a strip of metal placed in the circuit, or some equivalent device, but such regulators are fundamentally different from the regulator I have described above, for they are designed to throttle or partially divert a current already generated, while my regulator operates directly upon the source of supply. I am also aware that solid armatures have been heretofore constructed with the coils wound in grooves or recesses cut in the metallic core, and that grooves and perforations of various forms have been made in such armature-cores, both to break up the induced currents and to provide a larger surface for the radiation of heat, and that armature-cores have also been constructed of a series of discs hung parallel to each other upon a central hollow shaft, and separated from each other by collars, so as to leave openings between them, into which air may be introduced through the hollow shaft, and I do not claim such constructions or combinations, nor do I claim the use of an auxiliary machine for exciting the field-magnets of the main machine independently of the regulating device, but I claim:—

- First—The combination of a dynamo-electric machine and similar auxiliary machine used for exciting the main field-magnets with commutator brushes so mounted as to turn freely and revolve automatically relatively to the points of maximum and minimum current on the commutator of the auxiliary machine, substantially as described and for the purposes set forth.
- Second—A dynamo-electric machine having its field-magnets excited by a similar auxiliary machine, in combination with mechanism for revolving the commutator brushes of the auxiliary machine, to and from the neutral points of its commutator, and an electro-magnet for controlling the direction of such revolution, which magnet is thrown into and out of an electrical circuit by a shunt operated by an electro-magnet in the main circuit or a branch thereof, substantially as described.
- Third—The sector carrying the brushes in combination with the pinion *K*, the movable discs and the friction-wheel revolving continuously in one direction, substantially as described for the purposes set forth.
- Fourth—The combination of the electro-magnet *h* with the electro-magnet *T*, the said magnet *h* being of high resistance and placed in a branch of the main circuit, its armature-lever controlling the admission of an electrical current to the magnet *T*, and the said magnet *T* being of low resistance and serving to operate mechanism for increasing and diminishing the amount of electricity generated by the main dynamo-electric machine, substantially as described.
- Fifth—An armature for a dynamo-magneto-electric machine composed of a series of annular plates separated by air-passages from each other and from the armature-shaft, the said plates having outer and inner projections so constructed as to keep the coils separated from each other and leave air-passages between them, substantially as described.
- Sixth—An armature for a dynamo-magneto-electric machine composed of a series of thin annular plates separated by air-passages from each other and from the armature-shaft, a part of said plates being of the form shown at *A*³, and the remainder being of the form shown at *B*³, substantially as described.
- Seventh—In an armature for a dynamo-magneto-electric machine composed of annular plates with air-passages between them, projections on both the outer and inner circumferences of such plates, so constructed as to keep the coils separated from each other and leave air-passages between them, substantially as described.
- Eighth—The combination in a dynamo-magneto-electric machine of one or more of the coils *C*³ with an armature composed of a series of annular plates separated by air-passages from each other and from the armature-shaft, the said plates, or a part of them, having outer and inner projections so constructed as to keep the said coils separated from each other and leave air-passages between them, substantially as described.
- Ninth—In an armature composed of discs or annular plates, the combination with such plates of two or more similarly-shaped plates of insulating material, so constructed as to project slightly beyond the metallic parts and support the coils free from contact therewith, substantially as described.
- Tenth—The combination in an armature of two or more annular plates open about the armature shaft, and having inner and outer projections to keep the coils separated from each other, with rods and washers on said rods interposed between the plates, substantially as described.
- Eleventh—A commutator in a dynamo-magneto-electric machine having its conducting plates so constructed and arranged as to form a double spiral upon the outside, and to be parallel to the axis of the commutator on the inside, substantially as described and for the purposes set forth.
- Twelfth—A commutator for a dynamo-magneto-electric machine, having its conducting plates arranged in the form of a double spiral, substantially as described and for the purposes set forth.

In

Improvements in and relating to Dynamo-Electric Machines.

In witness whereof, I, the said Hiram Stevens Maxim, have hereto set my hand, this fourteenth day of January, one thousand eight hundred and eighty-two.

Witness—

W. S. BAYSTON,
Clerk to Edwd. Waters, Patent Agent, Melbourne.

HIRAM STEVENS MAXIM,
By his Agent,

EDWD. WATERS.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to Hiram Stevens Maxim, this ninth day of March, A.D. 1882.

AUGUSTUS LOFTUS,

REPORT.

Sir,

We do ourselves the honor to report, in reply to your blank cover communication of 18th instant, No. 966, transmitting Mr. Hiram Stevens Maxim's application for the registration of an invention entitled, "Improvements in and relating to Dynamo-Electric Machines," that we are of opinion the prayer of Mr. H. S. Maxim's petition may be granted, in terms of his specification, drawings, and claim.

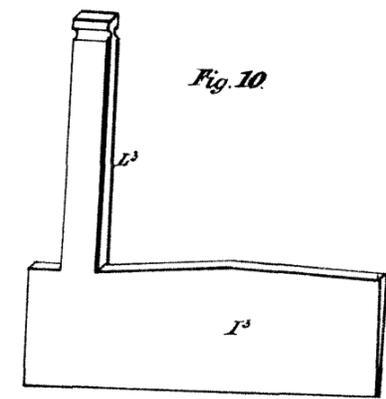
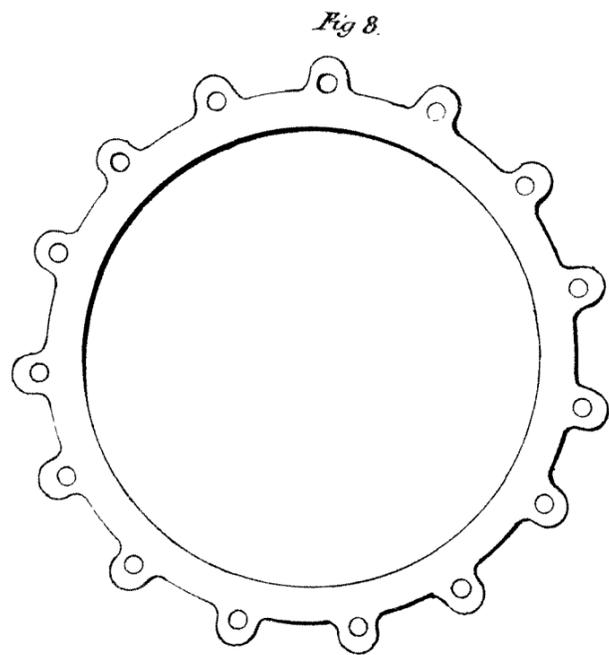
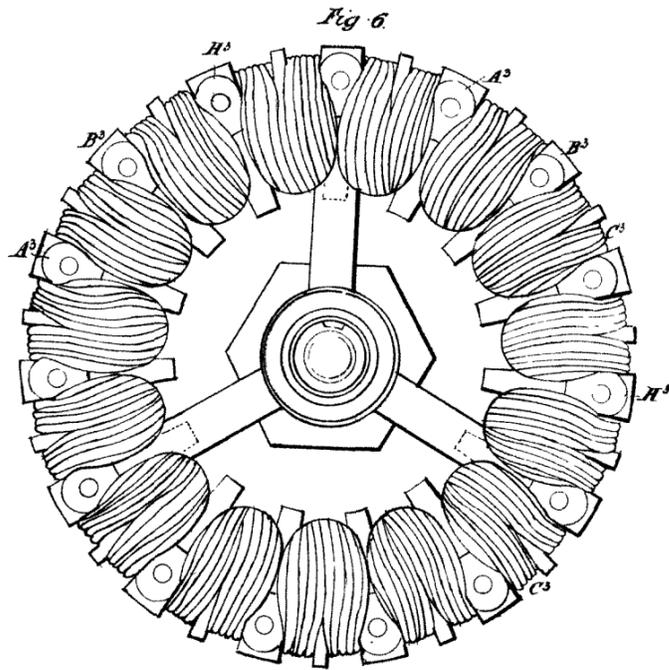
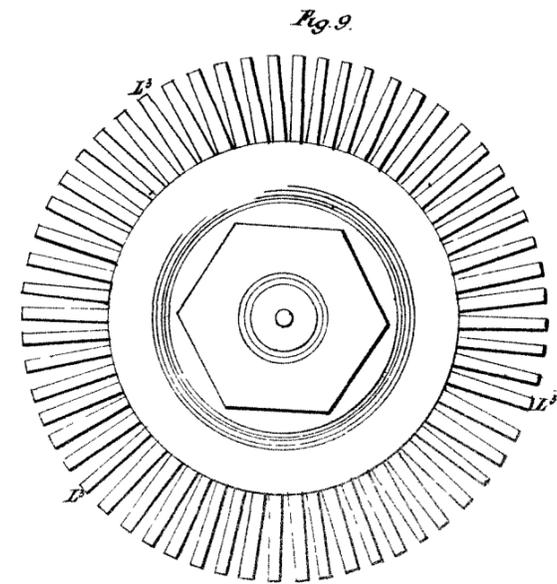
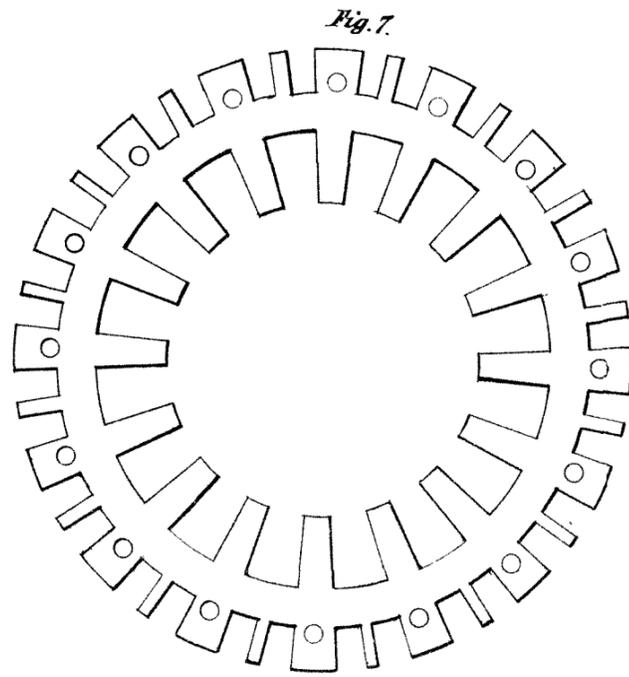
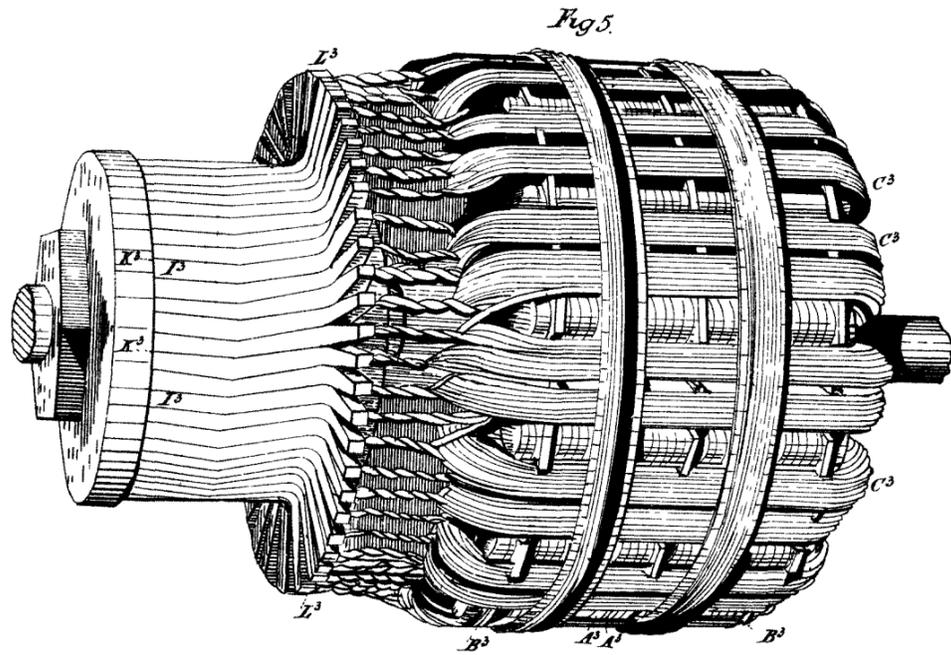
We have, &c.,

Sydney, 31 January, 1882.
E. C. CRACKNELL.
GOTHER K. MANN.

The Under Secretary of Justice.

[Drawings—two sheets.]

C.



This is the Sheet of Drawings marked C referred to in the annexed Letters of Registration granted to Hiram Stevens Maxim, this ninth day of March, A.D. 1882. Augustus Loftus.

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



A.D. 1882, 13th March. No. 1046.

AN INVENTION FOR COOLING WINES OR OTHER LIQUIDS ON DRAUGHT.

LETTERS OF REGISTRATION to Thomas Cramm, for an invention for cooling Wines or other liquids on draught.

[Registered on the 13th day of March, 1882, 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 CRAMM, of Darling-street, Balmain, in the Colony of New South Wales, engineer, hath by his Petition humbly represented to me that he is author or designer of a certain invention or improvement in manufactures, that is to say, of "an invention for cooling Wines or other liquids on draught," 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 Thomas Cramm, 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 Cramm, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and until 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 Cramm 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 March, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

An invention for cooling Wines or other liquids on draught.

SPECIFICATION of THOMAS CRAMM, of Darling-street, Balmain, in the Colony of New South Wales, engineer, of "an invention for cooling Wines or liquids on draught."

WHEREAS I, the said Thomas Cramm, have invented an apparatus hereinafter described for the above-mentioned purpose: Now know ye that the following specification fully describes the nature of the said invention, and the manner in which the said apparatus should be used for producing the desired results in reducing the temperature of wines or other liquids: The apparatus consists of a wooden box, containing an inside lining of metal, preferably zinc; the space between the lining of metal and the box must be filled with sawdust or any other substance acting as a non-conductor; the lining of metal is divided into two compartments by means of a perforated metal diaphragm; the upper compartment is intended as a receptacle for ice, which, as it melts, is conveyed through the perforations into the lower compartment, and from thence, by means of a waste-tap or pipe, drawn as required from the bottom of the box. In order to cool the wines or liquids, a pipe is carried through the box, capable of being connected with the cask or receptacle containing them; this pipe has a coil in each chamber or compartment of the box, which coil may be made either horizontal or spiral, so that the wines or liquids can be conveyed either upwards or downwards through the pipe and its coils from the cask or receptacle from which it is drawn for use. The box can be made of any required size, to contain as many pipes and coils as may be required for different liquids.

Having thus described the apparatus, I further illustrate the same by reference to the accompanying plan. Fig. 1 represents a longitudinal section of wooden box; fig. 2 is a transverse section of same, showing plan of coiled tubing; fig. 3 is a plan of ice chamber and perforated diaphragm; fig. 4 represents the lower chamber, to contain the water melted from the ice above the diaphragm. A is a representation of the ice chamber; B is the lower chamber, containing the water as melted, supplied through the perforations in diaphragm; C is a worm or coiled tube, through which the liquor to be cooled has to pass; E are the non-conducting walls of chest or box; G is lid of the chamber containing the ice; H is the box or outside casing, and D is a waste or drain-pipe.

I now claim as my invention the combination and arrangement of the different parts of the apparatus to effect a reduction of temperature in wines or other liquids in bulk from a cask or other receptacle, by conveying them through a refrigerating box or chest as above described, by means of a coiled tube or tubes, to a tap or other receptacle, from which they may be drawn or taken for consumption.

Balmain, 23 Jan., 1882.

THOMAS CRAMM.

This is the amended specification referred to in the annexed Letters of Registration granted to Thomas Cramm, this thirteenth day of March, A.D. 1882.

AUGUSTUS LOFTUS.

REPORTS.

Sir,

Sydney, 14 January, 1882.

The application of Mr. Thomas Cramm for Letters of Registration for "an invention for cooling Wines and other liquids" having been referred to us, we have examined the specification and plans accompanying the same, and beg to report:—

1. That the box described has no novelty of construction, being simply an ice-chest as commonly in use.

2. That other patentees have used spiral tubes for cooling liquids, though not exactly similar in arrangement; for example, J. D. Postle's Letters of Registration, No. 501 (1876).

3. That the only principle in the apparatus which could be secured to Mr. Cramm is that of conducting liquids in bulk from a cask or other receptacle by a coiled tube or tubes, through a refrigerating chest, to a consumption tap. This we consider there would be no objection to grant, but not for the apparatus as a whole.

We have, &c.,

EDMUND FOSBERY.

ROBERT G. MASSIE.

The Under Secretary of Justice.

Sir,

Sydney, 27 January 1882.

We see no objection to letters of Registration being granted to Mr. Cramm, in terms with the claim of the amended specification.

We have, &c.,

EDMUND FOSBERY.

ROBERT G. MASSIE.

The Under Secretary of Justice.

[Drawings—one sheet.]

No. 1047.

[Assignment of No. 606. See Letters of Registration for 1877, page 133.]

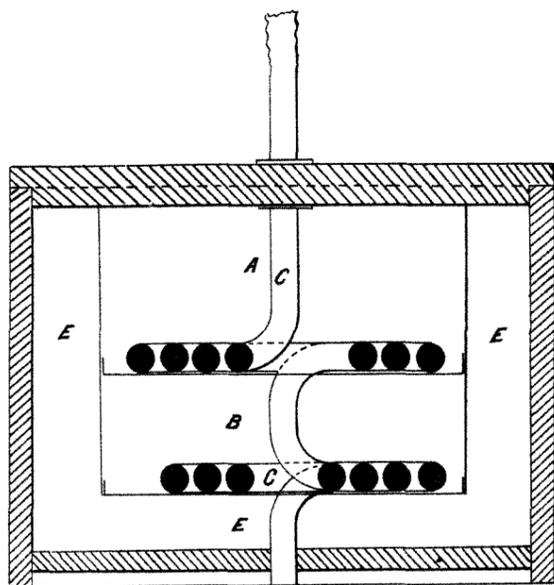


Fig. 1.

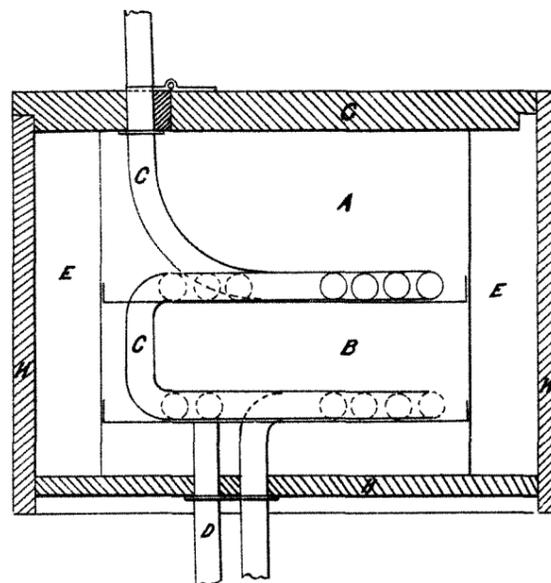


Fig. 2.

PATENT RAPID WINE LIQUOR
AND
BEVERAGE COOLER

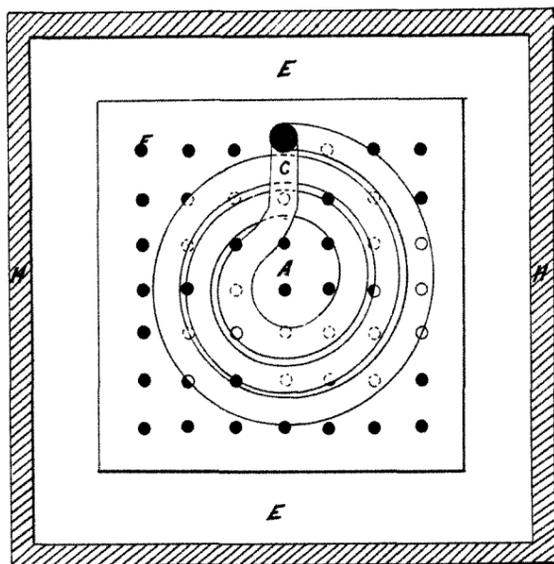


Fig. 3.

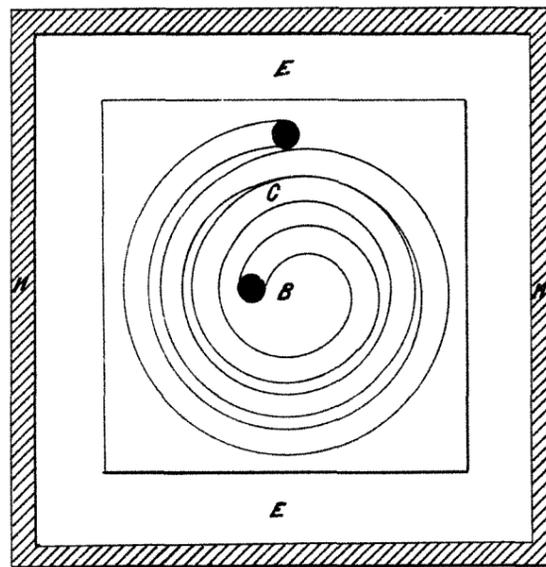


Fig. 4.

*This is the Sheet of Drawings referred to in the annexed
Letters of Registration granted to Thomas Cramm this
thirteenth day of March A.D. 1882*

Augustus Loftus.

*This is the Plan referred to in the accompanying
specification*

Thomas Cramm.



A.D. 1882, 17th *March*. No. 1047A.

IMPROVEMENTS IN ELECTRIC LAMPS, &c.

LETTERS OF REGISTRATION to Thomas Alva Edison, for Improvements in Electric Lamps and the manufacture thereof.

[Registered on the 17th day of March, 1882, 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," 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 seventeenth day of March, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in 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 Electric Lamps and the manufacture thereof," of which the following is a specification:—

THE object of a portion of this invention is to furnish a simpler and cheaper method of providing the neck of incandescing electric lamps with the collar necessary for attaching the lamp to the supporting socket, and making the proper connections therein with the wire conductors, and also to produce a neater and better collar, including a method of connecting the wires of the lamp with the metal rings of the collar, so as to hide the wire ends from sight.

This is accomplished by dropping the metal rings of the collar into a suitable mould, wires being first soldered to the inner surfaces of such rings, which are arranged to project upwardly on opposite sides of the mould. The wires of the lamp are bent up on opposite sides of the neck of the same, and the lamp is dropped into the centre of the mould and held upright therein by a spring holder which is adjusted down upon the same. The wire ends of the lamp and collar rings are twisted together and turned down into the mould, when such mould is filled with plaster of Paris, which is allowed to harden.

The lamp is then removed from the mould, and the plaster of Paris may be coloured, to improve the appearance of the collar.

In the drawings, figure 1 is a vertical section of the mould, showing the collar rings therein, and the lamp in position with the wire ends together; and figure 2 an elevation of the lamp complete, the lower end of the same being in partial section. A is the globe or bulb of the lamp, B the wire support, C the carbon filament, and *a b* the leading-in wires.

A cork *c*, is forced into the lower tubular end of the wire support B to separate the wires *a b*, after which said wires are bent up on opposite sides of the neck, as-shown in figure 1.

D is the mould, which is of the proper shape to produce the collar. The metal screw-ring *d* of the collar, provided with wire *g*, fits the lower portion of such mould, while the plain bevelled ring *f* carrying wire *e* is supported above the screw ring by a bevelled seat in the mould. E is the spring-holder, which is adjustable vertically, and after the lamp is set into the mould is dropped upon the same and fixed in position so as to hold the lamp steady.

The ends of the wires *a g* and *b e* are now twisted together and turned down in the mould, so as to be entirely covered by the plaster of Paris.

The plaster of Paris *h* (figure 2) is then poured into the mould and forms the body of the collar, the metal rings surrounding the plaster of Paris body. After the plaster of Paris has hardened, the spring-holder E is raised, and the lamp is removed from the mould, when the plaster of Paris may be coloured, if desired.

It is evident that these moulds and spring-holders can be multiplied to any desired extent and arranged in series side by side; it is also obvious that any other cement may be used, such as glycerine and litharge, instead of the plaster of Paris.

Another part of this invention relate to lamps in which the glass wire-support is held in a tapering soft rubber stopper forced in the neck of the globe, the object being to produce a simple lamp of this construction, in which the wire support cannot be forced by atmospheric pressure through the stopper into the globe, and the rubber stopper will be removed far enough from the light so that it will not be affected by heat conducted therefrom by the glass globe, and no mercury seal will be required to produce an air-tight joint.

A lamp of this construction is adapted to be taken apart when the carbon is destroyed, and all the parts except the carbon filament again utilized.

This globe is constructed with a long neck, the lower end of which has a slight outward taper or flare.

The glass wire-support is made tubular in form, and of sufficient length to bring the carbon in the centre of the globe. This tubular wire-support has its lower end enlarged or provided with a head or knob which rests against the rubber stopper, and prevents the forcing of the wire-support into the globe by atmospheric pressure.

The stopper is moulded of pure or nearly pure rubber in a polished mould, and has a taper corresponding to that of the neck of the globe.

The stopper has a central opening in which the glass wire-support fits closely. The stopper carrying the wire-support is forced into the tapering neck, and the globe is then exhausted and sealed.

The atmospheric pressure has a tendency to force the rubber stopper into the globe, and this pressure, on account of the taper of stopper and neck, serves to make the stopper close tight around the wire-support and also to hug close to the surface of the globe neck. When the carbon is destroyed, air is admitted to the lamp, preferably by breaking off the sealing projection, and the stopper is then drawn out of the neck of the globe, carrying the wire-support with it.

A new carbon filament is attached to the leading-in-wires; the globe has a glass tube fused to its upper end over the perforation made by breaking off the sealing projection, and the wire-support and stopper again inserted in the globe, when the globe is exhausted and sealed.

The neck of the globe is of such length that the heat conducted downwardly by the glass is mostly diffused into the air, and the glass in contact with the rubber is not heated sufficiently to affect the joint between the rubber and glass.

Figure 3 of the drawings is an elevation, partly in section, of an incandescing electric lamp constructed in the above manner.

A is the glass globe, which is extended at A¹ to form a long neck, the lower end of which has an outward taper or flare. B is the long tubular glass wire-support, provided with an enlargement or knob, *c*, on its lower end. C is the tapering rubber stopper. D is the carbon filament, and *a b* the leading-in wires.

A

Improvements in Electric Lamps, &c.

Another manner of constructing an incandescing electric lamp, so that it can be taken apart when the carbon is destroyed, and the principal parts again utilized, is as follows :—

The lower end or neck of the glass bulb or globe is provided with a ring of platinum, which is sealed into the glass of the globe, and is soldered to another platinum ring, sealed into the glass of the wire-support.

After the platinum rings are soldered together, the globe is exhausted and sealed. When the carbon is broken, the platinum rings can be separated by melting the solder by heat or eating it away with acid, and the parts can be used over again, it being only necessary to supply a new carbon filament, to solder the platinum rings together again, and to re-exhaust and re-seal the globe. For this last purpose, the globe will be heated at the top, and will be perforated and provided with a glass tube, for making connection with a suitable exhausting apparatus.

This is illustrated in figures 4 and 5 of the drawings. Figure 4 is a view of the lamp completed ; and figure 5, a vertical section of the two parts of the lamp before the platinum rings are soldered together. A is the glass globe, B the glass wire support, C the carbon filament, and *a b* the leading-in-wires ; D is a platinum ring sealed to the glass at the lower end of the neck of the globe, and E is another platinum ring which is dropped over the upper end of the glass wire-support and sealed to the glass of the enlarged portion of the wire-support.

One of these rings is preferably smaller than the other, so that they fit closely one over the other. These platinum rings are soldered together before the lamp is exhausted. To separate the two glass portions of the lamp, the solder can be melted or eaten away by acid.

The object of another part of this invention is to produce a simple and economical method of uniting the carbon filament of an incandescing electric lamp with the leading-in wires of the same.

This is accomplished by first attaching short copper wires to the ends of the carbon filament mechanically, then uniting the wires and carbon filament permanently by electro-plating the joints and then fusing or soldering these short wires to the leading-in wires, which have been previously sealed in the glass wire-support of the lamp.

The short copper wires may be connected directly to the platinum wires that are sealed in the glass, or with intermediate sections of copper wires.

For carrying out this method, an electro-plating cell is used, into which the ends of the carbon and the short copper wires mechanically attached thereto are hung, the carbon loop being supported by a metal arm, to which the negative pole of the battery is connected. This arm may be adjustable vertically so that the carbon can be set the right depth in the solution.

The wires below the joint may be covered with varnish, wax, or other substance, preventing deposition thereon.

The leading-in wires sealed in the glass wire-support and these short copper wires are brought together in the flame of a blow-pipe and fused, the glass wire-support and the carbon filament being held by suitable supports.

The glass wire-support is then connected with the globe or bulb, and the same exhausted and sealed.

This part of the invention is illustrated in figures 6 and 7 of the drawings. Figure 6 shows the arrangement for electro-plating the mechanically-formed joints of the carbon filament and short copper wires ; and figure 7, the arrangement for fusing the wire ends together.

A is the carbon filament, which has the short copper wires *a b* secured to its ends mechanically. This may be accomplished in several ways, but I prefer to flatten the ends of the wires and wrap them around the carbon ends. B is the electro-plating cell, above which is the arm *c* vertically adjustable on standard *d*.

The carbon is hung over this arm into the solution of the cell, the negative pole of the battery C being connected with this arm, while the positive pole leads to the electrode *e* forming the anode of the cell.

D is the glass wire support of the lamp, and *f g* are the leading-in wires. The platinum sections of these leading in wires are sealed in the top of the glass support. E is a stand for holding the wire support D in a horizontal position, and F is another stand for supporting the carbon filament so that the short copper wires *a b* united with said carbon filament by electro-plated joints, can be brought together with the leading-in wires *f g* in the flame of the blow-pipe G.

It is desirable for some purposes or locations to provide a shorter lamp, and one of simpler and cheaper construction than the incandescing lamp usually made by me. This is accomplished by sealing the leading-in wires which support the carbon directly in the lower end of the bulb, thus making the glass portion of the lamp in one piece, instead of two pieces fused together as heretofore practised by me. The glass bulb is blown from a tube, or directly from the pot or molten glass, in which operation the bulb is increased somewhat in thickness at its neck or lower end. The carbon is secured to the leading-in wires by means of clamps, plating, or soldering. The carbon is introduced into the lower end of the bulb and the carbon and wires are held in the right position by means of a proper clamping tool.

The lower end of the bulb is then heated to the point of fusion, when it is compressed upon the wires, closing tightly such lower end and securing the wires therein. The bulb is then exhausted from its other end, and there sealed. By setting the bulb into a suitable socket, and making the proper connections of the leading-in wires with the metal rings of the socket, the lamp is completed ready for use.

This is illustrated in figures 8, 9, 10, and 11 of the drawings, of which figure 8 is an elevation of the leading-in wires secured together, such wires being held by the clamping tool which is used for introducing the carbon and wires into the bulb ; figure 9, an elevation of the bulb, the carbon, the wires, and the clamping tool, such carbon and wires being shown as introduced into the bulb previous to heating and compressing the same at its lower end ; figure 10, an elevation of the lamp complete, with the exception of the socket ; figure 11, a similar view when the lamp is turned one-quarter way round.

A is the glass bulb, which is somewhat shorter than those before made by me, and has the walls of its lower open end made thicker than the body of the bulb, as shown at *a*. The upper end of the bulb is provided with a small tube, *b*, through which the bulb is exhausted.

B is the incandescing carbon, made of any suitable material, and *c d* are the leading-in wires of the lamp. The carbon is secured to the leading-in-wires by means of clamps, or by plating or soldering.

The

Improvements in Electric Lamps, &c.

The carbon and wires are introduced into the bulb A and held properly therein by the clamping tool shown in figures 8 and 9, or by any other suitable device. This tool has a handle, C, and spring jaws, D, D¹, which spring apart normally, and are forced together by a milled nut, e, working on the screw-threaded shanks of such spring jaws. The leading-in wires are grasped by this tool, and the carbon and wires held in the bulb thereby. The lower end of the bulb is then heated to the point of fusion, and is compressed upon the wires, as shown at f in figures 10 and 11. The lamp is then exhausted and sealed, as will be well understood, and is ready to receive a proper socket.

The bulb is compressed upon the leading-in wires for a sufficient distance at its lower end to form a good support for the wires, which in turn support the carbon.

Another part of the invention relates to an improved manner of attaching incandescing electric lamps or lamp chandeliers to the conducting wires, so that the lamps or chandeliers can be removed and replaced instantly, and without the necessity of removing or loosening any fastenings; and also to provide means for applying this connection to incandescing electric lamps used in mines, so that the sparks produced by connecting and disconnecting the lamps cannot possibly ignite the gases of the mine.

The first object is accomplished by providing the conducting wires and the leading-in wires of a downwardly hanging lamp or chandelier with open hooks or hooks and eyes, which can be disengaged by simply raising the lamp or chandelier. The lamp is provided with a suitable weight (as for instance a lead ring dropped over its neck), for making a good electrical connection of the hooks or hooks and eyes, by reason of the weight, and the chandelier is also provided with a weight, if its own weight is not sufficient for this purpose.

For use in mines, the lamp is hung in a water vessel with one or more glass sides, or in a glass jar, and the hooks or hooks and eyes of the conducting and leading-in wires are submerged in the water. The sparks caused by the making and breaking of the connection being under the water cannot ignite the inflammable gases of the mine. The submerged wires are coated with an insulating compound impervious to water, such as rubber, so that only the points at which contact is made are exposed to the water. The water used for this purpose being preferably distilled, the escape of electricity across between the connections will be inconsiderable.

This part of the invention is illustrated in figures 12, 13, and 14 of the drawings. Figure 12 represents a single lamp having the improved connection; figure 13, a chandelier with the connection; and figure 14, a lamp arranged for use in a mine.

A is an exhausted incandescing electric lamp. The conducting wires are provided with or formed to make open hooks B C, with which engage open hooks D E connected with or formed on the leading-in wires of a lamp or chandelier. F is the weight used on the lamp, and G is the extra weight used on the chandelier, if necessary.

By simply raising the lamp or chandelier, the connection will be broken, and the lamp or chandelier can be removed.

For mines, the lamp is submerged in the pure water of a glass-sided vessel or glass jar, H, the wires (except the hooks) being coated with an insulating covering impervious to water.

It is evident that the same object could be accomplished by substituting eyes for one set of open hooks. What I claim as my invention is—

First—In an incandescing electric lamp, the collar moulded upon the neck of the lamp, to which is secured the two electrodes of the lamp.

Second—In an incandescing electric lamp, the collar having metal rings in different horizontal planes, said collar being moulded upon the neck of the lamp and into said rings at the same time, substantially as set forth.

Third—An incandescing electric lamp having a moulded collar provided with metal rings, the wires of the lamp being secured together and imbedded in the moulded collar, substantially as set forth.

Fourth—The mould having seats for the collar rings, in combination with a holder for retaining the lamp in its proper position in the mould, substantially as and for the purpose set forth.

Fifth—In an incandescing electric lamp, the tubular wire support, having the knob or enlargement on its lower end, in combination with the perforated stopper and the globe, substantially as set forth.

Sixth—In an incandescing electric lamp, the globe having a long neck with tapering end, in combination with the tapering rubber stopper, and the long tubular glass wire-support having an enlarged lower end, substantially as set forth.

Seventh—In an incandescing electric lamp, the globe and wire support provided with metal rings sealed thereto, which are soldered together before the globe is exhausted, substantially as set forth.

Eighth—In an incandescing electric lamp, the globe provided with platinum ring D (figures 4 and 5), sealed to its lower end, in combination with the glass wire-support B, having the platinum ring E sealed thereto; such rings fitting one inside of the other, and being soldered together before the globe is exhausted, substantially as set forth.

Ninth—The method of uniting the carbon filament and the leading-in wires of an incandescing electric lamp, consisting in first attaching short wires to the ends of the carbon filament, and then securing such short wires to the leading-in wires of the lamp, substantially as set forth.

Tenth—The method of uniting the carbon filament and leading-in wires of an incandescing electric lamp, consisting in first attaching short wires mechanically to the carbon filament, then electro-plating such joints, and then fusing or soldering these short wires to the leading-in wires of the lamp, substantially as set forth.

Eleventh—An incandescing electric lamp, having the leading-in wires sealed directly in the lower end of the exhausted glass bulb, substantially as set forth.

Twelfth—In an incandescing electric lamp, the exhausted glass bulb compressed or melted upon the leading-in wires at its lower end for securing the same directly therein, substantially as described.

Thirteenth—

Improvements in Electric Lamps, &c.

Thirteenth—In an incandescing electric lamp, the glass bulb A (figure 9), having open lower end with enlarged walls *a* in combination with the leading-in wires secured directly in the lower end of said bulb by the compression of the walls *a* thereon, substantially as described.

Fourteenth—An incandescing electric lamp or lamp chandelier, the leading-in wires of which are connected removably with the conducting wires, by hooks or hooks and eyes, substantially as set forth.

Fifteenth—An incandescing electric lamp or lamp chandelier, the leading-in wires of which are connected removably with the conducting wires by hooks or hooks and eyes, such lamp or chandelier being provided with an extra weight to produce good contact, substantially as set forth.

Sixteenth—An incandescing electric lamp, the leading-in wires of which are connected removably with the conducting wires, the connections being submerged in water, substantially as set forth.

Seventeenth—An incandescing electric lamp, the leading-in wires of which are connected by hooks or hooks and eyes with the conducting wires, such hooks or hooks and eyes being submerged in water, and the wires being insulated, except at the points of contact, with a coating impervious to water, substantially as set forth.

Signed by me, this 25th day of October, A.D. 1881.

THOMAS ALVA EDISON.

Witnesses—

CHAS A. SMITH.
GEO. T. PINCKNEY.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to Thomas Alva Edison, this seventeenth day of March, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

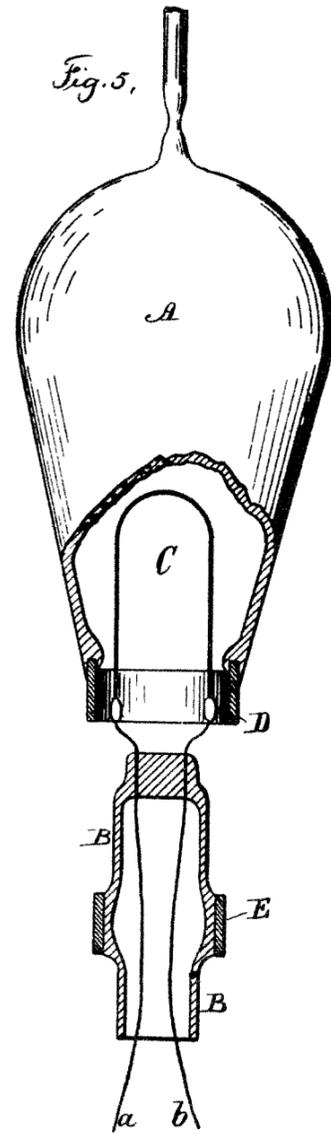
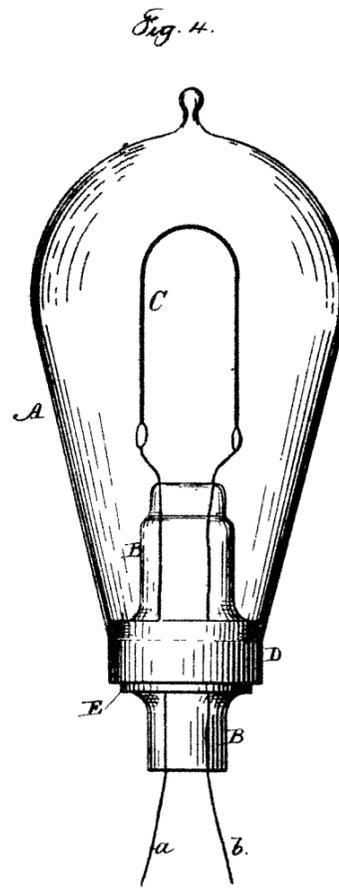
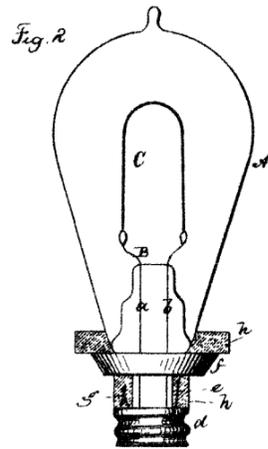
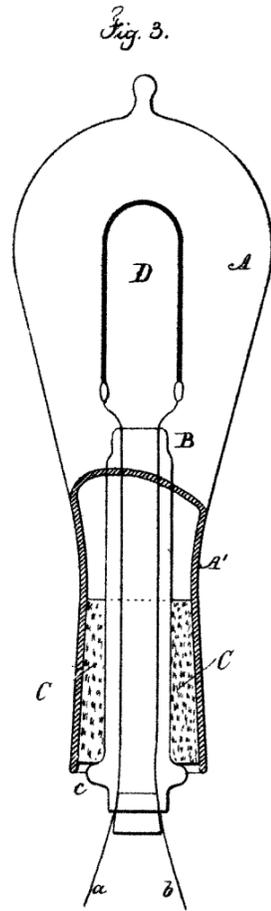
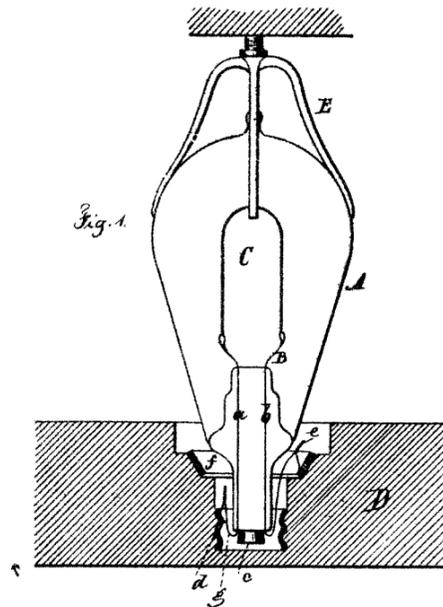
Sir,

We do ourselves the honor to report, in reply to your blank cover communication of the 9th instant, No. 12,162, transmitting Mr. Thomas Alva Edison's application for the registration of an invention entitled "Improvements in Electric Lamps and the manufacture thereof," that we are of opinion the prayer of Mr. Edison's Petition may be granted, in terms of his specification, drawings, and claim.

The Under Secretary of Justice.

Sydney, 25 January, 1882.
We have, &c.,
E. C. CRACKNELL.
GOTHER K. MANN.

[Drawings—two sheets.]

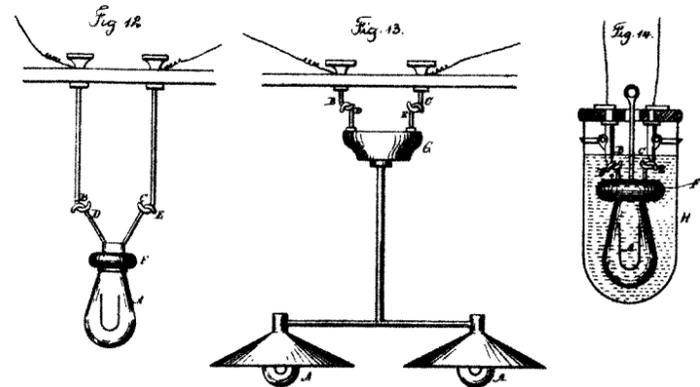
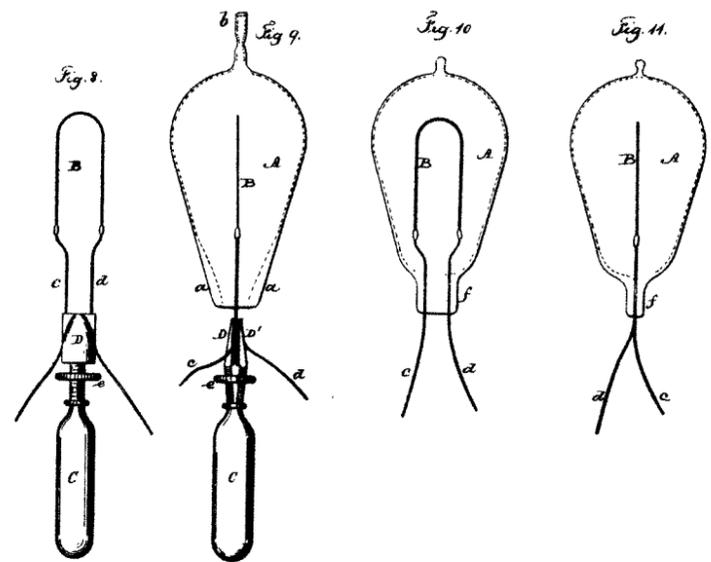
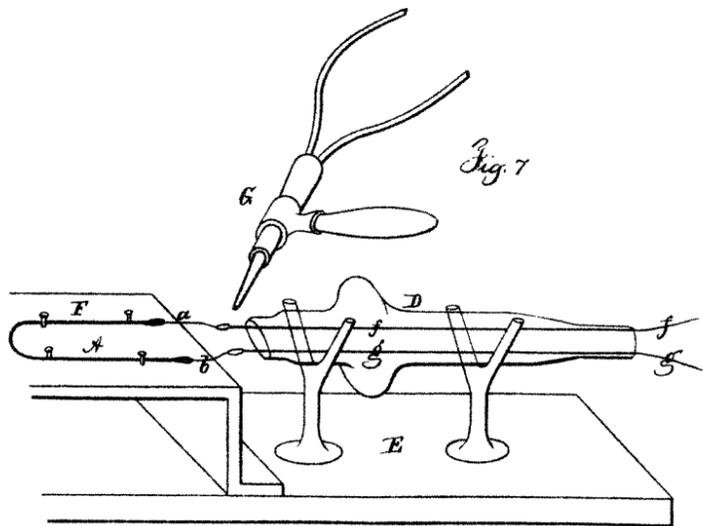
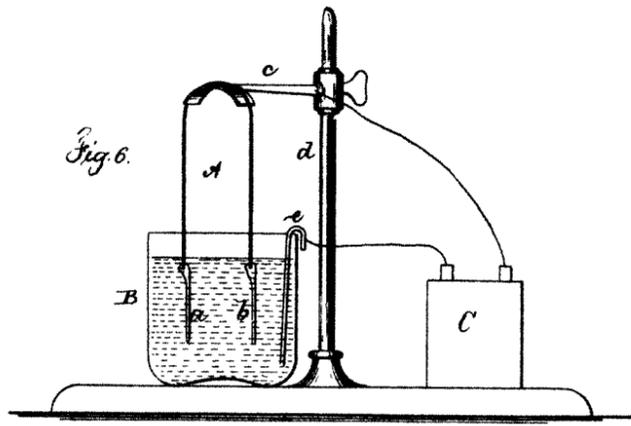


Thomas Alva Edison
Inventor

Witness
Chas. H. Smith
Geo. T. Quinby

This is the Sheet of Drawings marked B referred to in the annexed Letters of Registration granted to Thomas Alva Edison, this seventeenth day of March, A.D. 1882.

Augustus Loftus.



Witness
 Chas. A. Smith
 Geo. T. Finckley

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 seventeenth day of March, A.D. 1882.
 Augustus Loftus.



A.D. 1882, 17th March. No. 1048.

**IMPROVEMENTS IN THE MANUFACTURE OF CARBON CONDUCTORS FOR
INCANDESCENT ELECTRIC LAMPS.**

LETTERS OF REGISTRATION to Thomas Alva Edison, for Improvements in
the manufacture of Carbon Conductors for incandescent Electric Lamps.

[Registered on the 17th day of March, 1882, 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 manufacture of Carbon Conductors for incandescent Electric Lamps," 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 improve-
ment 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 hereof, 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 seventeenth day of March, in the year of
our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in the manufacture of Carbon Conductors

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 the manufacture of Carbon Conductors for incandescent Electric Lamps," of which the following is a specification.

In several patents hitherto granted to me, various methods are described of manufacturing from various materials the incandescing carbon conductors for electric lamps. Such carbons, though differing in methods and materials used in manufacture, had in common certain unitary essential qualities, viz., flexibility and high resistance.

Graphite or plumbago, graphotoidal silicon, boron, and zirconium, under some circumstances are desirable and excellent materials to use for such conductors, but their use has been negated by the fact that no method or means had been devised of treating them which would produce a flexible filamentary conductor, having in its small compass the necessary high resistance.

The object of this invention is to furnish a method by which such incandescent conductors may be made of the materials named and of allied substances.

The material used is reduced to an impalpable powder, and, where necessary, thoroughly purified. A quantity thereof is placed in a metal box sufficiently strong to withstand a high pressure.

The box should have a perfectly smooth polished bottom, and edges or sides extending upwardly so as to form a chamber about one-sixteenth of an inch deep, or even more if relatively quite thick sheets are desired.

A die with smooth polished face is used, fitting into this box, which is substantially a mould, and may be so designated.

The mould is filled with the pulverized material, the top thereof evened off, and the die brought down thereon with great pressure, for which purpose it is preferable to use an hydraulic press.

The result is a sheet of homogeneous material, whose density depends upon the pressure used, which may be varied to suit the requirements of special purposes.

If it is desired to increase the resistance of the resultant material, the preferable way is to incorporate with the material noted, before pressure into sheets, a proportion of powdered carbon or charcoal. The larger the proportion of carbon or charcoal used, the greater the resistance of the sheets of any given density.

As the density may be varied by varying the pressure used, and the resistance regulated by proportioning the amount of pulverized carbon or charcoal mingled with the basic material, it follows that both density and resistance may be regulated to suit the varying requirements of different systems of lamps.

While all kinds of carbons may be used, as a rule the substances mentioned are the easiest of manipulation.

If, however, it be desired to use carbons having little or no cohesion, such as charcoal, it may be done by mixing therewith a fluid having in solution a hydro-carbon, the menstruum being one that is readily evaporable; the resultant paste being dried, powdered, pressed, and treated with hydro-carbon vapour as hereinafter noted.

From the sheets before noted the conductors or horse-shoes are to be stamped or cut, and so that enlarged ends for clamping are made homogeneous with the body of the conductor.

In such operation there is a certain percentage of loss or breakage. This percentage is materially reduced by treating the sheets with hydro-carbon while heated to incandescence or at least to a very high heat. To this end the sheets may be placed in a closed flask or retort, provided with means whereby hydro-carbon vapour may be passed therethrough over and around the sheets, the flask or retort placed in a furnace, and the sheets brought up to a very high heat, or the material may be heated by electrical incandescence while in a hydro-carbon vapour, the result being that the material becomes tough and flexible.

Instead of the dry, powdered material being placed in the mould, it may be made into a paste or dough with any readily evaporable agent, and the mould filled with the paste or dough and allowed to dry.

After the sheets are formed, the loops or "horse-shoes" of any desired shape may be cut or stamped out, and then treated with the hydro-carbon as described, instead of the sheets being so treated before punching, cutting, or stamping, but the latter is preferable.

What I claim is:—

First—The method of manufacturing incandescing conductors of the materials set forth, consisting in pressing the material into sheets and then cutting or stamping the conductors therefrom, substantially as set forth.

Second—The method of manufacturing incandescing conductors, consisting in pressing the materials named into sheets, then treating with hydro-carbon and heat as described, and then cutting or stamping the conductors therefrom, substantially as set forth.

Third—An incandescing flexible and high resistance conductor for electric lamps formed of the materials noted and by the method described, substantially as set forth.

Fourth.—An incandescing conductor for electric lamps, formed of graphite, plumbago, or graphotoidal silicon, boron, or zirconium, subjected to pressure and the action of hydro-carbon and heat, substantially as set forth.

Fifth—The method of varying the resistance of carbons formed of graphite, plumbago, or graphotoidal silicon, boron, or zirconium, by incorporating therewith a proper percentage of powdered carbon or charcoal, substantially as set forth.

Sixth—An incandescing conductor formed of the materials and in the manner described, and having enlarged ends for clamping, integral therewith, substantially as set forth.

Signed by me, this 7th day of November, 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 seventeenth day of March, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT:

for incandescent Electric Lamps.

REPORT.

Sir, We have the honor to inform you that we have carefully considered Mr. Thomas Alva Edison's application for Letters of Registration for "Improvements in the manufacture of Carbon Conductors for incandescent Electric Lamps," No. 82/958, and we see no objection to Mr. Edison's petition being granted.

Sydney, 25 January, 1882.

&

We have, &c.,

E. C. CRACKNELL.
JAMES BARNET.

The Under Secretary of Justice.



A.D. 1882, 20th *March*. No. 1049.

**IMPROVEMENTS IN THE TREATMENT OF GRAIN OR CEREALS TO BE USED IN
BREWING, DISTILLING, AND VINEGAR-MAKING.**

LETTERS OF REGISTRATION to Alexander William Gillman and Samuel Spencer, for Improvements in the treatment of Grain or Cereals to be used in brewing, distilling, and vinegar-making, and in means or apparatus employed therein.

[Registered on the 20th day of March, 1882, 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 ALEXANDER WILLIAM GILLMAN and SAMUEL SPENCER, both of the Castle Brewery, Saint George's Road, Southwark, in the County of Surrey, 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 the treatment of Grain or Cereals to be used in brewing, distilling, and vinegar-making, and in means or apparatus employed 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 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 Alexander William Gillman and Samuel Spencer, 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 Alexander William Gillman and Samuel Spencer, 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 Alexander William Gillman and Samuel Spencer 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 twentieth day of March, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in the treatment of Grain to be used in brewing, &c.

A.

SPECIFICATION of ALEXANDER WILLIAM GILLMAN and SAMUEL SPENCER, both of the Castle Brewery, Saint George's Road, Southwark, in the County of Surrey, England, for an invention entitled "Improvements in the treatment of Grain or Cereals to be used in brewing, distilling, and vinegar-making, and in means or apparatus employed therein."

THE invention consists of improvements in the treatment of grain or cereals to be used in brewing, distilling, and vinegar-making, whereby the expense and waste incurred in the process of malting are avoided, whilst by our process we gelatinize or rupture the starch granules contained in the grain, and convert them more or less into dextrine and sugar, and at the same time alter the condition of the albuminoids contained in the grain, thereby rendering the constituents of the grain partly soluble in water, and suitable to be afterwards treated with diastase or malt extract at the proper temperatures for its complete conversion.

For the above purpose, we first soak the raw crushed or whole grain, either in pure water or in water containing a small proportion of alkali, in order to soften the grain and facilitate the action of steam thereon in the subsequent process.

When steeping the grain in a weak alkaline solution, we prefer to employ a solution containing one and a half to two per cent. of any suitable alkali, preferring soda or potash, which may be used at ordinary atmospheric temperatures.

After the grain has been soaked a sufficient time in water, or in a slightly alkaline solution, the surplus water or solution should then be drained off therefrom, and if an alkaline solution has been used, the alkali should be removed from the grain by washing the latter in pure water.

We find when soaking grain in pure water, and when treating whole barley, the latter should be kept immersed for from about forty to fifty hours, but when treating crushed barley, an immersion of about from one to three hours will be found sufficient. When soaking whole maize or Indian corn in pure water, we find it should be kept immersed for from about fifteen to twenty hours, but when treating crushed maize or Indian corn, an immersion of about two to four hours will be found sufficient.

When soaking whole rice in pure water, we find it should be kept immersed for from about two to three hours, but when treating crushed or broken rice, an immersion of from one to two hours will be found sufficient.

When soaking grain in a slightly alkaline solution we find the following periods of immersion sufficient:—

For whole barley, about twenty to twenty-five hours; for crushed barley, about a half to one hour; for whole maize or Indian corn, about ten to twelve hours; for crushed maize or Indian corn, about a half to one hour; for whole rice, about one hour; for crushed rice, about a half to one hour.

In the event of treating other descriptions of grain, the time of soaking must be varied according to the description and character of the grain used, and the length of time for soaking crushed or broken grain will vary according to the size of the particles.

After the whole or crushed grain has been sufficiently soaked, and the surplus water has been drained off therefrom, the moist grain is placed in a vessel capable when closed of sustaining a considerable steam pressure.

In this vessel we submit the grain to the action of steam under pressure, for a sufficient time to effect the abovementioned change in the constituents of the grain. The pressure of steam, and consequent temperature, is regulated according to the nature of the different kinds of grain and the amount of gelatinization or conversion desired to be produced.

For grain soaked as above described, we find the following pressures and periods during which such pressures are maintained produce the desired conversion:—

For whole barley, a pressure of about 10 to 15 lbs. to the square inch maintained for about ten to fifteen minutes; for crushed barley, a pressure of about 5 to 10 lbs. to the square inch maintained for about five to ten minutes; for whole maize or Indian corn, a pressure of about 25 lbs. to the square inch maintained for about five to ten minutes; for crushed maize or Indian corn, a pressure of about 20 lbs. to the square inch maintained for about three to five minutes; for whole rice, a pressure of about 20 lbs. to the square inch maintained for about two to three minutes; for crushed rice, a pressure of about 20 lbs. to the square inch maintained for about one to two minutes.

If a further conversion of the starch granules into dextrine and sugar than that produced by the above process be desired, the grain must be submitted to higher pressures and for longer periods than those above indicated.

By these means the grain is not reduced to a soft pulpy condition, as when boiling the same in a quantity of water under steam pressure, but the steam and temperature produce the desired effect, somewhat swelling the grain, but do not impart an unnecessary quantity of moisture thereto.

If desired, the previous soaking of the grain in water or in an alkaline solution may be dispensed with, in which case it must be submitted for longer periods than those above mentioned to the action of steam under pressure, so as to cause the latter first to swell the grain and then to effect the desired change.

We find that dry whole barley should be submitted to the action of steam at 10 to 15 lbs. pressure to the square inch for a period of about thirty to forty minutes, whilst dry crushed barley would require to be so treated under the same pressure for about twenty to thirty minutes.

Dry whole maize or Indian corn should be submitted to the action of steam at 20 lbs. pressure to the square inch for a period of about thirty to forty minutes, whilst dry crushed maize or Indian corn would require to be so treated for about twenty to thirty minutes.

Dry whole rice should be submitted to the action of steam at 20 lbs. pressure to the square inch for a period of about fifteen to twenty minutes, whilst dry crushed rice would require to be so treated for about ten to fifteen minutes.

It will be evident that the pressure of the steam and the length of time to which the grain is submitted to its action may be somewhat varied, but in such case, if the pressure of the steam be reduced, the length of time should be proportionately increased, and *vice versa*.

Previous

Improvements in the treatment of Grain to be used in brewing, &c.

Previous to operating on the grain in the steaming vessel or chamber, the air is driven out of the latter, thereby preventing oxidation and acidity at the high temperatures employed.

After crushed grain has been thus treated, it may be passed direct into a mashing tun or vessel and be mashed alone or in combination with barley malt or other malt, in the manner ordinarily adopted in mashing malt, or the whole or crushed grain treated as above described may be dried on an ordinary malt kiln, or in or on other suitable drying apparatus, to enable it to be preserved for future use, after which, when whole grain has been treated, it is crushed or ground, and when crushed grain has been treated, it is further crushed or ground, as may be required, previous to use.

Figure 1 is a longitudinal section, figure 2 is an end view of apparatus employed in carrying out the treatment above described, and figures 3 and 4 are sectional views of the feeding apparatus in different positions.

The vessel *a*, in which the grain is steamed, is of cylindrical form, and is provided with suitable openings, *a*¹ *a*², for admission and discharge of its contents, and such openings are capable of being opened or closed when desired, by valves or otherwise, as will be well understood. The apparatus we prefer to employ for feeding and discharging the contents of the cylinder *a* consists of two piston or other valves, *b* *b*¹, separated from each other by a convenient space, *b*², steam from the cylinder *a* being admitted to the cylinder *c* so as to act on the backs of the piston valves *b* *b*¹, to equalize the pressure thereon, and thereby to facilitate the action thereof.

Motion is given to such piston valves, *b* *b*¹, by any suitable apparatus arranged to act on the piston rods *b*². By these means the chamber *a* can be fed and the contents thereof discharged, without the steam being permitted to rush out of the feed and discharge openings *a*¹ *a*².

The said vessel *a* is also provided with a perforated or wire-work inner cylinder or false bottom, *d*, and with rotating blades or stirrers, *e*, and with a pressure gauge, *f*, safety valve, *g*, and blow-off cock, *h*, the latter of which is used when treating certain classes of grain, to enable the oils (which would if retained impart injurious flavours to the product) to be driven off from the grain, and such vessel may also be provided with a steam jacket (not shown) to enable the same to be used for the drying process, in which latter case the steam would be shut off from the interior of the said vessel and the fans caused to rotate, in order to separate and agitate the grain, and thereby facilitate the drying thereof; or a separate drying vessel may be used, in which case it may be constructed and operated as above described, or it may be mounted on axes and caused to rotate, in which latter case the vessel would be provided with suitable apertures and covers for supply and discharge, and with blades or projections fixed to the interior surface thereof, to separate and agitate the grain, and thereby facilitate the drying thereof. Suitable means may also be adopted for withdrawing the moisture from the interior of the drying apparatus, or such moisture may be merely allowed to escape through suitable openings provided for the purpose, as will be well understood.

After being treated as above described, the grain may be roasted in the ordinary way of roasting malt, to produce a material in substitution for brown or black or roasted malt for colouring stout and porter.

Instead, however, of drying the grain after steaming it, as above described, the crushed raw grain, either dry or previously soaked in water or in a weak alkaline solution, and then drained, may be fed to an apparatus consisting of two or more chambers, as represented in the accompanying drawings, of which figure 5 represents a longitudinal section, and figure 6 an end view, partly in section.

In the chamber A the steaming operation as above described is performed. In chamber B the mashing takes place with boiling or hot water, and when a third, C, is used, it is provided with cold water supply to act within a jacket, C¹, or cold water may be added to the mash in order to cool it; *a* represents a pipe connected with chamber A to supply the same with hot water, and *a*¹ another pipe connected to such chamber A to supply steam thereto; *b* and *b*¹ represent respectively steam and hot water supply pipes connected with the chamber B, to enable the mashing operation to be conducted under steam pressure, and *c* *c*¹ represent respectively pipes for conveying cold water to jacket C¹, and cold water to the interior of the chamber C, and *c*² represents a pipe for conveying the water from the jacket. A cock or valve, D, controls the flow of the material from the chamber A to the chamber B, and a cock or valve, E, controls the flow of material from the chamber B to the chamber C.

The chambers A, B, C are represented as being all provided with stirrers or agitators, *a*² *b*² *c*².

In order to enable the said apparatus to be readily fed with the grain or cereals to be treated, it is provided with a feeding arrangement consisting of two cocks or valves, F G, separated from each other by a convenient space, H. The cocks or valves F G are connected together by levers *f* *g* and link *h*, or by other suitable means, so that the one cannot be opened until the other is closed, thereby preventing the rush of steam therethrough.

In charging the apparatus, the grain or cereals are introduced through the upper valve F, the lower one, G, being closed at such time, then the upper cock or valve F is closed, and the lower one, G, opened, when the charge will freely descend into the chamber A. Other arrangements of valves may however be employed, so long as they act in manner above described.

The cooled mash will flow out of the chamber C by the opening *c*² into the mash tun I. The stirrers or agitators *a*² *b*² *c*² may be rotated as shown, or in any other convenient manner.

Having thus described the nature of our said invention, and the mode in which we carry the same into effect, we would have it understood that what we claim is:—

First—Submitting crushed or whole grain, either previously soaked in water or in a weak alkaline solution, or in a dry state, to steam under pressure, and for about the periods mentioned, after which the grain so treated is passed direct to the mash tun, or it is dried for future use, and crushed or ground, all substantially as herein described and for the purpose stated.

Second—Treating grain in order to produce a substitute for brown, black, or roasted malt, substantially as herein described and for the purpose stated.

Third—The novel combination and arrangement of machinery or apparatus for steaming whole or crushed grain, substantially as herein shown and described with respect to figures 1, 2, 3, and 4, and for the purpose stated.

Fourth—

Improvements in the treatment of Grain to be used in brewing, &c.

Fourth—The novel combination and arrangement of machinery or apparatus, substantially as herein shown and described with respect to figures 5 and 6, and for the purpose stated.

In witness whereof, we, the said Alexander William Gillman and Samuel Spencer, have hereunto set our hands and seals, this sixteenth day of November, 1881.

ALEX. W. GILLMAN.
SAMUEL SPENCER.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to Alexander William Gillman and Samuel Spencer, this twentieth day of March, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

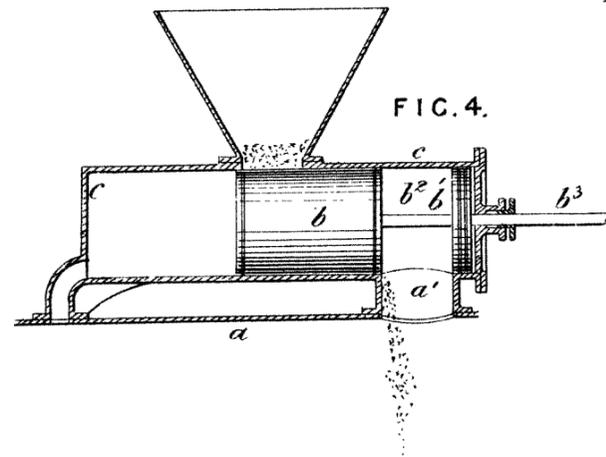
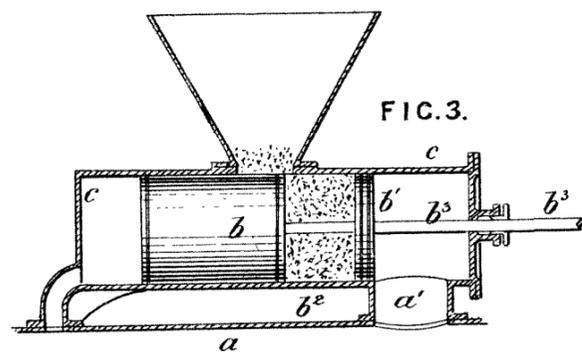
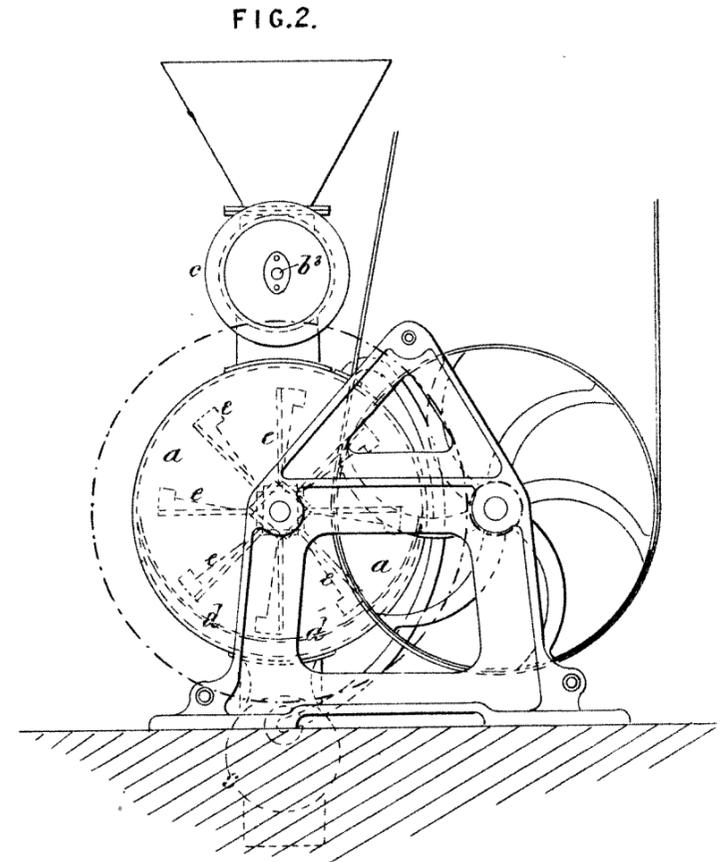
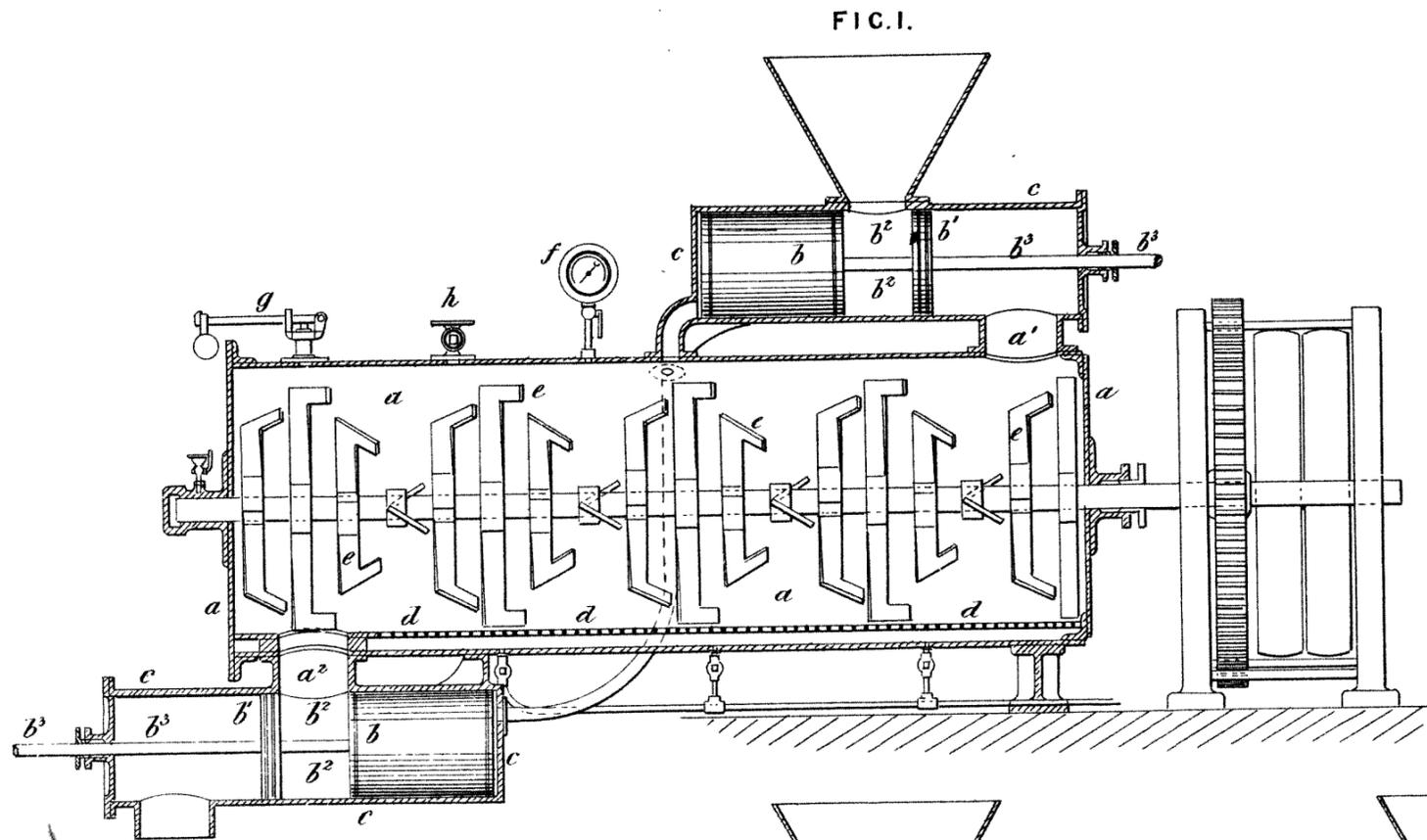
We have the honor to return herewith the papers having reference to the application of Messrs. Alexander William Gillman and Samuel Spencer, for Letters of Registration for "Improvements in the treatment of Grain or Cereals to be used in brewing, distilling, and vinegar-making." Having perused the documents in question, we see no objection to the issue of Letters of Registration to the applicants.

We have, &c.,

CHAS. WATT.
ROBERT G. MASSIE.

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 Alexander William Giltman and Samuel Spencer this twentieth day of March, A.D. 1882.

Augustus Loftus.

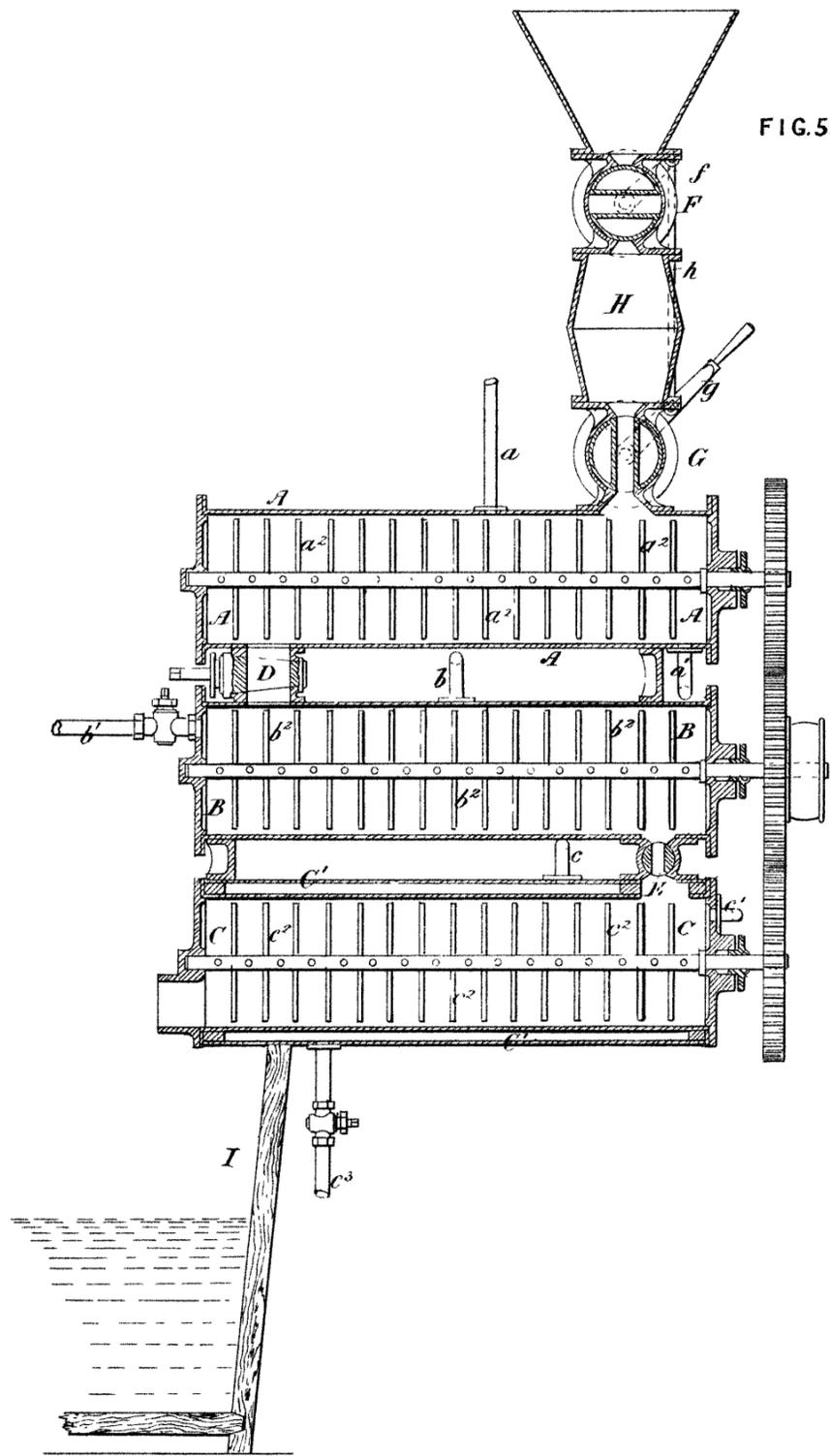


FIG. 5.

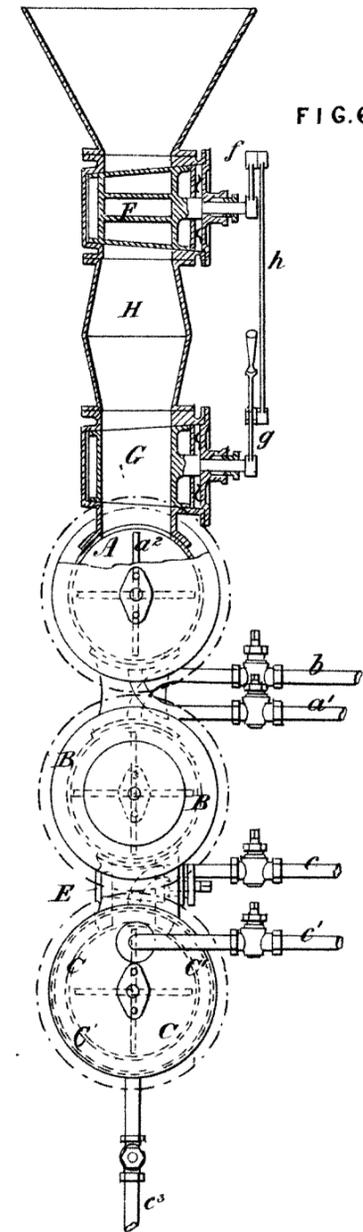


FIG. 6.

This is the Sheet of Drawings marked C referred to in the annexed Letters of Registration granted to Alexander William Gillman and Samuel Spencer this twentieth day of March, A.D. 1882.

Augustus Loftus.



A.D. 1882, 20th March. No. 1050.

THOMAS'S AUTOMATIC COUPLING.

**LETTERS OF REGISTRATION to John Thomas, for an invention entitled
"Thomas's Automatic Coupling."**

[Registered on the 20th day of March, 1882, 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, of Summerhill, Ashfield, near Sydney, in the Colony of New South Wales, builder, 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 "Thomas's Automatic Coupling," 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 Thomas, 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 Thomas, 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 Thomas 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 twentieth day of March, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Thomas's Automatic Coupling.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, JOHN THOMAS, of Summerhill, near Sydney, in the Colony of New South Wales, builder, 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 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 for coupling and uncoupling railway, tramway, and other rolling stock automatically, without the necessity for passing between the engine, carriage, truck, or other rolling stock; and in order to obtain the said Letters of Registration 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 matter the same is to be performed, and must also enter into a 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 to and by the following statement and drawing, that is to say:—

SPECIFICATION.

This invention consists of a method or arrangement for attaching to the several draw-bars of rolling-stock self-acting front and back hooks, H and G, which are held in position by the hook-bar F and the latch I. These front and back hooks are so contrived that they are capable of movement in one direction only, so long as the latch I is in the position shown on the drawing, thus enabling the eye-piece J, by sliding on the lower curved face of the front hook H, to open and enter the space provided for its reception, at the same time, owing to the shape of the upper part of the front hook H and the latch I, the latch rises until the eye-piece J is in proper position, when the front hook H becomes locked by means of the latch I. The hook-bar F containing the front and back hooks is provided with slots, as shown on drawing, to enable it by means of the pins E to be secured to the projecting ends of the draw-bars D.

The eye-piece J is also provided with slots similar to and for the same purpose as the hook-bar F.

If the front and back hooks H and G in the hook-bar F be attached in the aforesaid manner, and in proper position, to a carriage, truck, or other rolling stock that is approaching another carriage, truck, or other rolling stock (on the same rails or track), fitted with the eye-piece J in the aforesaid manner, and in proper position, the carriages, trucks, or other rolling stock, on coming sufficiently close together, will become coupled as described above, and will continue to be so coupled until an attendant, either by means of a chain, rope, or some such manner from above, or by means of a key L from the side, of a proper length, and fixed at the side of the back hook G, as shown on drawing, raises the latch I, which would cause the carriages, trucks, or other rolling stock to become immediately uncoupled, which can be better understood by referring to the drawing, which more fully and particularly describes the working parts of this my invention, which are of the most simple construction, not more liable to injury from wear and other causes than those at present in use. The several parts are described and referred to by the initial letters in the drawings.

CLAIMS.

I claim the peculiar kind of tumbling hooks H and G, hook-bar F, latch I, and slots for securing the same to the draw-bars D, all of the form shown on the drawing, or of similar forms to suit every description of rolling stock, and also the means of locking and unlocking by the use of the latch I.

ADVANTAGES.

The advantages to be derived from this invention are—

- 1st—Security to life and limb as compared with the present most dangerous mode of coupling and uncoupling rolling stock, as by this invention there is not any necessity whatever to pass between the rolling stock in making up a train or in releasing any portion of the rolling stock from the train.
- 2nd—An immense saving of time and labour in making up trains, and also in disengaging any portion of a train, consequently a great reduction in the working expenses.
- 3rd—The remarkable simplicity and cheapness of all the working parts, having no springs or such-like delicate appliances, and can be made equal to any requisite strain, and are less likely, from their simplicity, to suffer derangement than any of those at present in use. They do not require any high class skill in the manufacture, but merely ordinary care in the quality and soundness of the materials.
- 4th—Only one set or pair would be required for each carriage, truck, &c.
- 5th—Being a central coupling it would transmit strains evenly, and could be made to act as a central buffer, and by this means be made available for tram-cars, &c.
- 6th—Although the couplings are made in pairs of hook and eye, both are capable of fitting any draw-bar.
- 7th—The rolling stock can by this means be constantly coupled or uncoupled, whether on curves or on the straight; in fact there is not any likely condition that can make this invention unworkable.

And I do hereby, for myself, my heirs, executors, and administrators, covenant with Her Majesty, Her Heirs and Successors, that we 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 any other person than myself is the true and first inventor of this said invention, and that I will not deposit these presents at the office of the Minister for Justice with any such knowledge or belief as last aforesaid.

Thomas's Automatic Coupling.

In witness whereof, the said John Thomas has hereunto set his hand and seal, this 29th day of November, in the year of our Lord one thousand eight hundred and eighty.

JOHN THOMAS,
By his Agent,
HENRY HALLORAN.

This is the specification referred to in the annexed Letters of Registration granted to John Thomas, this twentieth day of March, A.D. 1882.

AUGUSTUS LOFTUS.

REPORTS.

Sir,

Sydney, 11 November, 1881.
With reference to the application of Mr. John Thomas for Letters of Registration for an invention entitled "Thomas's Automatic Coupling," we have the honor to report that we do not consider the plans and specification to be sufficiently definite to warrant the issue of Letters of Registration to the applicant. And we are further of opinion that the principle of the coupling clearly resembles the automatic coupling for which Letters of Registration have been granted to Messrs. Thomas and Cowdery.

We have, &c.,
JOHN WHITTON.
E. O. MORIARTY.

The Under Secretary of Justice.

Sir,

Sydney, 21 December, 1881.
Having reference to the annexed drawings and specification forwarded by Mr. John Thomas, in reply to our report on his application for Letters of Registration for an invention entitled "Thomas's Automatic Coupling," we do ourselves the honor to state that the drawings submitted show the detached portions only of his invention, and we shall be glad if he will favour us with drawings showing a plan and section of his invention complete, as it would appear when the carriages or waggons are coupled up.

We have, &c.,
JOHN WHITTON.
E. O. MORIARTY.

The Under Secretary of Justice.

Sir,

Sydney, 14 February, 1882.
Mr. John Thomas having submitted a model of his invention entitled "Thomas's Automatic Coupling," we have the honor to report that we see no objection to Letters of Registration being issued to him.

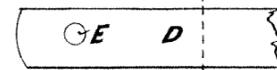
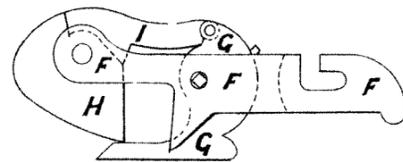
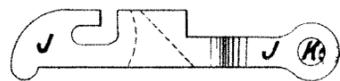
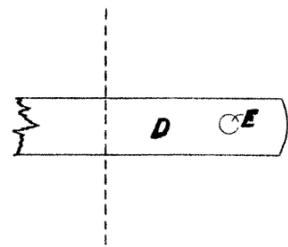
We have, &c.,
JOHN WHITTON.
E. O. MORIARTY.

The Under Secretary of Justice.

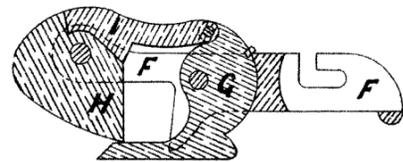
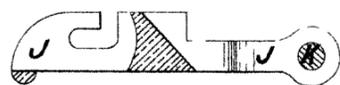
[Drawings—one sheet.]

— JOHN THOMAS' INVENTION —

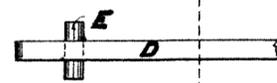
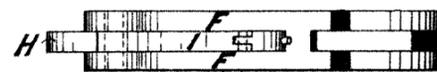
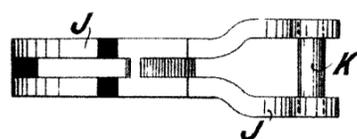
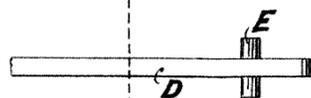
PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE,
SYDNEY, NEW SOUTH WALES



— Side Elevation —



— Longitudinal Section —



— Plan —



*This is the Sheet of Drawings referred to in the annexed
Letters of Registration granted to John Thomas this
twentieth day of March, A.D. 1882. Augustus Loftus.*



A.D. 1882, 20th March. No. 1051.

THE AUTOMATIC CARD WINDER.

LETTERS OF REGISTRATION to Henry Benjamin Liebmann, for an invention entitled "The Automatic Card Winder."

[Registered on the 20th day of March, 1882, 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 BENJAMIN LIEBMAN, of 317, George-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 entitled "The Automatic Card Winder," 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 expenses 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 them atters 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 Benjamin Liebmann, 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 Benjamin Liebmann, 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 Benjamin Liebmann 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 twentieth day of March, in the year of our Lord one thousand eight hundred and eight-two.

[L.S.]

AUGUSTUS LOFTUS.

The Automatic Card Winder.

SPECIFICATION of "The Automatic Card Winder."

THE invention consists of a reel, R, made of brass, tin, or any other suitable material, upon which the elongated card C is wound. The reel works upon a hollow axle, H, containing a spiral spring, S, fastened at one end to the axle E, and the other end to a second and smaller axle, A, placed centrally in the first.

The smaller axle is fastened in a bracket, B, which prevents its revolving, and carries a catch-wheel, W, worked in conjunction with a lock, L, attached to the support.

The card, which sustains samples of textures, pictures, or photographs, &c., in being unwound, gives a tension to the spring, caused by the latter being fixed; and for rewinding, the cord D attached to the lock, when pulled, allows the spring to spend itself, and sets the automatic working of the reel in motion.

I claim the automatic motion in all belongings pertaining to the "Card Winder," as hereinbefore set forth.

Sydney, December 21st, 1881.

HENRY B. LIEBMANN.

This is the specification referred to in the annexed Letters of Registration granted to Henry Benjamin Liebmann, this 20th day of March, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

We have the honor to inform you that we have carefully considered Mr. Henry Benjamin Liebmann's application for Letters of Registration for an invention entitled "The Automatic Card Winder," No. 81-1,193, and we see no objection to Mr. Liebmann's petition being granted.

The Under Secretary of Justice.

We have, &c.,

Sydney, 2 February, 1883.
JAMES BARNET.
WILLIAM C. BENNETT.

[Drawings—one sheet.]



A.D. 1882, 28th March. No. 1052.

IMPROVEMENTS IN EVAPORATING AND BOILING APPARATUS.

LETTERS OF REGISTRATION to Norbert Rillieux, for Improvements in Evaporating and Boiling Apparatus employed in the manufacture of Sugar, and in the application of megasse as fuel.

[Registered on the 28th day of March, 1882, 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 NORBERT RILLIEUX, 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 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," 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 Norbert Rillieux, 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 Norbert Rillieux, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and until 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 Norbert Rillieux 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-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Evaporating and Boiling Apparatus.

SPECIFICATION of NORBERT RILLIEUX, of Paris, in the Republic of France, for an invention entitled "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."

This invention has reference to improvements in apparatus for evaporating *in vacuo* in boiling-pans, and in triple action apparatus, such as are used more particularly in the manufacture of sugar and other evaporating processes, the main object being to obtain a maximum useful effect from the said apparatus, which maximum has not been attained heretofore on account of the defective methods of arranging and constructing the various apparatus.

The various improvements whereby these defects have been overcome, and which, by their combined operation, tend to produce the maximum useful effect of the apparatus, will be readily understood on reference to the accompanying drawing, in which figure 1 shows a general elevation of the combined apparatus, while figures 2 to 8 show separate details thereof.

In multiple action apparatus direct steam is required, which is introduced into the recipient K for discharge steam, figure 1, from which the first evaporating pan is fed through the valve I'. If too much steam is introduced the action of the steam-engine is retarded or stopped. In order to prevent this, the recipient K is provided with an equilibrium valve, A (shown in enlarged detail at figure 2), which regulates the maximum quantity of steam that can be used. It prevents the difference between the pressure upon the one face of the piston of the engines and the counter pressure on the other side from sinking below a certain point. For this purpose the valve is arranged as follows:—The valve *a* has a stem, *b*, passing through a stuffing-box, and connected to a loaded lever, *c*; this lever cannot be raised until the pressure in the generators exceeds the limit adopted for the proper working of the apparatus. It works inside a loop, *d*, in the top of which is a screw, *f*, which is screwed down to such an extent as to allow of only a small amount of motion to the lever and its valve, so that by means of this screw the supply of steam is regulated. Instead of arranging this valve A to the left of the recipient K, as shown at fig. 1, it may be placed at I' on the pipe leading to the first evaporating pan, the first recipient being the steam generator of the entire apparatus, and being heated by the discharge steam of all the engines. I also connect therewith the discharge water from the coils of the boiling pan, as follows:—The steam coils being provided at their extremities with check-valves, B, are connected to a common collecting pipe, C, of which the other end, D, is connected to a branch pipe at bottom of the tubular part of the first evaporating pan. By this means the small excess of steam that escapes with the water from the coils is made to assist in heating the first pan, while the combined water of condensation from the coils and from the said pan pass off through another pipe, E E', provided with a check-valve, F, into the recipient, H, or reservoir for the feed-pump to the generators. When the boiling pan is employed without using the triple action, the passage of the condensing water and steam from the worms to the first pan is prevented by turning a three-way cock, G, into such a position that the steam worms of the boiling pan communicate directly with the reservoir H of the feed pump. This cock is arranged in the length of the collecting pipe CD, and allows this to communicate either with the bottom of the first pan or with the reservoir H. The water of condensation from the first pan, as also the water contained in the vessel K, also flows directly into the reservoir of the feed-pumps, through pipes in which are the check-valves F already mentioned, and the valve I on the pipe leading from the vessel K to the reservoir H. The several check-valves B to the worms of the boiling pan, as also those, F and I, of the first pan and recipient, have the extent of their opening regulated by a screw passing through the top of the valve chamber, so that they shall only allow the exact quantity of steam and water to pass that is necessary for the proper action of the apparatus. The boiling pan X, fig. 1, is also heated by the steam from the discharge steam recipient, K, which is conducted into it through the pipe L and distributing pipe P, the admission being regulated by a valve, O. From the distributing pipe P it is led into the one or the other of the three or four coils of the pan. Steam could however also be taken from the first evaporating pan. For this purpose, the distributor P has a branch provided with a valve at Q, connected to a pipe, R, leading to the branch connecting the first evaporating pan with its condensing column. The boiling pans with steam coils have only a small amount of heating surface in proportion to the saccharine charge contained therein.

In order to effect the boiling with double action with these boiling pans, a considerable pressure is required in the first pan, namely, from $\frac{1}{2}$ to $\frac{3}{4}$ atmosphere, and even more, according to the size of the coils. Under these conditions the vacuum is very small, or even nothing in the second pan. Experiment has shown that no deterioration of the sugar takes place at this temperature. The pressure is regulated by introducing into the feed vessel for the triple action a sufficient quantity of direct steam, such that it does not interfere with the action of the steam-engine. The pressure in this vessel may be one atmosphere or more. Up to the present time the operations have never been conducted under these conditions; the use of direct steam therefore has in this case quite a different object from that which ordinarily regulates its employment.

In order to maintain in the first pan the normal pressure, it is necessary in large pans to regulate the pressure by means of a special apparatus. For this purpose there is provided in the steam exhaust pipe of the first evaporating pan a throttle or other valve, *v*, which is automatically regulated so as to intercept the passage of the steam to the second pan, as long as the pressure is not equal to that which it is desired to maintain. For this purpose the axis of the throttle-valve *v* is provided with an external lever connected to a piston in a small cylinder, *t*, on one side of which the steam pressure in the first evaporating pan acts, while the other side is open to the atmosphere. The piston is loaded so that it only rises when the pressure in the first pan is equal to that desired to be maintained. Thus, when the pressure is low, the piston closes the throttle-valve, while, when the pressure rises so as to be equal to that desired to be maintained, the throttle-valve is full open, and at any intermediate pressure the valve is held in a corresponding intermediate position, thus maintaining the pressure approximately constant. The regulating apparatus may either be a cylinder and piston or plunger, or a flexible diaphragm, provided it be sensitive. For loading the piston lead discs may be used, which may be added or removed as may be required, or a lever with adjustable weight or other equivalent means may be employed.

Improvements in Evaporating and Boiling Apparatus.

If the boiling pan is heated by direct steam at high pressure, the discharge (condensed water and steam) is conveyed to the first evaporating pan. If steam from the expansion chamber be used, or the escape steam from the engines, the discharge from the boiling pan will be conveyed to the second evaporating pan; if steam from the first evaporating pan be used for boiling, the discharge passes to the third evaporating pan or to the condenser. A pipe passes for this purpose along the evaporating apparatus, and a branch provided with a valve or cock extends from this pipe to the tubular part of each pan.

In triple-action apparatus the first evaporating pan is, according to the present invention, provided with two small auxiliary pans, shown at *Z'* in the diagrammatic plan at fig. 8, one serving to evaporate the syrups that have been subjected to the osmose action, and the other for evaporating the saline liquors, both being connected to the same condensing column.

For drawing off the water of condensation from the second and third evaporating pans a double-acting pump is generally employed, each such suction valve of which is in communication with only one of the pans. In order to enable these pumps, which are generally too small for the work, to be employed with more effect, the following arrangement is according to the present invention employed:—The water of condensation from the second and third pans passes into a small receptacle, *J*, fig. 3, having two compartments; one of these, *a'*, which receives the water from the second pan, has a float, *b'*, actuating a throttle valve, *c'*, which opens or closes a communication between the first and the second compartment, *d'*, of which the latter receives the water from the third pan; while at bottom it is connected to the section *e'* of the exhaust pump. The first compartment, *a*, also communicates by a pipe, *a*, with the steam feeding pipe of the second pan, and the second compartment, *d*, communicates with the condenser by the pipe *B*, both communications being regulated by check valves, *f g*; the admission of water into the two compartments is also regulated by check valves *h i*. When the water level in the first compartment, *a'*, has sunk to a certain depth, the float closes the communication with the second one, and only opens it again when the water has accumulated to a certain extent. As the float is so arranged as not to allow the water level to uncover the communicating opening of the two compartments, no steam can pass from the one to the other, although a single pump is employed for drawing off the water from both pans. The back of the receptacle is removable, and can be made of glass, for inspection.

In order to obtain a maximum effect from the apparatus modified as above described, it is necessary to maintain a considerable vacuum in the last pan. As it is much more difficult to obtain an effective vacuum by condensation of the steam by means of a water jet in the above-described apparatus than it is to obtain this in the condenser of an ordinary steam-engine (probably on account of the pressure of a large quantity of air and other uncondensable gases in the steam in the former case, the condensation is, according to the present invention, effected by bringing the steam in contact with very extended surfaces, over which the water flows in thin films, thus obtaining a very extended contact of the steam with the particles of water. The steam from the safety chamber is, as usual, subjected to a water jet. In order to render the air pumps for the exhaust more effective, the water is removed from the bottom of the condensers *N N*, by separate pumps, *L*, fig. 1, so that the air-pumps in only pumping air or gas can work much more rapidly than in the present arrangement, where they have to pump both air and water. The pumps are, however, kept moistened, to prevent heating. The pumps that draw off the water from the condensers deliver it to the refrigerating apparatus. In this apparatus, instead of causing the water to trickle over layers of faggots, *P*, fig. 1, as at present, a series of vertical canvas screens, *R*, placed close together, are employed, which descend to a certain distance above the water level in a trough, *Q*, below; these are surrounded by walls of any suitable material, such as tarpauling, wood, bricks, &c., and a strong current of air is directed by a fan, as shown at figs. 6 and 7, into the bottom of the enclosure, so as to ascend in the narrow spaces between the canvas screens, while the water discharged by the before-mentioned pump *L* is made to flow down them in a very divided state, from perforated pipes or channels, *O*, above in the reverse direction to the air currents, whereby the water will be cooled several degrees below the atmosphere. The air currents may also be produced by forming a ventilating shaft, *S'*, extending some height above the screen, as indicated at fig. 7. The lower part of the apparatus would in that case be enclosed by movable doors or panels, which would be opened on that side whence the wind proceeds. The water descending from the refrigerator is collected in a tank, *T*, where the excess of air passes off from it, and whence it is then led by a pipe to the tops of the condensers. The canvas screens may conveniently be made out of old filter press cloths, sacks, &c., sewn together. The apparatus would not require to have the large dimensions of the faggot apparatus, and this may therefore be readily converted into the former.

According to another part of the invention, the "megasse" or "sugar-cane trash," instead of being dried in the open air, as heretofore, is delivered by travelling buckets, *A*, figs. 4 and 5, in a moist state, into a hopper, *T*, leading at bottom into a chamber communicating with the furnace, *F*, of the steam boiler employed for the before-described evaporating and boiling pans. In the hopper is a hinged horizontal flap, *P*, on to which the megasse falls, and which is kept in the horizontal position by a balance weight until the accumulated load upon it overbalances the weight, whereupon the megasse is discharged down into the chamber and passes thence to the furnace to be burnt as fuel, the flap being closed by its weight again, or any suitable arrangement of mechanism might be employed for periodically opening and closing the flap for the above purpose. While the megasse is retained in the hopper and descends in the chamber it is subjected to currents of hot gases from the furnace, so as to become dry before passing into the fire. The hot currents may be accelerated by connecting the hopper, by a pipe, *C*, with the chimney of the boiler, the draught being regulated by a throttle-valve, and, if required, a blowing-fan, *V*, may also be provided in such pipe for accelerating or regulating the draught, in which case the throttle-valve can be dispensed with, the speed of the fan being regulated to the exact degree to produce the required degree of desiccation of the megasse.

Although I have described the above improved apparatus as applied to the manufacture of sugar, yet it will be evident that it is also applicable to other manufactures where substances undergo the same evaporating and boiling processes to which sugar is subjected, such as saline solutions.

Having thus described the nature of this invention and in what manner the same is to be performed, I claim in respect to the above-described improved means for obtaining a more perfect and economical utilization of the steam, the vacuum, and the waters of condensation, in the evaporating pans of sugar-mills and analogous works:—

First—

Improvements in Evaporating and Boiling Apparatus.

- First—The use of an equilibrium valve, such as herein described with reference to figs. 1 and 2 of the drawings, either upon the supply pipe of the recipient for discharge or exhaust for regulating the supply of steam thereto, or upon the pipe leading from the said recipient to the first evaporating pan, substantially as herein described.
- Second—The herein-described arrangements whereby the boiling process with double action may be effected in pans with steam coils by means of the steam pressure of one-half or three-quarters of an atmosphere, or even greater, obtained in the first evaporating pan.
- Third—The heating of the boiling pan by means of the steam from the recipients of discharge or exhaust steam, or from the first evaporating pan, the steam pipes from both the said vessels being connected to the distributing pipe of the steam coils of the boiling pan.
- Fourth—The method of maintaining the pressure in the first evaporating pan, either automatically by means of a valve actuated by a pressure regulator or by means of a valve worked by hand, substantially as herein described.
- Fifth—The combined arrangement herein described for regulating the supply of discharge steam from the boiling pan, either to the first pan of the triple action apparatus when direct steam is used in the boiling pan, or to the second pan when discharge steam is used for heating, or to the third pan or to the condenser when the steam from the first evaporating pan is used for heating.
- Sixth—The use, in combination with the first evaporating pan, of two smaller pans, of which the discharge steam passes to one and the same column, and which serve respectively to evaporate the syrups from the osmose action and the saline solutions, substantially as herein described.
- Seventh—The use of the float discharge vessel herein described, with reference to fig. 3 of the drawings, for withdrawing the water of condensation from two vacuum chambers with different degrees of vacuum, and in particular from two consecutive evaporating pans.
- Eighth—The combined arrangement of pipes and apparatus herein described for obtaining a more perfect action of the triple action process, and a more perfect utilization of the steam in the factories.
- Ninth—The arrangement herein described with reference to figs. 4 and 5 of the drawings, whereby the drying of the megasse is effected by the furnace heat of the steam boilers in which it is to serve as fuel.

In witness whereof, I, the said Norbert Rillieux, have hereunto set my hand and seal, this tenth day of December, in the year of our Lord one thousand eight hundred and eighty-one.

NORBERT RILLIEUX.

Witness—

CHARLES WARDELOT,
of Paris, 3 rue de Valenciennes, Civil Engineer.

This is the specification referred to in the annexed Letters of Registration granted to Norbert Rillieux, this twenty-eighth day of March, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

In the matter of the application of Mr. Norbert Rillieux, of Paris, for Letters of Registration for an invention entitled "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," which has 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.

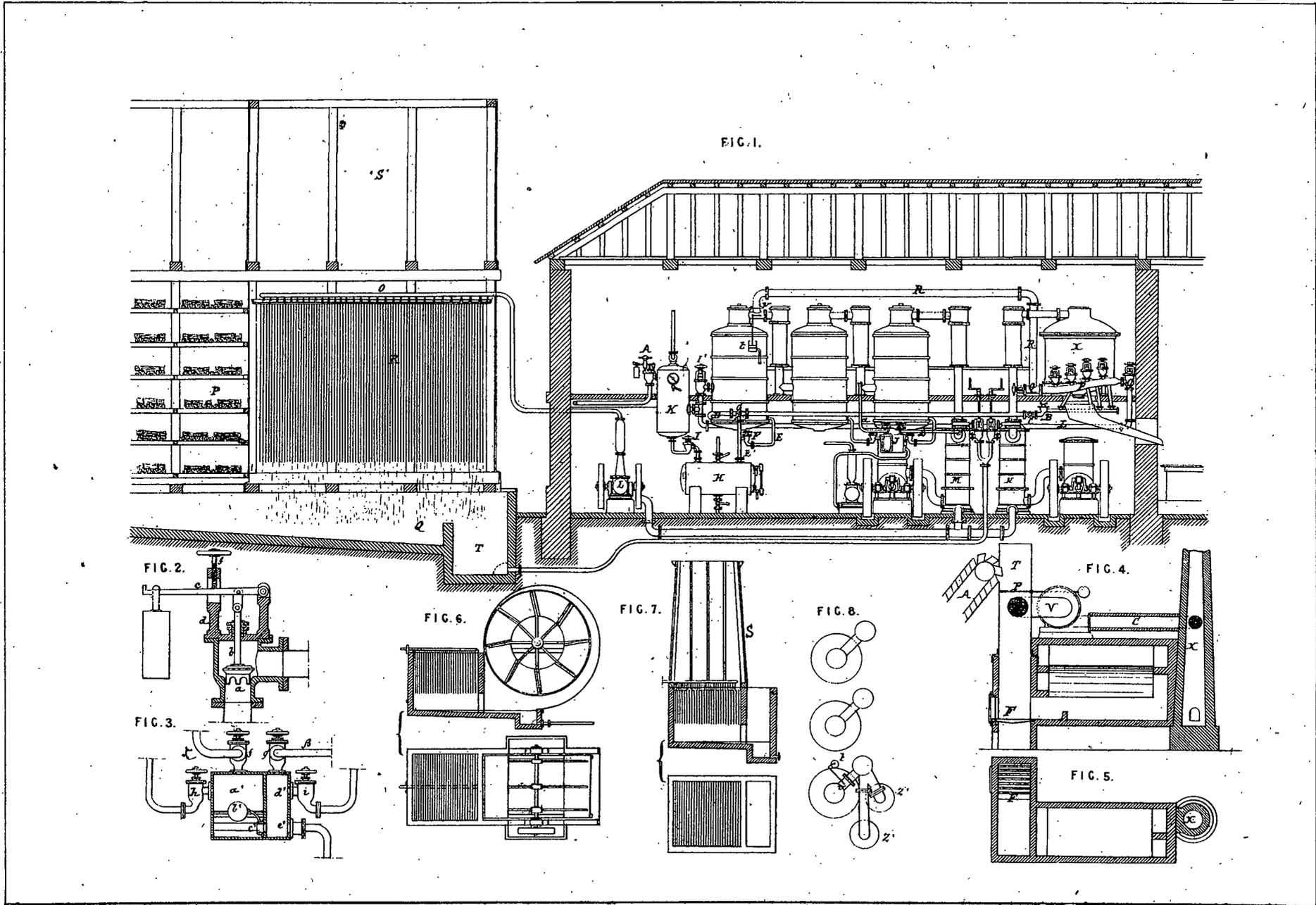
Sydney, 22 February, 1882.

We have, &c.,

A. LEIBIUS.
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 Norbert Billieux this twenty-eighth day of March, A.D. 1882. Augustus Loftus.
 (Sig. 32.)

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



A.D. 1882, 4th April. No. 1053.

IMPROVEMENT IN SHEEP-WASHES.

LETTERS OF REGISTRATION to James Ben Ali Haggin and William Irelan,
for an Improvement in Sheep-washes.

[Registered on the 5th day of April, 1882, 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 BEN ALI HAGGIN, attorney and counsellor at law, and WILLIAM IRELAN, Junior, mining engineer, both of San Francisco, in the county of San Francisco and State of California, 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 "Improvement in Sheep-washes," 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 James Ben Ali Haggin and William Irelan, 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 Ben Ali Haggin and William Irelan, 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 Ben Ali Haggin and William Irelan 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 April, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvement in Sheep-washes.

SPECIFICATION of JAMES BEN ALI HAGGIN, attorney and counsellor at law, and WILLIAM IRELAN, Junior, mining engineer, both of San Francisco, in the county of San Francisco and State of California, one of the United States of America, for "an invention for an Improvement in Sheep-washes."

OUR said invention relates to an improved sheep-wash, consisting of sulphur and lime combined with some saccharine matter, such as sugar, molasses, or other non-dyeing agent; the whole mixed with and boiled in a suitable quantity of water to reduce it to the desired consistence. The proportions of each of these ingredients will be varied according to the nature and character of the disease it is desired to cure.

For ordinary purposes a wash compounded according to the following formula will be sufficient; but we wish it distinctly understood, that we do not confine ourselves to the proportions given:—Sulphur, thirty-one pounds; lime, forty-one pounds; saccharine matter, four pounds; water one hundred gallons. The wash will cure scab and other parasitical diseases in sheep and other animals, and is also a valuable curative agent for all kinds of skin diseases.

We are aware that sulphuret of calcium, either alone or combined with other ingredients, has been used as a mange lotion, and we do not claim the use of such materials. We are not, however, aware that it has ever been contemplated to form a wash composed of sulphuret of calcium and saccharine matter.

It has been found in practice that the use of sulphuret of calcium is very injurious to the skin, causing it to crack and become sore. By the addition of the saccharine matter the cracking of the skin is entirely avoided and the utility of the sulphuret of calcium greatly enhanced, and it can be used much more generally and safely than when saccharine matter or its equivalent is omitted.

Having thus described our invention, what we claim and desire to secure by Letters Patent is,—a "sheep-wash" composed of sulphur, lime, and saccharine matter, boiled in a suitable quantity of water, substantially as specified.

In witness whereof, we, the said James Ben Ali Haggin and William Irelan, junior, have hereunto set our hands and seal, this fourteenth day of January, A.D. 1882.

JAMES BEN ALI HAGGIN.
WILLIAM IRELAN, JUNIOR.

Witnesses—

C. W. M. SMITH.
WILMER BRADFORD.

This is the specification referred to in the annexed Letters of Registration granted to James Ben Ali Haggin and William Irelan, this fourth day of April, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 24 February, 1882.

In the matter of the application of Messrs. James Ben Ali Haggin and William Irelan, junior, for Letters of Registration for an invention for an Improvement in Sheep-washes, which has 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.,

CHAS. WATT.
E. O. MORIARTY.

The Under Secretary of Justice.



A.D. 1882, 4th April. No. 1054.

IMPROVEMENTS IN AND RELATING TO ELECTRIC LIGHTING APPARATUS, &c.

LETTERS OF REGISTRATION to Hiram Stevens Maxim, for Improvements in and relating to Electric Lighting Apparatus, and the manufacture of carbonized material to form conductors for the same, and for other purposes.

[Registered on the 5th day of April, 1882, 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 HIRAM STEVENS MAXIM, of Brooklyn, 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 and relating to Electric Lighting Apparatus, and the manufacture of carbonized material to form conductors for the same, and for other purposes," 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 Hiram Stevens Maxim, 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 Hiram Stevens Maxim, 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 Hiram Stevens Maxim 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 April, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in and relating to Electric Lighting Apparatus, &c.

A

SPECIFICATION of HIRAM STEVENS MAXIM, of Brooklyn, New York, United States of America, for an invention entitled "Improvements in and relating to Electric Lighting Apparatus, and the manufacture of carbonized material to form conductors for the same, and for other purposes."

THE first part of my invention relates to electric lamps producing light by a voltaic arc between two carbon electrodes, and especially to the class of such lamps known as hanging lamps, in which the clock-work or other machinery for feeding the carbons is located in a case above the focus; and it consists in an improved method of regulating such feeding mechanism, and in an improved construction of the part of the lamp carrying the lower carbon and the globe.

In electric lamps as heretofore made the regulator has not been sufficiently sensitive, as it has required too great a change in the strength of the current to cause it to act, and this has been the cause of unsteadiness in the light. In order to obviate this difficulty, I have removed all friction from the regulating device by suspending the working parts upon springs, which at the same time support the upper carbon and its feeding mechanism free from contact with all other parts of the lamp, and serve as frictionless conductors of the current to the carbon-holder.

Lamps as heretofore constructed have also been subject to another difficulty. It is frequently necessary to remove the globe in order to perfectly adjust the carbons when they are first put in, and in such lamps no means have been hitherto provided for setting or removing the globe when the carbons are of full length and adjusted without disturbing their adjustment. To obviate this difficulty I make the side rods which carry the globe-holder telescopic.

This part of my invention is shown in figs. 1, 2, and 3 of the drawings, in which fig. 1 is a front elevation of a lamp constructed in accordance with this part of my invention, fig. 2 is a side elevation, and fig. 3 is partly an elevation and partly a central vertical section of the upper part of the same, showing the feeding mechanism and regulator. Fig. 3 is drawn to an enlarged scale, to show more clearly the construction of the parts.

A is the case containing the feeding mechanism and regulator; B is an axial magnet or coil, and C the iron core of the same; D is a brass extension of the magnet-core, screwed into its upper end and extending some distance above it.

This extension D carries the train of clockwork E, which is of the usual form used in such lamps, and the magnet core and its extension are suspended upon the springs T T¹ and I. F is a star-wheel mounted upon the most rapidly moving shaft, and carrying one or more fans; G is a stationary detent affixed to the case A; H is a controlling clamp or dash-pot, connected with the magnet core and its extension, to prevent the too rapid movement of the parts. The perpendicular spiral spring I is hung upon the two adjusting screws J and K. The nut of the screw K has a fan-shaped projection bearing loosely against the side of the case, to keep the spring from turning.

The screw K is attached to the case A, and the screw J is attached to a projecting arm S of the magnet-core, so that the spring I tends to support the core with its extension and connected mechanism, and the tension of the spring may be readily adjusted either from above or below; L is a combined hook and lever pivoted to the case A, and fitted to hook over the projection S, and thus hold up the parts connected therewith. The said hook is provided with a lever handle for convenience of manipulation, and has a spring R bearing upon it like the back spring of a knife, and so arranged that the lever has two positions of rest, that is to say, one when the hook is thrown forward and one when it is thrown back. N is the positive binding post, and O is the negative binding post. The positive wire is carried from the interior end of the post N to the coil of the magnet B, and passes thence to the case A, from which it is conveyed to the upper carbon holder. A metallic spring is attached to the core-extension and presses lightly upon the enclosed spindle, to ensure perfect electrical connection between the parts.

The binding post O is electrically connected with the lower carbon holder by the side rod *d* and the globe-holder X. P and Q are set screws to limit the vertical movement of the magnet-core and its connected parts. The flat horizontal springs T T¹ are attached at one end to the case A, and at the other to the projections S, S¹, affixed to the magnet-core and its extensions. The side rods *d d* are attached to the case A with a joint of insulating material, and support the globe-holder X. These rods are made hollow, and other rods rigidly attached to the globe-holder are inserted in them longitudinally. This construction is shown in fig. 1, where the rod *d* is represented partially in section; *c* is the interior rod, and *a* is a head attached to it to bear against an interior shoulder at the lower end of the tube *d* and prevent an entire separation of the parts. U U are short projections on the rods *d d*, bevelled on their lower sides, and V V are spring catches, which are hinged to the globe-holder, and which hook over the projections U U and hold the said globe-holder up.

The lower rod may be made the outside one if desired, and I do not consider the particular form or location of the fastening essential, although those shown are effective and convenient. The lower part of the upper carbon holder is made with a ball and socket joint, with part of the socket formed of a nut, M, so that the carbon may be readily adjusted as regards direction, and secured firmly in position by turning the nut. The upper carbon-holder is carried by a spindle, W, passing longitudinally through the magnet core and its extension. This spindle has a rack on one side, which engages with a small pinion of the train of clock-work on the shaft having the slowest movement, but otherwise is free to move longitudinally.

The operation of the said lamp is as follows, that is to say:—The magnet-core C and its extension D have a free vertical motion within the coil B, and are suspended upon the horizontal flat springs T T¹ and the spiral spring I, as above stated, and as the magnet core is located somewhat lower down than its coil, it constantly tends to rise when the coil is excited by a current of electricity. The spindle W is supported by the train of clock-work only, and its weight is so adjusted that it will descend slowly when the gearing is free to move. The tension of the supporting springs is so adjusted to the weight of the magnet-core and the parts which it carries that the train of gearing shall hang just low enough to clear the detent G when a current of ordinary strength is passing. The gearing then slowly turns and the spindle W descends, bringing the carbons together to supply the consumption at the focus. If

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If the points approach too closely to each other, the current increases in strength, the magnet-core is drawn in, the upper carbon is retracted, and the feeding mechanism is arrested by the detent G. If, on the other hand, the points become too widely separated the current is weakened, the magnet coil loses its power, and the core descends and advances the upper carbon; at the same time the gearing is released from the detent and the feeding process proceeds.

The apparatus may be adjusted with very great nicety by means of the adjusting screws J and K and the spring I, and as the moving parts are freely suspended and nicely balanced upon the supporting springs a very slight change in the current passing through the coil is sufficient to bring the gearing into contact with the detent or to release it.

Whenever it is desired to stop the light, the hook I is sprung over the arm S, and the feeding mechanism is by one operation retracted and locked.

Whenever it is necessary to renew the carbons, the spindle W is pushed up (a ratchet in the gearing allowing it to move upwards freely) and the globe is removed. When the new carbons are adjusted to position, the globe-holder is depressed by pressing down the catches V V and drawing out the telescopic side rods, the globe is replaced over the lower carbon, and the globe-holder returned to its former position without disturbing the adjustment of the carbons. It is evident that the construction of the different parts may be considerably varied without essential change in the apparatus. Instead of the magnet B, with the movable core, one or more electro-magnets with fixed cores and movable armatures may be used, and the spring I may be dispensed with, by applying a tension adjuster to one or both of the other springs. Other forms of feeding devices than a rack and train of gearing may be adapted, to be stopped and started by a slight vertical movement of their supports, for the purpose of this invention.

My next improvement relates to the class of electric lamps known as incandescent lamps, in which light is produced by the incandescence of a continuous strip or conductor forming a part of the electrical circuit.

It has been found necessary in practice to protect the conductor or incandescent portion of such lamps from any access of oxygen, as all materials heretofore used for this part of the lamp rapidly deteriorate at a high temperature, with even a very small amount of free oxygen present. Lamps of this class have usually been constructed with a sealed glass globe enclosing the incandescent conductor, and various means have been used for excluding or removing atmospheric oxygen from the globe, such as displacing the air with an atmosphere of nitrogen and pumping out the air with an air-pump. Such methods of removing oxygen from the globe have, however, proved ineffectual for completely protecting the conductor of the lamp. The presence of the nitrogen in the globe is objectionable, as the currents of convection set up in it injure the conductor by "air washing" it and carry away its heat, while it is extremely difficult, if not impossible, in practice to produce a sufficiently perfect vacuum in such a globe by means of an air-pump alone to prevent some small quantity of free oxygen from coming into contact with the highly heated conductor.

Another difficulty in the use of such lamps has arisen from the liability of the globe to leak at the places where the electrical connections pass through it, by reason either of defective sealing or of fractures caused by unequal expansion and contraction of the glass and the metallic connection. Such leaks are fatal to the lamp, however perfectly the air may have been removed from the globe when the lamp was made.

Another difficulty has arisen from the liability of the incandescent conductor to work loose from its supports. Such conductors are preferably made of carbon, and the supports, forming at the same time the electrical connections, are usually made of platinum, with clamps securing the connections to the conductor.

Carbon proper for such conductors is quite hard, and the surface of such material is not perfectly smooth. Where the carbon is prepared by carbonizing card-board or other fibrous material, the surface when examined under a microscope appears to be made up of a succession of points, corresponding with the ends of the fibres of the material used. As the platinum is also quite hard, the contact between the carbon and platinum where they are clamped together consists of a series of points of carbon bearing upon the surface of the platinum, and pressure sufficient to press these points into the metal, so as to bring the two surfaces into perfect contact, cannot be applied, as it would crush the carbon.

When a sufficiently strong current is passed through the lamp to heat the carbon conductor to incandescence, some of the points of carbon bearing upon the platinum are liable to become so highly heated as to fuse a minute portion of the metal immediately in contact with them, and in this case a small voltaic arc is established which soon destroys the connection.

It is one object of the present improvements to remedy these difficulties, and also to provide a convenient and effective device for opening and closing the circuit of the lamp.

This part of the invention is shown in figs. 4 to 9 of the drawings. Fig. 4 is a vertical section of a lamp constructed in accordance with the said improvements; fig. 5 is a side elevation, and fig. 6 is a horizontal section of the base of the same; figs. 7, 8, and 9 are views of the conductor, and its connections on an enlarged scale, to show the method of clamping the carbon to the platinum.

A² is a globe made entirely of glass, enclosing the incandescent part of the lamp; B² is an incandescent conductor of carbon, of any convenient form, but preferably arranged entirely above its supports as shown. This conductor should be made of high or low resistance, according to whether a large machine of high electro-motive force is used to operate many lamps, or a small machine is used to operate few lamps. I prefer to construct the said conductor of carbon made by the process hereinafter described, but any sufficiently dense and tough carbon may be used.

C² C² are platinum supports clamped to the lower ends of the carbon conductor. They serve also for conductors of the current to the carbon, and pass through the globe at D² D², where tubes of glass constructed in one piece with the globe are drawn up and sealed to the platinum connections. These tubes are made tapering, so as to leave capillary spaces, s s, between the platinum wires and the glass below the points of sealing.

The construction of the clamps connecting the carbon to its supports is best shown in figs. 7, 8, and 9. Fig. 7 is a front view of the carbon and clamps; fig. 8 is a side view of one of the said clamps, and fig. 9 is a view of the several parts detached from each other. The lower ends of the carbon conductor are enlarged, as shown in fig. 7, for the purpose of decreasing its resistance, and so preventing it from becoming as highly heated

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as the upper parts. These enlarged ends are flattened, for convenience of attachment, and for the purpose of providing large surfaces of contact with the adjacent parts. The upper ends of the supports C^2 C^3 are also enlarged and flattened.

For convenience of construction I make the upper part of each support in a separate piece, shaped like a washer, with a hole or socket in its edge to receive the supporting rod or wire, which is secured in the hole by gold solder or in any other suitable manner. This construction of the upper part of the support is best shown at l in fig. 9; k is a washer of platinum, and m m are washers of soft carbon.

The carbon washers I prefer to make of blotting-paper or similar material carbonized by the process hereinafter described, but such carbon may be prepared in other ways, and I do not wish to be limited to carbon prepared according to my improved process. The parts are put together in the order shown in fig. 8, with one of the soft carbon washers m upon each side of and in contact with the flattened end of the conductor. The whole is held in place by the platinum screw o , passing through all of the parts, and the nut t , which is screwed up as tightly as practicable without injury to the said parts. The soft carbon washers, yielding to the pressure, fit into all the inequalities of the opposing surfaces and form a durable packing between the conductor and the platinum supports, thus ensuring perfect electrical connection between the conductor and the said supports. E^2 is the base of the lamp, constructed of metal or any other suitable material; F^2 represents plaster of Paris for cementing the globe to the base; G^2 represents shellac or copal melted and poured into the base when inverted, so as to cover the entire lower end of the globe and fill up the tubes s s about or around the connections; H^2 is a sub-base, constructed of vulcanite or other insulating material, with a metallic core, I^2 . The said sub-base screws on to a nipple on the under side of the base, and has a socket, J^2 , for attaching it to an ordinary gas fixture.

The connection C^2 is carried down and joined to the metallic base, but the connection C^3 terminates in a metallic plug, K^2 , carried slightly beyond the lower surface of the base, but entirely insulated from it.

R^2 is a ring of metal inserted in the vulcanite part of the sub-base, and flush with its upper face, directly under the end of the plug K^2 , so that when the base is screwed down the plug will form a contact with the ring.

The connection C^3 is continued outside of the sub-base by the wire S^2 , which is joined to the ring R^2 , while the connection C^2 is continued through the gas-fixture and pipe. The carbon conductor B^2 is mounted upon the supports C^2 C^3 , as above stated, and the supports are sealed into the globe at D^2 D^2 before the air is removed. The air is then exhausted as perfectly as may conveniently be done, by means of a proper air-pump, through an opening (not shown in the drawings) in the bottom of the globe, and an atmosphere of hydro-carbon vapour or gas, preferably vapour of gasoline, is then admitted to the globe. After this atmosphere has become mixed with the residuum of air left in the globe it is in turn exhausted, thus leaving in the globe a highly attenuated or rarefied atmosphere of hydro-carbon vapour or gas mixed with an infinitesimal trace of air. Another atmosphere of hydro-carbon vapour or gas may then be admitted to the globe and exhausted, and the operation may be repeated as many times as desirable. I find that admitting the hydro-carbon and exhausting it once or twice is usually sufficient, and after exhausting the gas or vapour as perfectly as possible the last time, the globe is hermetically sealed. The base is then cemented to the globe and melted shellac and copal or other resinous gum free from oxygen is melted and poured into the base when inverted, to fill the capillary spaces s s and cover the lower end of the globe where the connections emerge from it.

The base is then attached to its sub-base and the whole is mounted upon an ordinary gas fixture. One connection from the generator of electricity is joined to the gas-pipe and the other to the wire S^2 , and the lamp is ready for use.

The operation of this lamp is as follows:—The base is screwed down upon the sub-base by turning the lamp, and the plug K^2 is brought into contact with the ring R^2 , thus completing the electrical circuit of the lamp, and a current of electricity passes through the carbon B^2 , heating it to incandescence. Nearly if not quite all of the carbon in the slight residuum of hydro-carbon vapour remaining in the globe is precipitated upon the incandescent conductor at its hottest points, and an almost absolute vacuum is established in the globe. If there should be any trace of oxygen remaining in the globe, it would unite with the carbon of the vapour or gas instead of attacking the carbon of the conductor. As the hottest points of the conductor are its weakest points, the slight deposit of carbon tends to correct any unevenness of the conductor, by building it up at its weak points. A much more perfect vacuum can be produced in this manner than by the use of the air-pump alone, and as only a very small percentage of the residuum finally remaining in the globe is air, atmospheric oxygen is very much more effectively removed from the globe than by simply exhausting the air, as in the usual method.

If there is any imperfection in the sealing of the globe about the connections, or if any slight cracks are made in the base of the globe by the unequal expansion and contraction of the parts, all leakage of air into the globe is effectually prevented by the gum or wax G^2 ; and even if heat enough is generated in the connections to melt the gum, the part of the gum in the tubes s s will be prevented by capillary attraction from dropping out, and the sealing of the connections will remain perfect.

Another part of my improvements consists in a process of manufacturing carbon conductors for electric lamps producing light by the incandescence of a continuous strip or conductor.

A variety of different carbonaceous substances may be carbonized by my improved process, such as wood, the inner bark of trees, card-board, paper and silk, cotton or linen fabrics. The material used is cut or bent into pieces of the shape desired for the conductor of the lamp, but somewhat larger in each dimension, to allow for shrinkage, and is then charred in a suitable retort, while a current of hydro-carbon vapour or gas is flowing through the retort and enveloping the material.

I have shown in the drawings an apparatus suitable for making carbon conductors according to this process, but I do not wish to be confined to the particular apparatus shown, as the process may be performed with equal facility with other forms of apparatus.

This part of the improvements is illustrated in figs. 10, 11, and 12. Fig. 10 is a longitudinal vertical section of the said apparatus, and fig. 11 is a plan or top view of the same; fig. 12 shows a carbon conductor as it appears before and after carbonization.

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A³ is a carbonizer or retort for holding the material to be charred; B³ is a carburetter containing gasoline or other volatile hydro-carbon oil; a¹ is a pipe leading from the carburetter to the carbonizer, and b¹ is a gas-supply pipe; C⁴ is a sheet of metal placed in the carbonizer, and supported a short distance above the bottom of it by short posts, c¹ c¹.

A sheet of tissue paper is placed upon the plate C⁴, and a layer of the forms of material is placed upon this sheet, enclosed between pieces of cardboard, and another sheet of tissue paper is spread over the layer thus formed. Other sheets of metal and layers of material are added until the carbonizer is full, and the whole is then covered with sand.

The sheets of metal are made somewhat smaller than the inside of the carbonizer, so as to leave a space for the escape of the gas, and this space is covered with cotton batting or the like, to prevent the sand from sifting down into it.

The carbonizer thus filled is placed over a gas-flame or upon a stove, and heated to a temperature sufficiently high to expel the aqueous vapour contained in the pores of the material, but not sufficiently high to char the material to any considerable extent, and the carburetted gas is admitted to the carbonizer through the pipe a¹ and ignited, where it escapes through the sand at the top. After the material has been subjected to this heating for a considerable time, say ten or twelve hours, the carbonizer is placed in a muffle furnace and raised to a white heat and kept there until all the material is thoroughly charred, the gas being all the time supplied to the carbonizer through the pipe a¹ and circulating about the forms so as to envelop them on all sides. Ordinary coal gas may be used for this purpose, but unless it is rich in carbon it should be carburetted with gasoline or some other volatile hydro-carbon oil, and I prefer to carburet it in all cases. The carburetter B³ is of convenient form for this purpose, the pipe b¹ for supplying coal gas opening below the surface of the oil.

The function of the gas during the first part of the process is to all appearance to permeate the pores of the material and drive out the aqueous vapour and air contained in them so far as possible; and its function during the latter or charring part of the process seems to be to protect and consolidate the carbon of the material. When the hydrogen and other constituents are disassociated from the carbon of the material by the heat of the furnace, the surrounding hydro-carbon vapour or gas is also apparently decomposed, and some part of the carbon thus liberated; especially that which is contained in the pores of the material is apparently deposited upon the carbon of the forms, and serves to consolidate it. The hydrogen when liberated does not corrode the carbon of the forms, but if it has any tendency to again take up carbon, probably unites with some part of the free carbon liberated from the gas or vapour.

In this manner nearly if not quite all of the carbon of the carbonized material is preserved, and, as carbon liberated from a gas or vapour at high temperature has a tendency to deposit upon any solid carbon present, the carbons of the forms may apparently be built up to a considerable extent by maintaining the white heat for a sufficiently long period and keeping up the supply of gas. I prefer however to remove the carbonizer from the furnace soon after the forms have become thoroughly carbonized, and before any considerable amount of carbon from the gas has been deposited upon them. I find that two or three hours is usually sufficient for this purpose, and the carbonizer is then removed from the furnace and allowed to cool. The current of gas is kept passing through the carbonizer until it is so far cooled that it will not ignite dry sawdust; I thus prevent access of air to the forms while they are hot.

I find that carbon made by this process is more dense and tough than any made by other processes, and the forms shrink less than when carbonized in the usual way. The essential feature of the process is the enveloping of the forms in an atmosphere or current of hydro-carbon gas or vapour during the carbonizing, and the preliminary heating and the subsequent passage of the gas through the carbonizer are not essential, although I find that better results are secured by so conducting the process.

I have considered the process above described as especially applicable to making conductors for electric lamps, but it may obviously be used to make carbon for other purposes where a similar quantity of carbon is desired, and I do not wish to be limited to any particular application of the process.

Having thus fully described the said improvements and the manner of performing the same, I wish it understood that I am aware that trains of gearing in connection with detents of various forms operated by electro-magnets placed in the circuit have heretofore been used in voltaic-arc lamps, for feeding the upper carbon to the focus and regulating its movement, and I do not claim such combination of parts irrespective of the particular devices described. I am also aware that a glass globe sealed about the electrical connections has been used to enclose the conductors of incandescent lamps, and that a more or less perfect vacuum has been produced in such globes by means of an air-pump, and I do not claim such surrounding globe or a vacuum so produced therein.

I am further aware that carbon conductors for such lamps have heretofore been made by carbonizing wood, paper, pith of trees, and other carbonaceous substances, at a high temperature, and I do not claim carbonizing such materials independently of the particular process described, but I claim, with respect to the improvements above described—

First—The combination in an electric lamp of a carbon-feeding device, consisting of a racked spindle and a train of gearing, with a regulating device consisting of a stationary detent and an axial magnet, and a movable core having an extension carrying the said feeding device, the said core and its extension being suspended on springs, all substantially as and for the purpose specified.

Second—The combination in an electric lamp of a gravitating carbon-carrier supporting the upper carbon and the device for regulating the movement of the same, with a support for the said carbon-carrier and regulating device suspended upon springs, and adapted to be raised and lowered by variations of strength in the current, substantially as set forth.

Third—The combination in an electric lamp of the magnet, the core, and the train of gearing mounted upon the core extension with the springs T T¹ and I, the spring I having one or more adjusting screws to regulate its tension, substantially as and for the purposes set forth.

Fourth—The combination in an electric lamp of the magnet with the movable core C, and the springs T T¹ suspending the said core free from frictional contact with the stationary part of the lamp, substantially as and for the purposes specified.

Fifth—

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- Fifth—The combination in an electric lamp of a swinging armature bearing a gear-train and escapement actuated by the gravitating carbon-carrier, with an electro-magnet in the light-generating circuit, substantially as and for the purpose specified.
- Sixth—The combination in an electric lamp of a swinging armature bearing a gear-train for feeding the carbons, and an escapement actuated by the gravitating carbon-carrier, with a fixed detent for arresting the gear-train when the armature is raised, substantially as herein described.
- Seventh—The combination in an electric lamp of a movable magnet-core, hung on springs, and carrying the carbon-feeding and regulating devices, with the hook L for locking the same, substantially as and for the purposes set forth.
- Eighth—The combination in an electric lamp of a globe-holder, with telescopic supporting rods or arms, and catches or other suitable fastenings for holding the same in place, substantially as and for the purposes set forth.
- Ninth—In an electric lamp having a continuous incandescent conductor, the employment of a highly attenuated atmosphere of hydro-carbon vapour or gas surrounding such conductor and enclosed in a sealed glass globe, substantially as and for the purposes specified.
- Tenth—The production and utilization of a vacuum or highly attenuated atmosphere of hydro-carbon vapour in the globe of an electric lamp having a continuous incandescent conductor, and a sealed glass globe enclosing the same.
- Eleventh—The combination of the globe with the platinum connections, and the capillary spaces filled with gum or wax, substantially as and for the purpose specified.
- Twelfth—The combination of the base carrying the plug with the sub-base and the ring, substantially as and for the purpose specified.
- Thirteenth—The combination in an electric lamp of a continuous carbon conductor, metallic electrical connections for the same, and one or more washers of soft carbon interposed between the said conductor and each metallic connection, substantially as described.
- Fourteenth—The combination in an electric lamp of the carbon conductor, the support having the flattened end, the washers *m m* and *k*, the pin *o*, and the nut *t*, substantially as and for the purpose specified.
- Fifteenth—The process of carbonizing carbonaceous substances and of making carbon conductors for electric lamps, by exposing the same to a high temperature in the presence of hydro-carbon gas or vapour, substantially as above described.

The second portion of this invention relates to improvements in that class of lamps known as incandescent lamps, in which light is produced by the incandescence of a continuous strip or conductor of low conductivity, forming a part of the electrical circuit of the lamp.

It has been found that carbon is the best material of which to construct the light-giving or incandescent part of such lamps, on account both of its high resistance and of its infusibility; but as carbon readily oxidizes at high temperatures, it is essential that it should be protected while highly heated from all access of oxygen. For this purpose the carbon conductor has usually been enclosed in a glass globe, from which the air has been more or less perfectly exhausted or excluded, and various means have been devised for making perfectly tight joints about the conducting wires, such as stoppers of wood or other material sealed with gum or wax, mercurial seals, and fusing the glass of the globe directly upon conducting wires of platinum. Where the glass is sealed directly to the conducting wires the carbon conductor must necessarily be made of quite high resistance, as only small conducting wires can be used in lamps so constructed, on account of the liability of the glass to crack if sealed to wires of any considerable size. Other constructions have not provided so secure a joint, and none of the constructions heretofore used have provided a perfectly secure joint about the conducting wires so as to prevent all leakage of air into the globe, and at the same time admit of the ready and convenient removal and replacement of the carbon conductor.

Perfectly secure joints are essential to the efficiency of the lamp, and it is desirable under some circumstances to use a conductor of low resistance, while it is also desirable that means should be provided for the convenient replacement of the carbon. Even under the most favourable circumstances the efficiency of the carbon conductor is of limited duration; and as its cost is a very small fraction of that of the whole lamp, it is obvious that suitable means should be provided for readily replacing it when it is worn out or destroyed.

It is the object of this portion of the said invention to so construct the globe and the other parts of the lamp that a conductor of any desired resistance may be used, and that the lamp may be readily taken apart for the insertion of a new carbon, while all the joints are perfectly tight and secure against any influx of air when the globe is closed.

Referring to the drawings,—fig. 13 is a central vertical section of my improved lamp, with several transverse sections of the same taken at different points; fig. 14 is a detached view of the carbon conductor, showing one of the lamps; fig. 15 is a sectional view of a valve to be applied to the exhausting tube of the globe of the said lamp; fig. 16 is a side elevation of a modified form of the said lamp; fig. 17 is a central vertical section of the same, with transverse sections taken at different points; fig. 18 is a plan or top view of the same; and fig. 19 is a transverse section taken on the line *x x*, fig. 17. Similar letters of reference indicate corresponding parts throughout these figures.

A is the carbon conductor or light-giving part of the lamp. It is enclosed in the (preferably transparent) glass globe B, and clamped to the conducting wires C C'. The globe has a neck, D, which is made wide enough to permit of the free passage of the carbon and its connections through it. E is a hollow glass stopper ground into the mouth of the neck of the globe, so as to form as perfect a joint as possible with it. At F is an opening for exhausting the air from the globe. The inner end of the said stopper E is constructed with two tubular extensions, G G', which are sealed directly to the conducting wires, but when it is desired

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desired to make the incandescent or light-giving part of the lamp of low resistance, each of the conducting wires is divided into a greater or less number of branches where it passes through the glass. This is best shown in fig. 13, where C C' are the main parts of the conducting wires, and c c are the branches sealed into the glass. These branches are all securely joined above and below to the main parts of their conductors. I prefer to make the branches of platinum and the main parts of the conductors of copper. By means of this device I am enabled to use a current of much greater quantity, without danger of fracturing the glass about the connections, than has heretofore been practicable to use in lamps having the globe sealed to the conducting wires. It is well known that only very small conducting wires can be used when the glass is sealed directly to them, on account of the liability of the glass to crack from the unequal expansion and contraction of the parts; and as platinum is the metal which has been found most available for conducting wires when sealed in this manner, and its conductivity is comparatively low, it has been found necessary to make the conductor of very high resistance, and to use a current of small quantity and high potential in such lamps as they have been heretofore constructed.

Lamps of high resistance cannot well be used in any considerable number in series, on account of the immense electro-motive force required for passing a current through their combined resistances, and it is one of the objects of my improvements to provide an incandescent lamp adapted to be used in series and capable of giving a large amount of light.

By means of the device which I have described above, I am enabled to decrease the resistance of the carbon conductor and increase the quantity of the current, by increasing the number of the branches into which the conducting wires are divided where they pass through the glass. Any number of branches may be used without increasing the danger of fracturing the glass, provided the size of each branch is made sufficiently small. The clamps H H', by which the carbon is joined to the conducting wires, are made preferably of platinum, and the carbon is made broader and thicker at the points of attachment, to prevent danger of fusing the clamps. J is a cross-piece of glass or other insulating material, clamped to the conducting wires, to hold them in position.

In order to prevent any possibility of leakage of air into the globe about the stopper or the conducting wires, the neck of the said globe above the stopper, and also the stopper itself, are filled with wax or gum copal melted and poured in, as shown at L L' in fig. 13. This forms a supplemental seal, and if there should be any slight imperfections in the joints about the stopper all air will be effectually excluded, and the wax or gum will keep in its place, even if it is melted by the heat of the globe.

The stopper, with the conducting wires and the carbon, being placed in position, as shown in fig. 13, the air is carefully exhausted from the globe as perfectly as practicable, through the opening F, by means of a mercury air-pump or other suitable means, and the opening F is then hermetically sealed.

Instead of leaving a vacuum in the globe, a rarefied atmosphere of hydro-carbon vapour or gas may be introduced after the air is removed and before the globe is sealed.

It is evident that the pressure of the air will keep the stopper securely seated, and as the globe and the stopper are of the same material they expand and contract equally upon heating and cooling, and the joint between them remains tight. If there should be any inequality of expansion and contraction, the tapering form of the stopper and the pressure of the outside air would keep the joint closed. When it is desired to renew the carbon, the tip of F is broken off, the stopper E is drawn out, and a new carbon is secured to the clamps; the stopper is then replaced, and the air is exhausted and the globe sealed as before.

Instead of hermetically sealing the opening F, the device shown in fig. 15 may be used, in which a glass cap, M, is fitted to the end of a tube with a ground joint. The said cap has a tubular branch, N, on its side, for attachment to the air-pump, and the opening in this branch N, corresponds with an opening, O, in the side of F, so that as the cap is turned around it acts as a faucet or valve. To make the joints entirely secure, the opening in the branch N and the space in the cap above the joint may be filled with gum or wax in the same manner as the spaces above the stopper.

This improved lamp is especially adapted to be worked in series, as the resistance of the carbon may be made as low as desired, and the lamp may be made of sufficient size to give as much light as an ordinary voltaic arc lamp. The same construction may however be used for lamps of high resistance adapted to be worked in multiple arc. In figs. 16, 17, 18, and 19 I have shown my improvements as applied to such a lamp. The conductor A is in this case made longer and of less diameter, so as to interpose a much greater resistance, and as a current of high-electro-motive force is used the division of the conducting wires into branches is not essential. The stopper has a rim or lip, e, turned up about the edge of the neck of the globe, and the neck is joined to this lip by means of a ground joint. The lip flares out slightly above the joint, so as to form a trough for the reception of gum or other sealing material, and is recurved, as shown, so that the material used will not run out when the lamp is inverted. This latter formation of the parts about the base is especially adapted to lamps in which the globe stands above the neck, and the former construction to lamps in which the globe is suspended. The position of the lamp is not material.

In the form of lamp shown in figs. 16 and 17 the cap or valve M is made in the form of a stopper, as shown, and the form of the parts is somewhat changed, but their operation is substantially the same as that above described.

It is obvious that the stopper E may be made in whole or in part of other material than glass, provided the co-efficient of expansion of such material is approximately the same as that of the glass of the globe. It is essential however that the part of the stopper adjacent to the conducting wires should be made of metal which will form a tight joint with the metal of such conductors.

It is obvious also that the division of the conducting wires into branches is applicable to globes constructed in a single piece, as the advantages of such division are not dependent upon the particular form or construction of the globe above described.

I claim, with reference to this second portion of my invention—

First—In an electric lamp, the combination of a transparent globe enclosing the light-giving part of the lamp in a vacuum, with a stopper fitted to the mouth of the said globe with a ground joint, and carrying the conducting wires sealed directly into the material of which the said stopper is composed.

Second—

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Second—In an electric lamp, a transparent globe enclosing the light-giving part of the lamp in a vacuum, in combination with a stopper fitted to the mouth of the said globe with a ground joint, and with gum or wax applied as a supplemental seal outside of and above the said joint, substantially as above described and for the purposes specified.

Third—In an electric lamp, a globe enclosing the light-giving part of the lamp in a vacuum, in combination with a tapering stopper fitted to the mouth of the said globe with a ground joint, conducting wires sealed into the material of the said stopper, and a supplemental seal applied outside of and above the said joint, substantially as above described and for the purposes specified.

Fourth—In an electric lamp, a continuous incandescent conductor enclosed in a transparent vacuum globe, in combination with conducting wires leading to the said conductor, each of which is divided into two or more branches where it passes into the said globe, substantially as above described and for the purpose specified.

Fifth—In an electric lamp, a transparent vacuum globe enclosing the light-giving part of the lamp, in combination with an exhausting tube and a valve fitted with ground joints, and a supplemental seal applied outside of and above such joints, substantially as above described and for the purpose specified.

The third portion of this invention relates to improvements in electric lamps or lighting apparatus, and is carried into practice as hereafter described, and as illustrated in figs. 20 to 25 of the drawings, in which fig. 20 is a side elevation of a lamp constructed in accordance with my improvements, fig. 21 is a vertical section of part of the same taken near the centre and drawn to an enlarged scale, and figs. 22, 23, 24, and 25 are enlarged views of detached parts. Similar letters of reference indicate like parts in each of these figures.

A is a case, made of wood or other non-conducting material, containing the mechanism for regulating the feedings of the carbons; B is a glass cylinder or enclosing device surrounding the focus, and hereinafter referred to as the globe; C is a thin flat bar of metal supporting the globe. This bar is so arranged as to move freely up and down in slots cut in the arms *a a* attached to the case A, and is supported at any desired position by the dog *c* engaging with teeth in its edge. D is the upper carbon-carrier, and E is the lower carbon-carrier. The construction of the clamp holding the lower carbon is best shown in fig. 25.

The two sides *d d'* are made in separate pieces, and are held together by the screw *b*; at one end they embrace the head of a horizontal pin, *g*, attached to the lower carbon-carrier, and at the other end bear two semi-cylindrical jaws, *e*, of suitable size, to hold the lower end of the carbon. The carbon and clamp may be adjusted to any desired position, and fixed by turning the screw *b*. F is a bar rigidly attached to the case A; G is a flat bar supporting the lower carbon-carrier; H is a link pivoted to the bar F and also to the bar G; the form of the links is best shown in figs. 22 and 23; I is a flexible flat strip of metal, attached at one end to the case A and at the other end to the bar G; J is a lever which I term an armature lever, pivoted to the case A at *h* and to the bar G at *j*, by means of the connecting rod K; L is an axial magnet placed in the lamp-circuit, and M is its core. The upper end of the core passes through and is firmly attached to the head of an inverted cylindrical box, *q*, which fits over the upper head of the helix, and acts as a dash-pot or controlling chamber for preventing sudden movements of the regulating mechanism. The end of the lever J works in a recess *k* in the side of the core M; N is an adjusting screw for limiting the downward movement of the core M; O is a train of gearing working in a rack, P, on the side of the upper carbon-carrier, and controlling its downward movement. A detent, *m*, upon the lever J is so arranged as to come into contact with a star-wheel upon the most rapidly moving shaft of the gearing when the lever is depressed; Q is a rod passing through the lower carbon-carrier, and suspended from the case A by means of the spring R. S is an adjusting nut for regulating the tension of the spring R; T is a rod attached to the bar G by means of the brackets *t t'*, through which it has a free movement longitudinally; V is a spiral spring attached to the rod T and bearing against the bracket *t'*; the rod T has a shoulder, *x*, so arranged as to bear against the case A when it is thrust up by the spring V, and at its lower end passes through the lower carbon-carrier and terminates in a forked head, W, so arranged that it may be made to straddle the carbon-carrier, as shown in fig. 24, or when turned a quarter of a revolution to stand upon its lower surface. In the former position the shoulder *x* bears against the lower surface of the case, and in the latter it is drawn down away from it.

The lamp is suspended by means of the tubular support Y, enclosing the upper carbon-carrier, and the current is admitted to the upper carbon-carrier through a binding post, not shown in the drawings, electrically connected with the spring X and to the lower carbon-carrier, through the binding post L and spring I.

The operation of this lamp is as follows, that is to say:—The forked head W is drawn down and turned around until its legs stand upon the lower surface of the carbon-carrier E, when the spring R raises the bar G and lever J, until the detent *m* is raised from the escapement wheel of the gearing O. The upper carbon-carrier descends by its own weight until the points of the carbons come into contact, when the circuit is completed, and a strong current passing excites the coil L and draws down its core M, at the same time depressing the lower carbon and arresting the descent of the upper carbon. When the arc becomes long the coil L becomes too weak to overcome the tension of the spring R, and the lower carbon is gradually raised and the detent *m* is withdrawn, allowing the upper carbon to descend until the equilibrium is again restored. The length of the arc may be regulated by adjusting the tension of the spring R, and the lamp may be stopped at any time by turning the head W until it straddles the lower carbon-carrier E, when the spring V, obtaining a bearing point against the case A at the shoulder *x*, overcomes the tension of the spring R and keeps the lower carbon depressed.

It will be observed that the weight of the upper or positive carbon has no influence upon the operation of the regulating device, which is a material advantage, as the negative electrode is consumed only half as rapidly as the positive one. Where the spring regulating the length of the arc has to support the

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the upper carbon, as in lamps of the ordinary form, it is frequently necessary to re-adjust its tension during the burning of a pencil of considerable length, on account of the diminution of its load, but this difficulty is greatly reduced by applying the adjusting device to the negative carbon. At the same time, the arrangement above described secures all the advantages of having the regulating mechanism above the focus, where it does not obstruct the light.

The pivoted link H and the flexible strip I hold the bar G in place horizontally, free from frictional contact with all other parts of the lamp, so that the regulator is very sensitive to changes in the current and susceptible of nice adjustment.

It will also be observed that all the supports, both for the lower carbon-carrier and for the globe, are placed on the same side of the focus and in a line with each other, and they are made flat, with their edges turned towards the focus, so that they cast very little shadow, and that only in one direction.

It is obvious also that the globe B may be lowered by raising the dog *c*, without disturbing the other parts of the lamp. This is a valuable feature of the said lamp, as it is frequently desirable to remove or replace the globe when carbons of full length are in position, without interfering with their adjustment, and in such lamps as ordinarily constructed this cannot be conveniently done.

I claim, with reference to the said third portion of my invention—

First—In an electric lamp or lighting apparatus, a gravitating carrier for the upper carbon and a train of gearing controlling its descent, in combination with an electro-magnet and armature lever operating a detent engaging with said gearing, and a carrier for the lower carbon suspended from said lever, substantially as above described.

Second—In an electric lamp or lighting apparatus, an electro-magnet and mechanism for controlling the feeding of the upper carbon, located above the focus, in combination with a carrier for the lower carbon, movable vertically, and connected with the armature lever of said electro-magnet, substantially as herein described.

Third—In an electric lamp or lighting apparatus, an electro-magnet controlling the feeding mechanism, in combination with a dash-pot or controlling chamber fixed to the armature or core of the electro-magnet and surrounding its head, substantially as above described.

Fourth—In an electric lamp or lighting apparatus, the combination of a lower carbon-carrier and a globe surrounding the focus with thin flat supports for said carrier and globe, placed edge to edge upon the same side of the focus, and in the same vertical plane with it, substantially as above set forth.

Fifth—The carbon-carrier E in combination with the bar G, the link H, and the flexible strip I, substantially as herein described.

Sixth—The carbon-carrier E in combination with the adjustable spring R, the spring V, rod T, and forked head W, substantially as above described.

Seventh—The side pieces *d d'* in combination with the screw *b*, pin *j*, and jaws *e*, substantially as above described.

Eighth—The combination of the globe B with the support C and dog *c*, substantially as above specified.

The fourth portion of this invention relates to improvements in the preparation of carbon or other conductors for electric lighting apparatus, and is chiefly designed for application to that class of such apparatus known as incandescent lamps, in which the light-giving portion is a continuous conductor of high resistance, commonly formed of carbon.

The objects of this portion of the said invention are to make such conductors of a uniform standard illuminating power, and to make them more dense and homogeneous in structure and more elastic than those made by the process heretofore in use, with a resulting increase of durability.

By the methods heretofore generally practised in making electric carbons, it is impossible to obtain any considerable number of carbons which, under a current of given intensity, will develop the same light where the conductors are made of carbon deposit formed on the interior of gas retorts, whether by shaping such carbon into the required form with cutting tools, or by grinding it up and then moulding it into shape under pressure; it is practically impossible to secure two conductors having precisely the same radiating surface, or having the same resistance. The same difficulty attends the ordinary modes of manufacturing incandescent conductors by shaping a fibrous material into the desired form and then carbonizing it. Differences in the superficial area of the carbons or in their resistance will produce corresponding differences in their relative illuminating power.

Manifestly, in any system of electric lighting, equality of light-giving capacity in the lamps employed is an object exceedingly desirable. The mode by which this result may be obtained, and which constitutes a part of the present improvements, consists, generally stated, in subjecting the carbon conductor, while surrounded by an atmosphere of hydro-carbon vapour or other carbonaceous gas, to the action of the electric current, in the presence of some standard light or other means of ascertaining when the conductor conforms to the standard fixed. The intense heat generated by the passage of the currents dissociates the elements of the gas, and the carbon set free therefrom is deposited in a state of exceedingly minute subdivision in the pores and upon the exterior of the carbon under treatment, gradually reducing its resistance and correspondingly changing its illuminating capacity; when this has been brought to the desired point, as indicated by the standard of comparison, the operation of building up is arrested, and the finished carbon is ready to be sealed up in the globe in which it is to be used.

The best manner heretofore discovered for regulating the extent of the change to be effected in the resistance of electric carbons in order to produce uniformity of illuminating power is to use a standard electric lamp, connecting it with the circuit in the same manner as the carbon to be treated.

An apparatus suitable for this purpose is illustrated in fig. 26 of the accompanying drawings, in which A A' are the main wires of the circuit leading from the source of electric energy B; C is a standard lamp placed in a branch between the main wires of the circuit, and D is a carbon to be treated, arranged in a co-ordinate branch between the two main wires. These branches are provided with switches of any known and suitable character. The carbon D is approximately of the same size as that of the lamp C, but is of higher resistance, and is enclosed in a glass receiver, E, whose only outlet is the tube F. Through or by means of this tube the globe is attached to an exhausting pipe at S, by any tight connection,

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preferably a joint of ground glass and a mercury seal. A tube, H, leads to an exhausting apparatus capable of producing a high vacuum, such, for instance, as a "Sprengel" or a "Geisler" pump; I is a vessel containing gasoline or some other very volatile hydro-carbon oil. This vessel may be filled through the tube K, which should be hermetically sealed by a ground glass stopper or otherwise. The said vessel communicates with the pump, through the pipes L M and H and the cock N. All of the joints and connections should be perfectly tight, to prevent all ingress of air.

The operation is as follows, that is to say:—The cock N being closed, the air is exhausted from the globe E as perfectly as possible, after which a current of electricity may be passed through the carbon or conductor D, in order to expel from it the occluded gases, which should also be pumped from the globe. Then, upon opening the cock N, the vapour or gasoline will flow from the vessel I into the globe, filling it to the required degree; practically a pressure of about an inch of mercury, more or less, will be found sufficient. Now, inasmuch as the conductor to be treated is of a higher resistance than the lamp C, it will be found that, on switching on the current to the conductor and the lamp, a smaller portion of the current will flow through the carbon or conductor D than through the lamp C, and the light developed in it will be correspondingly less, but as the conductor D builds up, by the deposition upon it of carbon from the surrounding gas, as above explained, its resistance gradually falls, permitting an increased flow of the current through it, and correspondingly increasing its illuminating power. When the light has become equal to that of the standard lamp the operation is to be arrested.

Instead of arranging the standard lamp and the carbon to be treated in parallel series in branches of the main circuit, as above described, they may be arranged in consecutive series in the main circuit. In this case, as the entire current would be made to pass through both the carbon D and the lamp C, the light at first developed in the carbon will, by reason of the greater resistance of the carbon, be greater than that of the lamp; but as the building up of the carbon by the decomposition of the surrounding gas proceeds, with a corresponding diminution in its resistance, the heat and the light developed by the passage of the current will gradually be diminished, until the latter is brought to the same intensity as that of the standard lamp.

According to a modification of the mode of accomplishing the above result, I subject the carbons to be treated to the action of a constant or uniform electric current, comparing the changing intensity of the light developed, as the decomposition of the carbonaceous gas goes on, with any uniform standard light, as, for example, the flame of an ordinary "Caral" burner, and arresting the operation when the illuminating power of the carbon as thus indicated has reached the required point.

It will be readily understood that this modification of my process involves the same general principle as the one first herein described, since the uniform current employed in the last method is a current capable of developing a uniform light of given intensity in a standard lamp. The first method will however be found in practice the most convenient, as when an electric lamp of standard illuminating power is used it is not necessary that the operator should be constantly careful to keep the current at the same strength; it is also specially convenient for the operator to be able to compare his work directly with a light of the same capacity and the same quality as that which he seeks to produce.

Another modification of my method or process of accomplishing the object of this portion of my invention is to employ a galvanometer or some equivalent device to indicate the resistance of the carbon during the process of treatment as above specified, and to reduce all the conductors to a standard resistance.

It is to be understood that the carbons are made in the first instance of as nearly the same size as practicable, but of somewhat higher resistance than the desired standard, and that this process of treatment corrects such unavoidable variations as occur in carbons made according to the usual mode, by reducing them all to a definite standard.

With conductors of equal radiating surfaces acted upon by the same current the illuminating power of each obviously depends upon its resistance, and if they be made of uniform resistance the conductors will be of uniform illuminating power. As has been stated above, the deposition of carbon upon the conductor during the process of treatment increases its conductivity, and its resistance is correspondingly diminished. Its resistance during all stages of the process will be indicated by a galvanometer placed in the same circuit with the conductor, or arranged in any other suitable manner, so as to be acted upon by the same current, it being understood that a constant current is to be used.

The process is to be arrested when the needle of the galvanometer is brought to a point indicating the standard resistance of the carbon.

It may be observed that several carbons may be treated simultaneously by means of the process above described, with a corresponding economy in time and labour.

So far as this portion of my invention relates to the production of conductors of standard illuminating power, it is not to be limited to the use of a gas or vapour in a rarefied condition, since it is obvious that the conductors may be reduced to the standard illuminating power or standard resistance, by treating them in a carbonaceous gas at even a full atmospheric pressure; but it is believed that better results are produced in all cases by the use of a rarefied gas, and the attenuation of the gas is essential, so far as the said part of the invention relates to improvements in the structure of the carbon of which the conductor is composed.

Carbon conductors made according to the methods heretofore practised, such as shaping pieces of carbon deposit taken from the interior of gas retorts, and moulding pulverized carbon into form under pressure, with or without other substances intermixed, or shaping some fibrous material into the desired form and subsequently carbonizing it, are more or less imperfect. Those cut from the deposits of the gas retort, while in the main hard are not of uniform structure, and are liable to develop flaws, while those produced artificially are not only far from being uniform in structure, but also are exceedingly porous. The existence of interstices between the fibres or particles of the carbons is a recognized element of weakness,—among other reasons, because of the formation of minute voltaic arcs across such spaces, whereby the carbon is gradually eaten away or consumed. Another mode of preparing carbons for electric lamps has been to deposit carbon upon some solid conductor, by electrically heating it while immersed in a gaseous or a liquid hydro-carbon at atmospheric pressure.

The

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The practical difficulty experienced in treating the conductors by this method is that, if the temperature be carried high enough to produce a carbon deposit otherwise of good quality, the dissociation of the hydro-carbon goes on so very rapidly that the deposition of the carbon takes place almost entirely upon the exterior of the conductor, and does not sufficiently penetrate the interstices of the interior, and the carbon thus deposited will be comparatively soft, irregular, and easily broken. On the other hand, if the carbon to be treated be subjected to an intense heat in the presence of a highly attenuated carbonaceous gas, the dissociation of such a medium will take place much more slowly than with a gas at full atmospheric pressure, and the deposition will begin and will proceed the most rapidly at the interior of the conductor, that portion being the soonest and the most highly heated. In this manner the interstices will become filled with a fine deposit of carbon, which will firmly cement the fibres and particles of the original conductor into a much more dense, homogeneous, and elastic mass, the exterior of which also, as the operation proceeds, will be materially evened up and rounded off. For the best results, the occluded gases should be expelled from the conductor as completely as possible before the treatment with the carbonaceous gas is commenced.

The best manner yet ascertained of carrying this said portion of my invention into practice is to place the carbon to be treated in an exhausted receiver, provided with proper electrical connections, then to pass through it a current of electricity to expel the occluded air and gases, which, when released, are to be pumped from the receiver, and then to admit a pure hydro-carbon vapour or other carbonaceous gas of a pressure equal to about one inch of mercury, more or less, and increase the current on the conductor, carrying the temperature up to a very high point, the time of the exposure being dependent mainly on the thickness of the conductor and the strength of the current. By arresting the operation at the proper point it will be found that the density of the carbon conductor has been greatly increased, with also a large increase in its strength and elasticity, and, if desired, without material change in volume; its conductivity, although somewhat increased, still remains at a low point, and its resistance correspondingly high.

The apparatus shown in the drawings may be used in the manner above explained, for the purpose of this portion of the invention.

When the deposition of the carbon has been arrested, if the receiver is to form the globe of the finished lamp, the excess of gas is to be pumped out of the receiver, which is then to be sealed up, and the lamp will be ready for use. Conductors thus prepared may also be transferred from the receiver and afterwards placed each in its own globe, enclosing a very high vacuum, or, preferably, a very highly attenuated atmosphere of some carbonaceous vapour.

It will be readily understood that, in working the foregoing process, the higher the attenuation of the gas used in the receiver the greater will be the temperature required to effect the deposition of the carbon; and it is believed that the fineness of the deposit, and thus the excellence of the product, varies in a measure as the heat to which the conductor is subjected.

The most available gases for the purpose are the vapours of gasoline, marsh gas, olefiant gas, or ordinary coal gas. A gas composed of nitrogen and carbon may also be used with advantage, such as cyanogen, as derived from cyanide of mercury or other sources. A preparation of sulphur and carbon also may be used, such as carbon bi-sulphide.

The above-described process, while designed primarily for the manufacture of continuous carbons for incandescent lamps, may also be used with advantage in preparing the carbon electrodes to be used in voltaic arc lights, as also in the preparations of carbons to be used otherwise for electrical purposes. This portion of my invention is moreover not necessarily limited to the treatment in the manner above described of conductors of carbon, as conductors of other material may be greatly improved by being subjected to the same process.

I claim, with respect to the said fourth part of my invention—

First—The above-described method of producing conductors (for electric lamps) of uniform illuminating power, which consists in electrically heating the carbon or other material, in the presence of a carbonaceous or equivalent vapour, until by the decomposition of such vapour they are brought to the standard power, substantially as above set forth.

Second—The above-described method of preparing conductors (for electric lamps), which consists in subjecting them, in the presence of a carbonaceous or equivalent vapour or gas, to the action of an electric current, such current being at the same time caused to act upon a lamp of standard illuminating power or a galvanometer, as above set forth and for the purposes specified.

Third—The above-described process of preparing carbons or conductors (for electric lamps), which consists in first removing the occluded gases by means of heat and an air-pump, then subjecting the conductor to a high heat in an attenuated atmosphere of hydro-carbon vapour or other carbonaceous gas, and afterwards exhausting the surplus gases, substantially as above set forth.

Fourth—In the preparation of electric carbons or conductors, the cementing and consolidation of the conductors by the deposition of pure carbon from an attenuated atmosphere of hydro-carbon vapour or carbonaceous gas, substantially as above set forth and for the purposes specified.

In witness whereof I, the said Hiram Stevens Maxim, have hereto set my hand and seal, this twenty-seventh day of January, one thousand eight hundred and eighty-two.

HIRAM STEVENS MAXIM,

Witness—W. S. BAYSTON,

(By his Agent, EDWD. WATERS.)

Clerk to Edward Waters, Patent Agent, Melbourne.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to Hiram Stevens Makin, this fourth day of April, A.D. 1882.

AUGUSTUS LOFTUS.

REPORTS.

Improvements in and relating to Electric Lighting Apparatus, &c.

REPORTS.

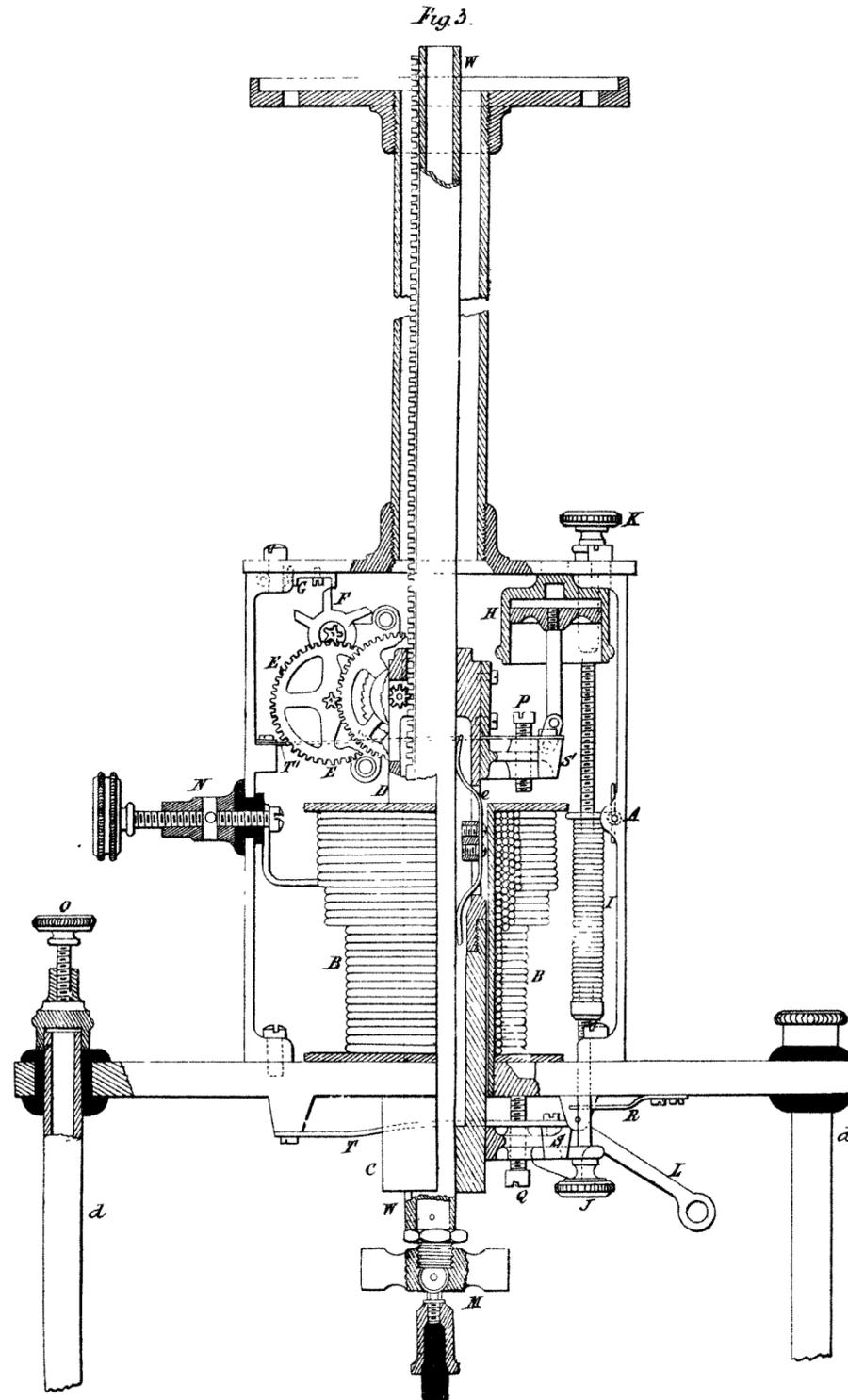
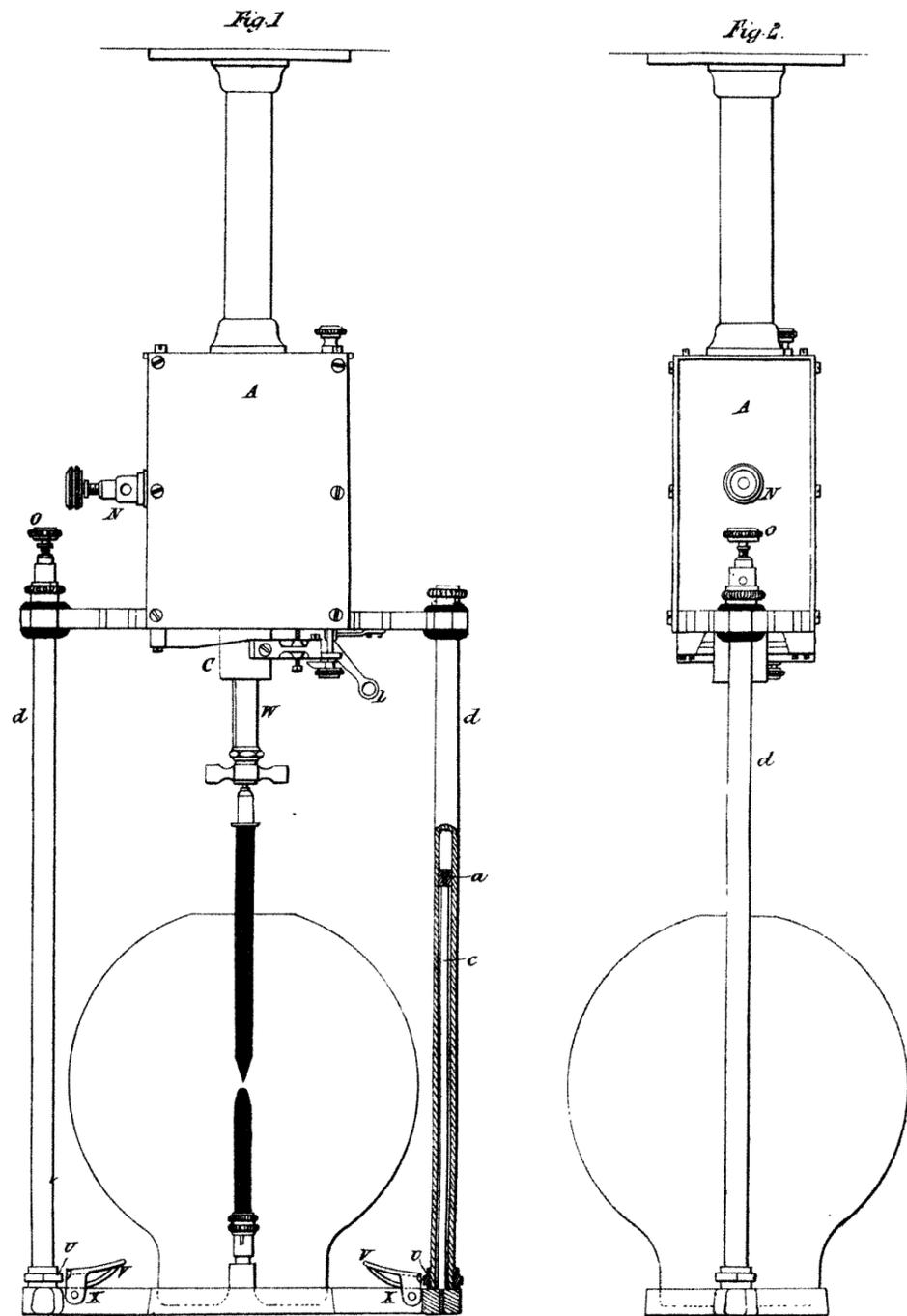
Sir, Sydney, 24 February, 1882.
 We have the honor to inform you that we have carefully examined the specification and drawings 82-1614, being an application from Mr. Hiram Stevens Maxim for Letters of Registration for "Improvements in and relating to Electric Lighting Apparatus, and the manufacture of carbonized material to form conductors for the same, and other purposes," and are of opinion that the petition may be granted.
 We have, &c.,
 E. C. CRACKNELL.
 CHAS. WATT.

The Under Secretary of Justice.

Sir, Sydney, 24 February, 1882.
 We have the honor to inform you that we consider it our duty to point out that, although we have approved of Mr. Hiram Stevens Maxim's application for Letters of Registration, No. 82-1614, for Electric Lighting Apparatus, &c., that there are three or four distinct and separate patents in the one application, and, in our opinion, Mr. Waters' attention should be directed to this, and be cautioned that in future it will be necessary to make separate applications.
 We have, &c.,
 E. C. CRACKNELL.
 CHAS. WATT.

The Under Secretary of Justice.

[Drawings—five sheets.]



This is the Sheet of Drawings marked B preferred to in the annexed Letters of Registration granted to Hiram Stevens Maxim, this fourth day of April, A.D. 1882.
Augustus I. of tus.

(32.)

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

C.

1054

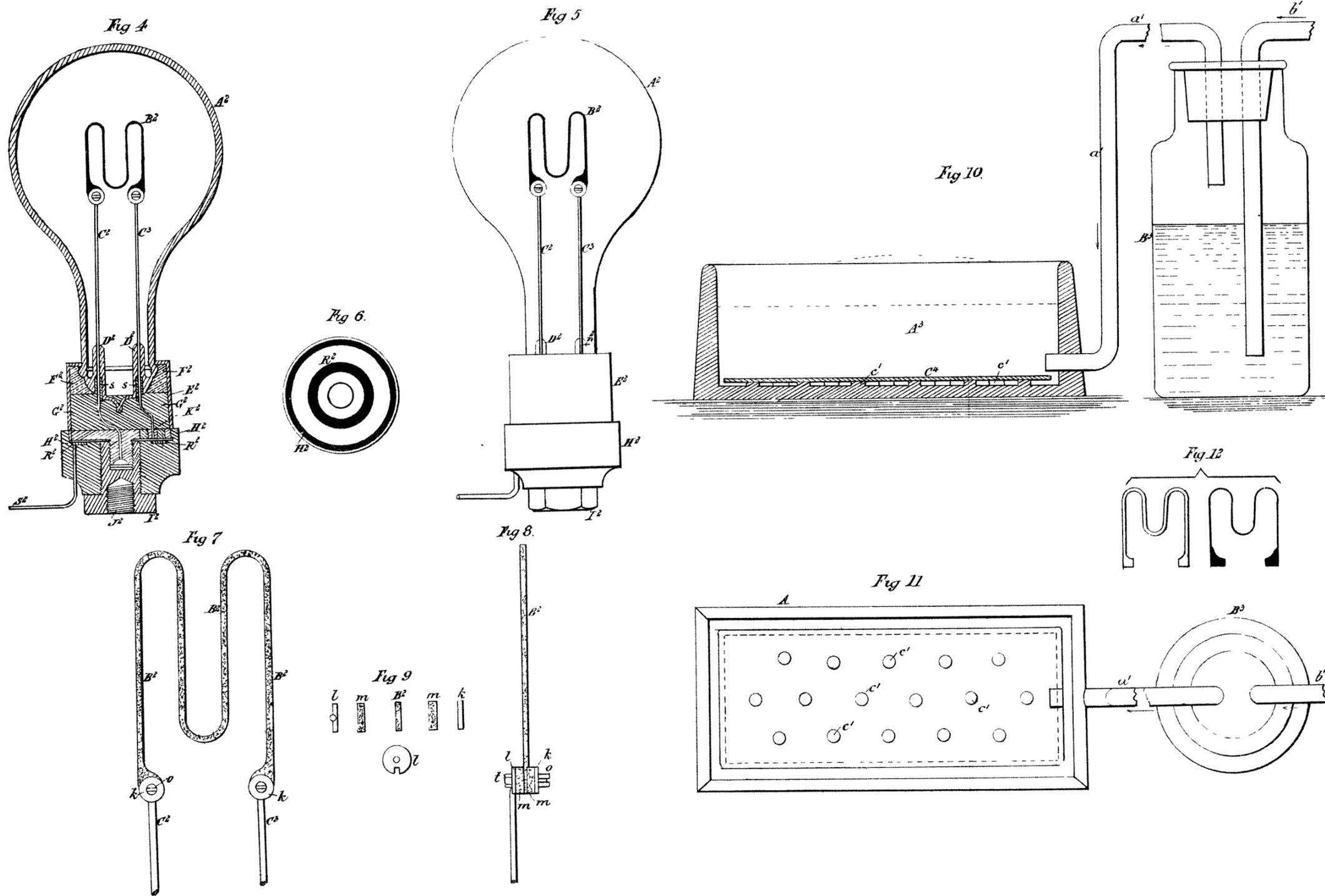
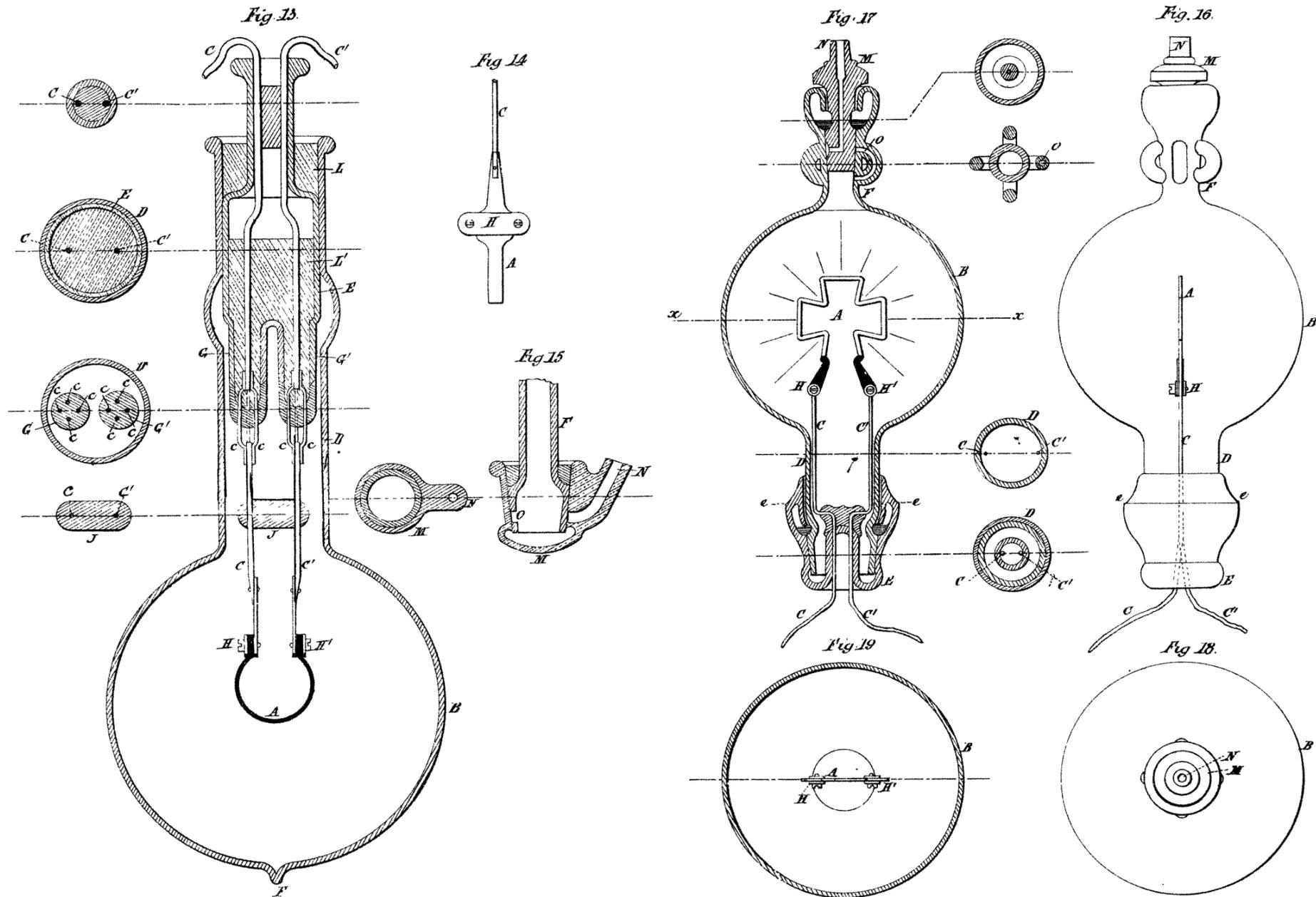


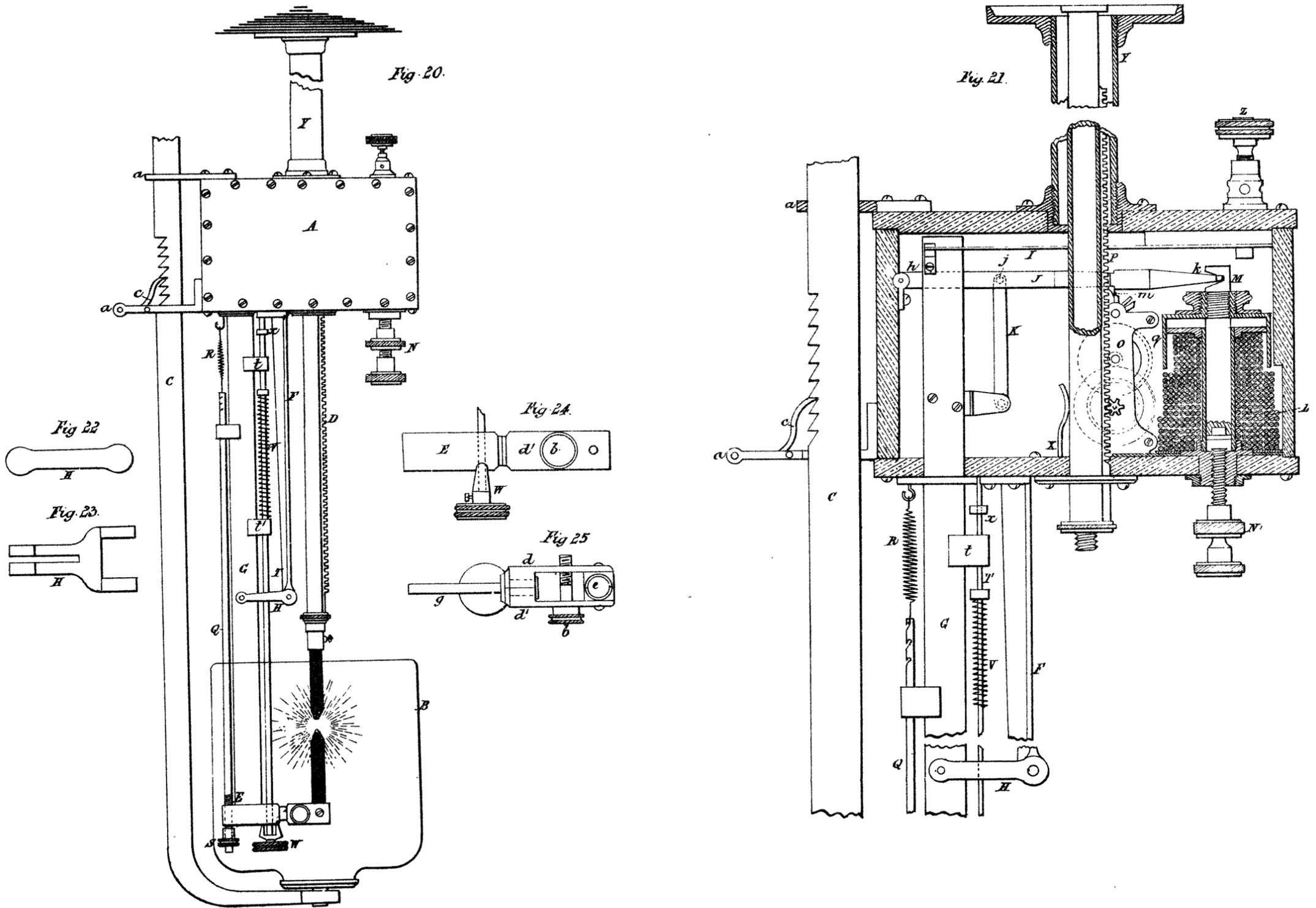
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This is the Sheet of Drawings marked C referred to in the annexed Letters of Registration granted to Hiram Stevens Maxim this fourth day of April, A.D. 1882. Augustus Loftus.



This is the Sheet of Drawings marked D referred to in the annexed Letters of Registration granted to Hiram Stevens Maxim, this fourth day of April, A.D. 1882.

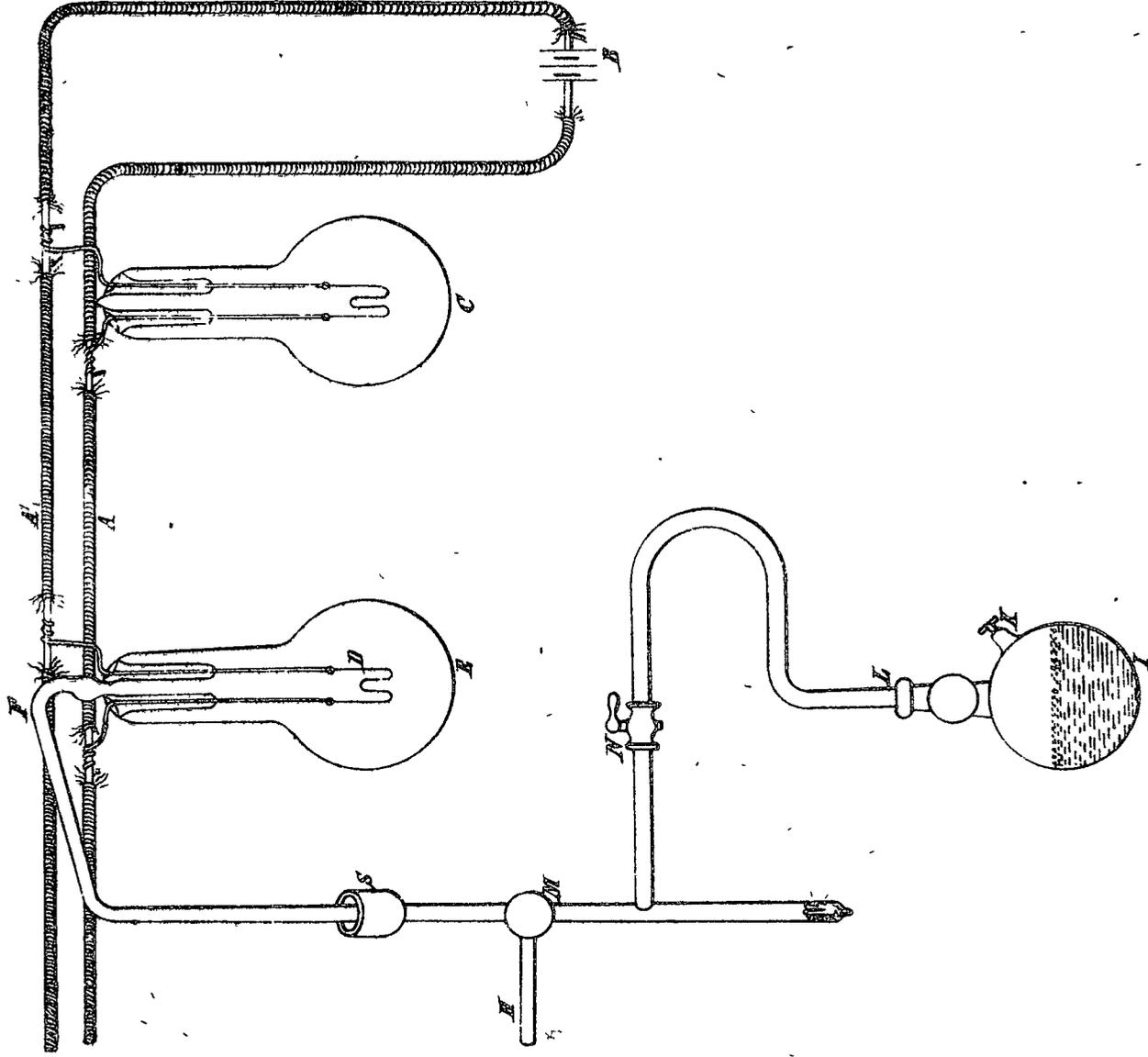
Augustus Loftus.



This is the Sheet of Drawings marked E referred to in the annexed Letters of Registration granted to Hiram Stevens Maxim, this fourth day of April, A.D. 1882.

Augustus Loftus.

Fig. 26.



*This is the Sheet of Drawings marked F referred to in the annexed
Letters of Registration granted to Hiram Stevens Maxim, this
fourth day of April, A.D. 1882.*

Augustus Loftus.



A.D. 1882, 4th April. No. 1055.

**IMPROVEMENTS IN APPARATUS FOR GENERATING ELECTRIC CURRENTS AND
FOR PRODUCING ELECTRIC LIGHT.**

**LETTERS OF REGISTRATION to Edward Weston, for Improvements in Appa-
ratus for generating Electric Currents and for producing Electric Light.**

[Registered on the 5th day of April, 1882, 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 WESTON, of Newark, New Jersey, 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 Apparatus for generating Electric Currents and for producing Electric Light," which is more particularly described in the specification, marked A, and the eight sheets of drawings, marked B, C, D, E, F, G, H, and I, 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 Edward Weston, 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 Weston, 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 Weston 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 April, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Apparatus for generating Electric Currents

A.

SPECIFICATION of EDWARD WESTON, of Newark, New Jersey, United States of America, for an invention entitled "Improvements in Apparatus for generating Electric Currents and for producing Electric Light."

THE first portion of my invention relates to certain improvements in dynamo-electric machines heretofore constructed by me.

The said improvements are as follows:—

First—The combination with a commutator, such as is used in the said machines, of two brushes attached to a pivoted disc, whose axis coincides with the axis of the commutator-shaft, the disc being provided with several concentrically-curved slots for the admission of set-screws, by means of which the disc, and consequently the brushes, may be clamped in variable positions, for the purpose of regulating the strength of the current; the range of adjustment of the disc, and consequently of the brushes, being limited to the distance between the position where the current obtainable from the machine will be of the lowest strength and the position where such current will be of its highest strength.

The second feature of the present improvements relates to devices for automatically closing and breaking the circuit, and which consist substantially of a rotating disc provided with two radial slots containing sliding switch-blocks, which are pressed inward towards the axis of the disc by adjustable spiral springs.

The shaft to which the disc is attached is provided with a suitable bearing in the upper end of a metallic pillar, and at one end has a pulley by means of which it is rotated. At the other end the shaft projects outward from the disc, and is covered with a shell of wood or other suitable insulating material, whereon there is mounted a metallic hub, against the periphery of which hub the switch-blocks rest when they occupy the position due to the preponderating influence upon them of the spiral springs. A brush attached to a vertical pillar is made to bear constantly upon the periphery of this insulated hub, and is electrically connected with one line wire, while the pillar supporting the shaft of the disc is electrically connected with the other line wire, both of these connections being made between the machine and the vat used for containing the electrolytic solution. When the machine is at rest, or whenever its speed falls to a prescribed point, the switch-blocks, in consequence of the action upon them of the spiral springs, form an electrical contact with the hub, and the electrodes in the vat are thus provided with a short circuit through a portion of the main line wires, and through the connecting wires to the pillars which support the rotating disc and the brush that bears upon the hub.

In this arrangement the main circuit, which includes the machine and the electro-plating vat, is always unbroken, but the short circuit or bridge, which includes the circuit closer and breaker, presents when closed so much less resistance than that presented by the wire forming the coils in the machine, that any reverse current from the electrodes in the vat is nearly all discharged by the short circuit or bridge, and no portion of it sufficient to effect the polarization of the magnets can reach the machine. On the contrary, when the machine has acquired a predetermined speed of rotation, centrifugal force, acting upon the switch-blocks, throws them out of contact with the hub, and thus breaks the short circuit, and compels the entire current from the machine to pass through the electro-plating or electro-typing vat or vessel.

The third feature of these improvements also relates to the preservation of the polarity of the magnets in the machine, and consists in combining with the main or operative circuit of the same a constantly-closed differential circuit of prescribed resistance. This object is conveniently effected by a bridge connecting the two line wires, and including a resistance coil. By means of this bridge or shunt the machine is provided with a constantly-closed short circuit, which keeps the electro-magnets in the said machine constantly excited. When the operative circuit is closed, the larger portion of the current generated by the machine passes through the operative circuit, because of the excessive resistance in the short circuit. The short circuit or bridge containing the resistance-coil may be advantageously employed in connection with another bridge containing an automatic circuit closer and breaker, either such as herein described or like that used in my former machine, in which the object is accomplished by using a rotating cup containing mercury, the mercury assuming a position either in or out of the circuit, according to whether it occupies the position due to the preponderating influence upon it of gravity simply, or whether it occupies another position induced by the preponderating influence upon it of the centrifugal forces generated by its own rapid rotation. Any suitable conducting fluid may be used in place of the mercury.

The fourth feature of the said improvements relates to a device for keeping the machine cool when in operation, and consists in the use of magnets having hollow cores connected with water supply pipes, by means of which a circulation of water is maintained through the said cores.

The fifth feature of the said improvements also relates to a device for keeping the machine cool, and consists in coating the interior parts of the said machine with paraffine or other suitable insulating material, and in arranging the parts in a water-tight shell provided with an induction-pipe at the bottom and an eduction-pipe at the top, by means of which pipes a circulation of cold water is maintained through the shell.

The first part of this portion of the said invention is shown in figures 1 and 3; figure 1 is a side view of an improved dynamo-electric machine provided with my improvements, showing the said machine partly in central vertical longitudinal section; figure 3 is a front view of the same.

The said machine has a cylindrical iron shell, A, supported on a suitable bed-plate, A¹, and closed at the ends by the heads a and b, which are secured to the cylinder by means of the screws a' and b'. These heads are centrally perforated, to afford bearings for the shaft C. The driving pulley c is fixed on one end of the shaft C, and the commutator D is fixed on the other end. The commutator is similar to that employed in my said former machine, and currents are collected from the commutator by means of two brushes, E and E'. These brushes are secured in bosses, e e', cast upon the cylinder head a; and the screws by which the cylinder head is fastened to the cylinder pass through concentric slots, a², in the cylinder head a. By loosening the screws a' the cylinder head a may be turned back and forth upon its axis,

and for producing Electric Light.

axis, the range of its motion being limited by the length of the slots a^2 . The brushes being affixed to the head a move with it, and are hence capable of simultaneous adjustment by the turning of the cylinder head a . The rotating armature F and the stationary electro-magnets G G in the interior of the machine have the same relation to each other as those employed in my machines as heretofore constructed. The holding screws a^1 and the slots a^2 are so arranged with reference to the position of the brushes, and to the positions of the stationary electro-magnets G , that when the screws a^1 are in contact with one end of the slots a^2 the current collected by the brushes from the commutator is of the lowest strength; and when the screws a^1 are in contact with the other end of the slots a^2 , the current collected by the brushes from the commutator is of the highest attainable strength.

The second part of this portion of the said invention is shown in side elevation in figure 1, and in front elevation in figure 2. It consists of a rotating disc, H , mounted in the upper end of a metallic post, H^1 , the base of which is electrically connected with one of the binding posts, J , of the machine. This disc H is provided with two radial slots, h , each of which contains a switch-block, h^1 . Each switch-block is pressed toward the centre of the disc by the expanding spiral springs h^2 , which are adjustable by means of the set screws h^3 . The switch-blocks project outwardly from the face of the disc, and when the apparatus is stationary form an electrical contact with the hub I , which is supported on a bushing, I^1 , of insulating material covering the projecting portion of the shaft whereon the disc H is mounted.

Another metallic post, i , electrically connected with the other binding post j , supports a brush, i^1 , which bears constantly upon the periphery of the hub I . When therefore the switch-blocks are in contact with the hub, a continuous electrical connection is made from one binding post to the other, through the brush i^1 , hub I , switch-blocks h^1 , disc H , and post H^1 . The disc-shaft is provided with the driving-pulley H^2 , and the disc is rotated by means of the belt H^3 , which is driven by the pulley H^4 on the main shaft C of the machine. The spiral springs h^2 are so adjusted that when the machine, and consequently the disc H , is rotated at a predetermined rate of speed, centrifugal force acting upon the switch-blocks throws them outward, and thus breaks the electrical connection between the posts H^1 and i . The binding posts J and j are connected by means of the wires J^1 , j^1 , and l with the machine, this connection being for convenience made on the under side of the bed-plate A^1 , as shown in figure 6. The line-wires K k of the operative circuit are connected in the usual way with those portions of the binding posts which project above the bed-plate. It will thus be seen that this mechanical circuit closer and breaker is not contained in the operative circuit, but acts either to open or close a short circuit between the binding posts, the resistance of which is so small, compared with that portion of the circuit composing the coils surrounding the electro-magnets in the machine, that the greater part of any reverse current from the electrodes with which the machine may be in circuit will pass through the short circuit in preference to passing through the coils surrounding the magnets in the machine.

The third feature of this portion of the said invention is illustrated in figure 6, which is a view of the under side of the bed-plate A^1 of the machine, and shows the bases of the binding posts J and j and of the posts i and H^1 , which belong to the said mechanical circuit closer and breaker. It will be seen that the two binding posts are electrically connected, by means of the wires L l and the opposite ends of the resistance-coil M . If, therefore, the operative circuit should from any cause be broken, the current from the machine is afforded a path through the constantly-closed circuit containing the resistance-coil M . This constantly-closed circuit or bridge connecting the wires of the operative circuit has such great resistance, by reason of the inclusion in it of the coil M , that when the operative circuit is closed no material portion of the operative current is diverted from the operative circuit.

The fourth feature of this portion of the said invention is illustrated in figure 4 and 5. Figure 4 is a side view of one of the electro-magnets in the said machine, and figure 5 is a transverse section through the line xx , figure 4. The core N of the magnet is made hollow, to form the interior chamber n . This chamber is provided with two pipes, n^1 n^2 , connected with a water supply, and by means of which a circulation of cold water is maintained within the chamber n when the machine is in operation.

The fifth part of this portion of the said invention consists in coating the interior parts of the machine, that is to say, the armature F and the stationary electro-magnets G , with paraffine or other suitable insulating material, and in making the cylinder in which the magnets are contained water-tight by means of the packing rings O O^1 , figure 1, between the heads a and b and the ends of the cylinder, and by providing the cylinder with the induction-pipe o and the eduction-pipe o^1 , by means of which a circulation of water is maintained through the said cylinder when the machine is in operation.

I claim in a dynamo-electric machine constructed according to this portion of the said invention—

- First—Two or more brushes for collecting currents of electricity from a rotating commutator, and deriving their support from a disc having a definitely limited capacity of adjustment upon an axis coinciding with the axis of the commutator, as above described.
- Secondly—The radially slotted disc mounted upon a shaft rotated by the machine or by the power which drives the same, and which is provided with the movable switch-blocks and the insulated hub, in combination with a brush affixed to the upper end of a standard, as and for the purpose set forth.
- Thirdly—The combination of the main or operative circuit of a dynamo-electric machine with two bridges, each electrically connecting the two wires of the main circuit, one bridge containing a resistance-coil, and affording a constantly-closed differential circuit of predetermined resistance, and the other bridge containing a contact maker and breaker, as above described.
- Fourthly—The combination of magnets having hollow cores with water-supply pipes, by means of which a circulation of water is maintained through such cores, for the purpose of keeping them cool when the machine is in operation.
- Fifthly—The method of preventing the overheating of dynamo-electric machines by coating the interior parts of the machine with paraffine or other suitable insulating material, and enclosing such coated parts in a water-tight chamber provided with an induction and eduction pipe, by means of which a circulation of cold water is maintained in and through such chamber while the machine is being operated.

Improvements in Apparatus for generating Electric Currents

I will now proceed to describe the second portion of my invention relating to improvements in dynamo-electric machines.

It is the object of these improvements to give to a dynamo-electric machine the capacity of economically developing and persistently maintaining a continuous current of electricity of substantially uniform electro-motive force.

The said improvements relate to that class of dynamo-electric machines in which the current-inducing instrumentality acts at the same time upon several distinct coils or upon several separate divisions of a continuous coil.

I have embodied my improvements in two distinct forms of machines, in one of which a coil wound upon a hollow carrier of non-magnetic material is continuously rotated in the magnetic field between the poles of two stationary electro-magnets, and around a stationary electro-magnet contained within the hollow carrier.

These improvements include a variety of devices especially adapted for employment in this form of machine. These devices comprise a hollow carrier for the rotating coils, substantially in the form of a cylinder, and having perforations in its ends and in its periphery, for the purpose of enlisting centrifugal force into action for the establishment of currents of air, which are drawn into the carrier through the perforations in its ends, and expelled tangentially from the perforations in its periphery, and tend to prevent the machine from becoming overheated when in operation.

Also, a hollow carrier, made partially or wholly of a non-conducting material, as, for example, papier mâché, or papier mâché and brass, and of a diamagnetic metal, and bisected longitudinally, for the purpose of preventing the establishment by induction of rotatory currents in the carrier itself, which, when they exist, increase the resistance to the rotation of the carrier.

Also, a commutator in the form of a disc, composed of sectors insulated from each other, and respectively connected with the free ends of a group of separate coils wound upon the rotating carrier, and so arranged that two brushes respectively bear upon several adjoining sectors of like polarities, and thus collect and conduct to the operative circuit several electrical impulses or waves at the same time.

Also, a series of connections whereby the coils surrounding all the stationary electro-magnets and the rotating coil or coils are included in a single circuit.

The said improvements also comprise a modification of the connections whereby two separate operative circuits are supplied by the machine with continuous currents, each of substantially uniform electro-motive force, and the binding posts of the respective circuits are arranged in such proximity that by means of switches both currents can, if desired, be directed into either one of the operative circuits.

In the other form of machine for obtaining a current by the direct interaction of a coil and a magnet, coils or systems of coils are wound upon a skeleton support, which is stationary, and which surrounds either a permanent or an electro-magnet, mounted and rotating upon its neutral axis. If an electro-magnet be thus employed, its coil is included in a circuit with the stationary coils.

One of the distinctive features of these improvements is that a portion of a stationary coil is arranged immediately opposite and in close proximity to the side of the magnet, in a plane substantially parallel with the plane of its rotation, whereby all the lines of magnetic force are cut by the rotating magnet at substantially right angles, and the entire magnet, from its axis to its poles, is employed for the production of the current. In this form of my machine I may also employ a hollow cylindrical iron shell for enclosing the coils, which will materially increase the inductive action of the rotating magnet upon them.

These improvements also relate to that class of dynamo-electric machines in which the current is generated in the ordinary manner, that is to say, by the interaction of a rotating electro-magnet and a stationary electro-magnet or electro-magnets. This part of my improvements consists in providing the core of a rotating electro-magnet with holes from end to end, parallel with its axis of rotation; and in cutting in the core series of parallel concentric grooves, deep enough to bisect the path of the longitudinal holes, whereby when the core is rotated currents of air are drawn in through the holes in the ends, and are expelled through the parallel grooves, and exert a cooling effect upon the armature and upon the adjacent parts of the machine. This form of armature may also be made of a series of separate discs clamped between collars upon the shaft.

The said improvements also comprise a rotating armature, so constructed that both the poles and the coils of the series of electro-magnets of which the armature is composed are made to cut the lines of force in the magnetic field between the poles of two or more stationary electro-magnets at substantially the same angles. I effect this by forming that portion of each core upon which the coil is wound in a concentric curve, and by bending one end of the core radially outward to form the pole on the periphery of the armature, and bending the other end of the core radially inward to form a contact with the central shaft. In this case the coil traverses both sides of the curved part of the core in a line parallel with the axis of rotation, and the outer surface of the coil forms a continuation of the arc of the circle described by the face of its outer pole.

I construct an armature core substantially in the form of the disc armature which I have described, by building up the discs with a soft iron wire, coated with an insulating material, and wound upon the periphery of a hollow shaft or cylinder, between parallel guides projecting radially therefrom, the ends of the iron wire being also insulated, and not connected with each other.

Instead of wires, flat strips of soft iron, covered with an insulating material, may be used for the same purpose.

In its general appearance this armature resembles the armature having iron discs, which I have described, and a circulation of air is maintained through it by means of holes in the periphery of the hollow shaft or cylinder upon which the masses of wire are wound.

In connection with the general purpose of imparting to dynamo-electric machines the capacity of producing currents of constant electro-motive force, I introduce between the binding posts a condenser, with the opposite sides of which the binding posts are respectively connected. It will be seen that the condenser is always charged when the current is flowing through the operative circuit, and that upon any diminution in the strength of that current there will be a partial discharge of the condenser through the operative circuit, which will tend to balance such diminution.

and for producing Electric Light.

In the accompanying drawings the first of the above-specified forms of this improved machine is illustrated as follows:—

Figure 7 is an isometrical perspective view of a machine containing my revolving coil; figure 8 is a transverse vertical section of the same through the line $x x$ figure 7; figure 9 is a central longitudinal section of the rotating carrier for the coil, the commutator, the stationary magnet, and the bar upon which the interior stationary magnet is supported, and upon which the rotating carrier revolves, showing the mode of winding each series of coils upon the carrier, and connecting such coils with the sectors of the commutator, and also the mode of winding and connecting the coil of the interior stationary magnet; figure 10 is an isometrical perspective view of the exterior stationary electro-magnets, with the cap, base, and rotating parts of the machine removed, for the purpose of showing the mode of winding the coils on the stationary magnets and connecting them with the other parts of the machine; figure 11 is an isometrical view of the rotating carrier and commutator, showing but one of the series of coils on the carrier; figure 12 is an isometrical view of the interior stationary magnet and its supporting bar, and one of the standards which supports the said bar; figures 13 and 14 show the two binding posts of the machine; figures 10, 11, 12, 13, and 14 are connected by spiral lines, indicating the method in which these several parts of the machine are included in the same circuit; a system of arrows shows the path of the current through the entire circuit in one direction; figures 10', 11', 12', 13', 14', 15, and 16 are also connected, and show a rotating carrier provided with two commutators; and also show a method of connection by which two distinct circuits are obtained; figures 15 and 16 show the two additional binding posts required for the second circuit.

These figures represent a machine having a substantial bed-plate, A, to which are secured the two vertical cores of the stationary electro-magnets B B'. The upper ends of these cores are bolted to the cross-piece B², and the coils B³ are so wound upon the vertical cores that the laterally projecting poles b and b' are of opposite polarities. The faces of the poles b b' are concave, and just clear the periphery of the revolving carrier or shell C, which is provided with a series of equidistant ribs, c , parallel with its axis, and projecting from its ends, and by means of which it is secured to the edges of two cup-shaped discs, c' . These discs are each provided with long hubs, c'' , which are perforated to admit the axis or central bar d , upon which they revolve, and by which the electro-magnet D is supported within the interior of the shell. The commutator disc E is affixed to one of these hubs, and the driving pulley F is affixed to the other. The shell C is an elongated sphere, and is provided at one end with a removable cap, G, which is held in place by the screws g radially inserted through the ribs c . The shell should be insulated from the discs c' . Its insulation may be effected by inserting in the discs plugs of insulating material to receive the screws, which enter the ends of the ribs. The shell may also be bisected longitudinally by the slit e'' . This insulation and bisection of the shell prevents the establishment by induction of rotatory currents in the shell, by breaking the continuity of the path for such currents. It will be seen that the ribs c are eight in number. Four distinct and similar systems of coils, C¹, are wound lengthwise around the shell in the spaces between the ribs. Two convolutions of one of these systems of coils are shown in figure 9. The ends, C², of each of the coils C¹ are connected respectively with two diametrically opposite divisions or sectors, e , of the commutator. Holes are bored through the outer faces of the ribs c , to allow the air from the interior of the shell to escape when the shell is rapidly rotated, and the poles b and b' are provided with the parallel slots b^3 for the same purpose. The ends of the shell are perforated to admit air into its interior, and hence when the shell is rotated a rapid circulation of air is kept up, which tends to cool the structure.

My commutator is composed of a number of metallic sectors, e , equal to twice the number of coils upon the shell, such sectors being insulated from each other, and affixed to the flat face of the disc E, fastened to one of the rotating hubs c'' . Each pair of diametrically opposite sectors is connected with the opposite ends of one of the systems of coils upon the shell. As the neutral points in the magnetic field are vertically opposite each other in the centre of the machine, all the adjoining sectors on either side of the commutator are of like polarity, and of opposite polarity to the adjoining sectors on the other side of the commutator.

The currents induced in the rotating coils are collected from the commutator by the brushes H and H', each of which it will be seen overlaps two or more sectors of like polarity. The brush H is electrically connected by means of the wire h with one end of the wire, which forms the coils B³ upon the exterior stationary magnets. The other brush H' is electrically connected by means of the wire h' to the standard I, in the upper end of which one end of the bar d is supported. One end of the coil D' on the stationary magnet D is connected with the iron core of this magnet D, and hence with the supporting bar d , and the other end of the coil is carried out through the interior of the bar d , which is made hollow for this purpose, and is connected by means of the wire d' with the binding post K. One end of the operative circuit L is connected with the binding post K, and the other end with the binding post K', the latter being connected by means of the wire k with the end of the coil B³ on the stationary magnets opposite to the end which is connected by the wire h to the brush H. The complete circuit is shown in figures 10 to 14, wherein the several parts are shown detached from each other.

Figure 11' represents a rotating shell, provided with two commutators, E E and E' E', each composed of four sectors, connected respectively with the ends of two of the four coils upon the rotating shell. To prevent obscurity, figure 11' shows but two of the four coils on the rotating shell. The coils B³ are in this case connected by the wire k with the binding post K' K', and by the wire h with the brush H, and the brush H' is connected by the wire i with the binding post K K, the binding posts K K and K' K' being connected by the operative part L of their circuit. The brush H² of the other commutator is connected by the wire j with the standard I (figure 12'), and hence with one end of the coil D' on the stationary magnet D, while the other end of the coil D' is connected by the wire d' with the binding post K², the latter being connected by the operative part L' of its circuit with the binding post K³, with which the commutator brush H³ is connected by the wire j' .

The mode of operation of the parts in the arrangement shown in figures 10', 11', 12', 13', 14', 15, and 16 is similar to that already described with reference to the arrangement shown in figures 10, 11, 12, 13, and 14, in respect of the constant electrical contact of all the brushes with sectors of the commutators, by which both currents are made persistent, and of substantially uniform electro-motive force. It

Improvements in Apparatus for generating Electric Currents

It may be desirable in a large machine to increase the number of coils upon the rotating shell. If so increased, the number of sectors in the commutator or commutators should be correspondingly increased—that is, there should be twice as many sectors as there may be separate coils or separate divisions of coils upon the rotating shell.

My rotating shell may be varied in its construction. For example, the spherical or cylindrical part of the carrier may be made of paper, and may be riveted or otherwise secured to ribs made of metal. The advantage of making the shell of a non-conducting substance is, that there is then no opportunity for the establishment by induction of rotating currents in the shell. Such currents, when they exist, add a material degree of resistance to the movement of the coils, and there is therefore an important advantage in either using a non-conducting material for the carrier upon which the rotating coils are wound, or if the carrier is made of metal, then in bisecting it as shown and insulating it from the discs.

The mode of supporting the hollow carrier herein shown, to wit, by means of the longitudinal ribs projecting from its ends, and fastened to the peripheries of discs secured to the rotating shaft, is also applicable to para-magnetic cores, whether solid or hollow; such cores are usually supported upon a central shaft, which is necessarily in the way of coils traversing the core longitudinally and crossing its ends, but by supporting such cores solely by means of the projecting ribs which are affixed to the discs, and by not having the shaft run through the core, the entire space between the ribs is left unoccupied, and therefore free for the application of the coils. This is especially convenient when the coils are made of flat copper strips. This mode of constructing and mounting a para-magnetic core is illustrated in figure 11¹, showing a portion of one of the systems of coils wound upon it in the same manner as the coils are wound upon the hollow carrier. This core may be made solid, but it will be found preferable to make it hollow, and to provide the ribs with the radial perforations, for the purpose of causing a circulation of air through the core, tending to keep it cool when in operation, and also to split the core and insulate it from the discs, so as to render it incapable of affording a continuous path for any rotatory currents.

The second form of machine embodying the said improvements is illustrated in figures 17, 18, 19, and 20, which are as follows:—Figure 17 is an isometrical perspective view of my machine, provided with a stationary coil surrounding a rotating magnet; figure 18 is a central longitudinal vertical section of the same; figure 19 is a transverse section through the line $x^1 x^1$; figure 18 and figure 20 is an isometrical perspective view of the stationary frame upon which the coils are wound.

These figures represent a cylindrical iron shell, M, open at the ends, and provided with foot-pieces, M¹, by means of which it is secured to the bed-plate M². Within the cylinder M is a skeleton frame, N, consisting of two or more rings, N¹, N¹, joined together by the equidistant strips or ribs N², which are parallel with the axis of the cylinder, and which serve to divide the periphery of the rings into a number of equal parts or segments. The outermost surfaces of the ribs N² are curved transversely to fit the interior surface of the shell M, to which they are fastened by screws. The number of ribs, and consequently the number of segments into which the skeleton frame is divided, will of course depend upon the size of the machine, and may be varied at the will of the constructor. In the drawings the skeleton frame is shown to be divided into eight segments, and each pair of diametrically opposite segments serves to support one of the four coils O. Each coil traverses the entire exterior of the skeleton frame, extending across the ends of the cylinder from the segment on one side to the segment diametrically opposite, and the free ends O¹ and O² of the coils are respectively connected with two stationary brushes O¹¹ and O²² bearing upon diametrically opposite sides of the cylindrical commutator.

The eight brushes required for the connection with the free ends of the four coils are secured in the slotted stems O³, projecting laterally from the face of the annular cup-shaped disc O⁴ of insulating material, which is supported upon the cross-bar at P¹. This mode of winding and connecting each coil is shown in figure 18, wherein, for the sake of avoiding confusion, only one of the four coils is represented. The commutator is composed of the two concentric curved strips Q q, which project laterally in opposite directions from the opposed faces of the hubs Q¹ q¹. The hub q¹ is secured directly upon the rotating shaft R, while the hub Q¹ is mounted on a bushing which insulates it from the shaft R. The two curved strips Q q overlap each other upon opposite sides of the shaft, and the two spaces between their edges are filled with wood, in order to provide a continuous concentric curved surface for contact with the brushes O¹¹ O²². The hub Q¹ is elongated sufficiently to provide a bearing for the brush S, which is supported in the stem S¹, projecting laterally from one of the binding posts S², with which one end, S³, of the operative part of the circuit is connected. Outside the hub Q¹ is a metallic collar, T, mounted upon an insulating bushing r upon the shaft R, and separated from the hub Q¹ by the insulating collar r¹. The other binding-post s² of the machine, to which the other end s³ of the operative circuit is connected, is provided with a brush, s, which bears upon the periphery of the collar T. The inner face of the collar T is connected with the wire T¹, which is enclosed in a tube of insulating material, T², inserted in holes, T³ T³, extending through the hubs Q¹ and q¹. The inner end of the wire T¹ is secured by a set-screw, T⁴, to a metallic collar, T⁵, which is separated from the shaft R by the flanged insulating bushing T⁶. The bearings P¹ P² for the shaft R are formed in the arms P P³, which extend horizontally across each end of the cylinder, and are bolted thereto. The shaft R has at the front end of the cylinder an enlarged journal, U, which is longitudinally perforated to receive the insulating tube T² containing the wire T¹, which at its forward end is secured to the collar T⁵, and serves to connect that collar with one end of the system of coils W surrounding the iron cores W¹ of an electro-magnet mounted upon and revolving with the shaft R. The opposite end of the system of coils W is connected to the iron core of the rotating magnet, and hence through the core and shaft R with the commutator hub q¹, and successively with the brushes O¹¹ and O²² connected with the ends of the stationary coils.

It will be seen that if a permanent magnet be substituted for the electro-magnet upon the shaft R there will be no necessity for the system of connections by which the coil surrounding the electro-magnet is brought into circuit with the stationary coils, and that it will only be necessary to connect the collar T with the shaft R in order to complete the circuit.

The shaft R is kept from longitudinal movement by the journal U¹ at the rear end of the cylinder. The shoulder U² on the shaft holds it in one direction, and it is held in the other direction by the hub V of the driving-pulley V¹, which is secured to the rear end of the shaft R by the set-screw V².

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Those portions of the stationary coils which cross the ends of the cylinder are kept from coming in contact with the shaft R by the tubes N³ and N⁴ of insulating material, which are respectively held in position by means of radial arms, N⁵, extending outward, and secured to the skeleton frame.

The poles W² of the rotating magnet are concentrically curved, describing an arc of a circle nearly equal in length to the arc described by the inner circle of three of the segments.

It will thus be seen that there is a constant inductive action by the rotating magnet upon not less than three of the coils. In the middle coil of the three the electrical impulse may be said to be at its maximum strength, as indicated by the parallel lines *w* in figure 19. In the adjoining coil on the left the electrical impulse is decreasing in strength, as indicated by the converging lines *w*¹; and in the right-hand coil the impulse is increasing in strength, as indicated by the diverging lines *w*².

By enlarging the size of the machine and the number of parts into which the skeleton frame is divided, the rotating magnet may be made to act simultaneously upon a correspondingly larger number of coils, the mode of operation being the same in respect of the simultaneous communication to the main circuit of electrical impulses from several adjoining coils.

The effectiveness of the said machine is greatly increased by having the coils traverse the whole exterior of the skeleton frame, and pass across the ends in planes parallel to the plane of rotation of the magnet, in close proximity to the sides of the magnet, but the machine will be operative if this proximity is not preserved.

The construction of the skeleton frame is shown in isometrical perspective in figure 20. This frame is preferably made of a non-magnetic material.

By the rotation of the magnet air is drawn into the space within the coils through the openings between the shaft R and the tubes N³ and N⁴; the air so drawn in is thrown outward by the rotating magnet through the interstices between the coils and the ribs, and through the holes N⁶ in the ribs and shell M, and tends to keep the machine cool while in operation.

My mode of applying the condenser is illustrated in figure 21, which is a top view of the cross-piece B² shown in figure 7, showing the binding-posts K K¹, the connecting wires *d*¹ and *k*, and the end portions L L of the operative circuit. The condenser *l* is of the usual construction, and is connected with the binding-post K by the wire *l*¹, and with the binding-post K¹ by the wire *l*².

The part of these improvements relating to the construction and arrangement of the armature in such manner that both the poles and the coils of a series of electro-magnets composing the armature are used in producing the current is illustrated in figures 22 and 23, representing an armature which may be substituted for the rotating shell and stationary interior magnet, shown in figure 7.

Figure 22 is an isometrical view of one of the eight segments of which this armature is composed; and figure 23 is an end view of the armature, showing the manner in which the eight segments are placed together.

It will be seen that a portion *a* of each segment is concentrically curved in cross-section to receive the coil *a*¹, which is wound longitudinally upon it. At one end the core *a* is turned radially outward to form the exterior pole *a*², and the other end is bent radially inward to form the web *a*³, which is thickened near its edge, and bevelled to form the sector of a cylinder *a*⁴. When the eight segments of the armature are placed together, the eight sectors *a*⁴ are bound together by means of the clamping-rings *a*⁵. Each coil traverses both sides of the curved core *a*. One of the free ends, *a*⁶, of each coil is carried to the commutator, and the other is connected to one of the free ends of the coil on the segment diametrically opposite, by the wire *a*⁷.

My disc armature, which may be also substituted for the rotating shell and interior magnet shown in figure 7 is illustrated in figures 24 and 25; figure 24 being a side view, and figure 25 an end view of the same. In this case the coils traverse the entire exterior of the armature lengthwise across the peripheries of the discs.

The armature, as illustrated, is adapted to receive four separate coils, only one of which is shown in the drawings. The most convenient manner of constructing this form of armature is to make it of a series of separate discs, *f*, each of which is centrally perforated to receive the shaft *f*¹ and to interpose between the discs the collars *f*². Each disc is provided with eight projecting tongues, *f*³, which serve to separate the systems of coils from each other, and which also answer as the exterior poles. Two or more holes, *f*⁴, are bored through each disc, for admitting air from the ends of the armature into the spaces between the discs.

It may be desirable to mount the discs upon a hollow shaft provided with openings in its periphery coinciding in position with similar openings made radially through the collars between the discs, as shown at *f*⁵ in figures 26 and 27. By the rotation of this armature air is caused to be drawn into the spaces between the discs, through the holes in the ends, and is discharged therefrom through the spaces between the systems of coils, thus tending to keep the machine cool when in operation.

It is also an especially important feature of this armature, which for convenience I call the disc-armature, that the core is subdivided into so many separate masses that the establishment of rotatory currents in it by induction is most effectively prevented.

It will be seen that each of the discs is slit radially, as shown at *f*⁶ in figure 25, and that the path for a rotatory current in each disc is thus broken.

Figures 26, 27, and 28 show this disc armature, provided with a hollow shaft and the air chambers at the ends; figure 26 is a central longitudinal section; figure 27 is a transverse section through the line X X figure 26; and figure 28 is an end view.

The shaft at each end of the armature is surrounded by the tubular shield *f*⁷, which has a wide cup-shaped flange, *f*⁸. The flange *f*⁸ is bolted or otherwise secured to the end of the armature, which is recessed to form the air chamber *f*¹⁰, into which air is admitted through the annular space *f*⁹ between the shield and the shaft, and also through the transverse holes *f*¹¹ in the flange. When the armature is rotated, air will be drawn into the air chambers *f*¹⁰, and therefrom into the longitudinal holes *f*⁴ in the discs and into the spaces between the discs, from which it will be discharged through the interstices between the coils which traverse the armature.

Instead of relying solely upon centrifugal action for drawing air into the armature through the hollow shaft, I may affix an air-supply pipe, by a swivel coupling to the end of the shaft, and force air into

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into the armature through the interior of the shaft by means of a blower; or I may affix radial blades or fans to a portion of the shaft upon which the armature is mounted, for the purpose of creating a circulation of air when the machine is in operation.

It will be seen, by reference to figure 26, that the free ends of the coils are carried through insulating tubes, f^{13} , which are inserted in the journal f^{14} at one end of the hollow shaft. These free ends of the coils are connected to the several divisions of the commutator, and by this mode of construction I am enabled to mount the commutator upon the shaft outside the bearing in the most favourable position for removal or adjustment.

It will be understood that the free ends of the coils, if they are coated with an insulating material, may be carried out through the hollow shaft itself to the commutator, but the mode of construction shown in figure 26 is very convenient.

It will also be understood that the journal f^{14} is a collar affixed to the shaft, and revolving therewith, and supporting the shaft in the bearing.

I claim, with reference to this second portion of my invention,—

First—A coil or coils, wound upon a rotating hollow carrier or shell, in combination with the poles of one or more electro-magnets arranged outside of the rotating shell, and one or more electro-magnets supported within the interior of the shell, as above described.

Second—A group of coils wound in radially separate systems upon a shell rotating in proximity with the poles of stationary electro-magnets, and a commutator whose diametrically opposite strips or divisions are respectively connected with the opposite ends of the wire forming one of such groups of coils, whereby adjoining strips or divisions of the commutator on either side of a line bisecting its axis are always of like polarity, and of opposite polarity to that of the adjoining strips or divisions of the commutator upon the opposite side of the said line, in combination with brushes which are adapted to overlap two or more strips of the commutator of respectively opposite polarities, for the purpose of simultaneously communicating to such brushes, and to an external circuit with which such brushes are connected, electrical currents induced in two or more of such coils, all as above described and for the purposes set forth.

Third—In a dynamo-electric machine such as herein described, an electric circuit, embracing the coils around all of the electro-magnets, and one or more of the coils surrounding the rotating shell, in combination with a commutator, brushes, and an external conductor electrically connecting the binding posts, as above set forth.

Fourth—A commutator composed of a group of metallic sectors insulated from each other, and mounted radially upon the face of a rotating disc, and adapted to rotate in the same plane and present a flat surface for contact with the brushes which collect the currents from the commutator, as above described.

Fifth—In a dynamo-electric machine, such as herein described, two distinct operative circuits, each of which includes a portion of the rotating coils and one or more coils surrounding one or more stationary electro-magnets, as shown and described.

Sixth—The mode of supporting the core of a rotating armature by means of longitudinal ribs affixed to the periphery of the core and projecting from either end thereof, and bolted or otherwise secured to the edges of two parallel discs mounted upon the extremities of two rotating shafts whose axes are in line as above described.

Seventh—The hollow carrier or shell C for the rotating coils, bisected longitudinally by the slit; as above described.

Eighth—In a dynamo-electric machine, a series of stationary coils, wound in a cylindrical form, in combination with a rotating magnet enclosed within the coils, as above described.

Ninth—A magnet rotating upon its neutral axis in combination with a stationary coil, a portion of which is arranged in close proximity to the side of the magnet, and parallel with the plane of rotation of the magnet, as above described.

Tenth—A skeleton frame, adapted to support a series of stationary coils in a dynamo-electric machine in close proximity with a rotating magnet, as above described.

Eleventh—A skeleton frame adapted to support a series of stationary coils, in combination with a hollow cylindrical iron shell exteriorly surrounding the coils, as and for the purposes described.

Twelfth—A rotating magnet enclosed within a series of coils wound in the form of a cylinder upon a stationary frame, in combination with apertures in the ends of the cylinder for admitting air into the spaces within the coils, and apertures in the periphery of the cylinder for allowing the expulsion of such air, as above described.

Thirteenth—Two or more coils wound in diametrically separate divisions upon a stationary cylindrical support, and enclosing a rotating magnet, and a series of concentrically placed brushes respectively connected with the free ends of the coils, in combination with a commutator in two parts, one of which is electrically connected with one binding post, and the other is electrically connected with the other binding post, as above described.

Fourteenth—A stationary coil or coils, the convolutions of which enclose a rotating electro-magnet, whose coil is in a circuit with the stationary coil or coils, as above described.

Fifteenth—The armature, shown in figures 22 and 23 of the drawings, composed of a greater or lesser number of longitudinally separate segments of iron shaped in cross section, and adapted to be bound together and clamped or otherwise secured to the central shaft, as shown, a portion of each segment being concentrically curved to receive the coil, as above set forth.

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Sixteenth—The disc armature composed of the separate discs, each provided with the holes and mounted upon a hollow shaft, and separated from each other by the collars provided with the openings whereby, when the armature is rotated, air is drawn into the spaces between the discs through the holes, and discharged therefrom through the interstices between the coils traversing the exterior of the armature, for the purpose of cooling the apparatus when in operation.

Seventeenth—A disc armature in which the separate discs are built up of an insulated iron wire or ribbon wound concentrically upon the periphery of a hollow shaft or cylinder, as above described.

Eighteenth—In a disc armature such as described, the air chamber, having a communication with the atmosphere through apertures in its outer wall, and communicating with the spaces between the discs through the longitudinal holes, as and for the purpose set forth.

Nineteenth—In combination with the disc armature, the tubular shields provided with the flanges as and for the purpose set forth.

Twentieth—A disc armature such as described, provided with the polar extensions as and for the purpose set forth.

Twenty-first—A disc armature such as described, mounted upon a hollow shaft, through which air may be either drawn or forced into the spaces between the discs, for the purpose of keeping the machine cool when in operation.

Twenty-second—An armature provided with openings in its ends and in its periphery, in combination with the slots in the poles of the stationary electro-magnets, for permitting the escape of air drawn into the armature core through the holes in its ends and discharged from its periphery, as above described.

Twenty-third—A hollow core for a revolving armature, provided with holes in its ends and in its periphery, as and for the purpose set forth.

Twenty-fourth—The mode of connecting the coils upon the rotating armature with the commutator, shown in figure 26, by carrying the connecting wires through a hole or holes in the shaft or in the journal, whereby the commutator can be mounted upon the shaft outside the bearing, as above described.

Twenty-fifth—In combination with a dynamo-electric machine, the condenser, whose opposite sides are connected with the two binding posts, as and for the purpose set forth.

The third portion of this invention may be divided under two heads, the first of which relates to certain improvements in dynamo-electric machines, especially intended to increase their usefulness for employment in connection with apparatus for the production of electric light, and the second to improvements in electric light apparatus.

The first head of this portion of my invention embraces the following improvements, viz. :—

First—A novel means by which is imparted to dynamo-electric machines having but one commutator the capacity of simultaneously maintaining independent currents of electricity in several distinct circuits, and which consists in providing the stationary electro-magnets of such machines with a number of separate insulated coils, having one group of their free ends connected with one of the commutator brushes, and their opposite free ends connected respectively with a corresponding number of binding posts, to which are connected respectively a like number of line wires whose opposite ends are connected with the other commutator brush. By this improvement an ordinary dynamo-electric machine is converted into a multiple circuit machine without adding any commutator or commutators to it.

Secondly—A peculiar mode of winding upon the armature two systems of coils, by which each system is wound in separate divisions traversing the exterior of the armature, and each division is connected with the next adjoining division by a loop, the bight of which is connected to one of the commutator strips, the two free ends of each system of coils being respectively connected to the same two diametrically opposite strips of the commutator. The two systems of coils are thus connected with each other as though they were composed of an endless wire. As a result of this mode of winding the armature, two currents generated in two parallel wires are communicated to the two strips which are in contact with the commutator brushes, and the whole double system of coils is constantly employed in the generation of the current. It is an incidental feature of this head of the invention that the loops or wires connecting the coils with the commutator strips are all carried through one of the journals of the armature shaft, that is to say, through a bushing of insulating material inserted in a metallic shoulder or collar upon the shaft.

Thirdly—Certain improved features in the organisation and construction of the dynamo-electro machine as heretofore constructed. The outer ends of the cores of the stationary electro-magnets are secured to standards formed with foot pieces, and wrought iron is now substituted for the cast iron bars heretofore used in the slotted poles of the stationary magnets. The poles of the stationary magnets are also kept apart by means of bracing pieces made of brass or some other non-magnetic material, which bracings also afford bearings for the armature shaft. Devices are also provided for accurately adjusting the brushes. The binding posts are arranged upon the upper stationary magnetic pole; and are separated therefrom by an insulating material; finally, the armature core is formed of thin wrought iron discs.

The fourth part of the improvements consists of a modification in the form of the machine described in the second portion of this invention, whereby each of the separate divisions of the stationary coils is directly connected with the free ends of separate operative circuits, and the armature is charged by means of electricity from another machine or battery.

The second head of the invention consists of three improvements in electric lamps, viz. :—

First—An electric torch composed of two carbon electrodes arranged parallel to and near each other, and combined with a device for introducing into the electric arc at the points of the electrodes a conducting

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conducting vapour, which by lessening the resistance to the passing current affords an effectual means of retaining the arc in a prescribed path, and by its combustion increases the illuminating power of the arc. The mode of attaining this end consists in combining with one or each of the carbon electrodes, but preferably with the positive electrode only, a cylinder or stick of any material which, although not placed between the electrodes, is capable of being slowly volatilized by the heat of the electric arc, and when volatilized affords a vapour of superior conductivity, which vapour by its combustion affects the illuminating qualities of the arc, and by its passage over the end of the positive electrode to the end of the negative electrode so diminishes the resistance as to fix and maintain the position of the arc. In the electric torch nothing is interposed between the carbons, and there is nothing to prevent the arc from being formed below the points of the electrodes excepting the excess of conducting vapour discharged over the upper end of the positive electrode to the negative electrode. This vapour is produced by the volatilization of a cylinder composed of lime, glass, or of compounds of infusible earths and metallic salts, silicates, double silicates, mixtures of the silicates with other salts of metals, fluorides, double fluorides, fusible oxides, or combinations of the fusible oxides with the silicates, the requirement, so far as the material is concerned, being that it shall be capable of volatilization when placed on the outer side of the electrode to which it is attached, and when volatilized shall afford a conducting vapour which tends to pass to the other electrode. The foreign material added to the carbon may be incorporated into the electrode by being mixed with the carbon of which the electrode is composed, or it may be introduced into a tubular carbon, but it has been found best to place it in a groove formed longitudinally in the side of the positive electrode, which is made of about twice the area in cross section of the negative electrode. It is an essential feature of this part of the improvements that the foreign material applied to the positive electrode shall be placed upon the side opposite to the side adjacent to the negative electrode. The object of this arrangement is to ensure that the vapour generated from the added material by the heat of the arc shall be obliged to pass over the upper end of the positive electrode in order to reach the negative electrode, and hence to ensure that the path of least resistance shall be definitely fixed in a curved line, the crown of which is slightly distant from the ends of the electrodes, so that the electrodes will burn evenly at their ends, and there will be no possibility of a change in the position of the arc by which it shall be established otherwise than at the upper ends of the electrodes.

Secondly—In combining an igniter with an electric torch or candle, in which the position of the arc changes as the electrodes are gradually consumed. This igniter is a movable piece of carbon, so arranged and operating that, upon the extinction of the arc, it enters the space between the points of the two electrodes and by thus bridging the gap in the circuit re-establishes the arc. The igniter has the capacity to re-establish the arc in whatever position the latter happens to be, that is to say, in the various positions which the arc occupies as the electrodes gradually consume. The igniter is embodied in two forms; one consists of a stick of carbon having the same length as the original length of the torch, and arranged in close proximity with the torch, and mounted in a tilting holder, which by the action of a spring when the circuit is broken is so moved as to tilt the igniter toward the torch and cause it to enter between the ends of the electrodes. When the circuit is re-established an electro-magnet, polarized by the current, acts upon the tilting holder of the igniter and rocks the igniter away from the torch. In the other form of the igniter it is arranged in line with the space between the electrodes, and has an endwise motion toward and from the torch. In the latter case a spring or weight serves to lower the igniter until by the entrance of the lower end of the igniter into the space between the upper ends of the electrodes composing the torch the arc is re-established. An electro-magnet polarized by the current actuates a movable clutch, which grips and raises the igniter away from the torch a prescribed distance; in other words, the igniter is freed from the clutch when the current ceases, and permitted to move downward whatever the distance it may have to go to reach the end of the torch; but it has a limited range of movement upward from whatever may have been its starting-point, the latter being subject to variation by the gradual reduction in the length of the torch as the electrodes are consumed.

Thirdly—In incorporating the principle of the tilting igniter into the construction of an electric lamp, by making one electrode stationary and making the tilting igniter constitute the other electrode, or by mounting both electrodes in tilting holders geared or otherwise connected together, and having parallel axes of oscillation.

In the accompanying drawings, figures 29 to 37 illustrate the first head of the invention. Figure 29 is a front elevation of the machine; figure 30 is a side elevation; figure 31, a vertical section through the line *x x*, figure 30; figure 32 is a partial longitudinal section; and figure 33 is a plan or top view of the same; figures 34 and 35 are diagrams illustrating the mode of winding and connecting the two systems of coils upon the armature.

AA are the parallel stationary magnets, arranged horizontally, and connected at their outer ends by the iron standards A¹ A¹, which are provided with the laterally projecting flanges or foot-pieces A² A² for the support of the machine. The standards A¹ are also provided with the strengthening webs A³, and are cast with a series of parallel slots, A⁴, which are intended to provide for the circulation of air through the standards into and from the spaces between the upper and lower magnets.

In the machine as formerly constructed, the curved pole of the stationary magnets was provided immediately opposite the armature with parallel slots formed in the casting; but it has been found important that the slots or openings in the curved poles shall be exactly in line with the spaces between the several discs composing the armature, and therefore wrought iron bars are now substituted in place of cast iron bars; and these wrought iron bars are incorporated into the cores by placing them in the mould in which the cores are cast, the spaces between the bars being previously filled with plaster of Paris, which, after the casting has been made, is easily removed.

By reference to figure 29^a it will be seen how the wrought iron bars are bound together and separated by plaster of Paris preparatory to being deposited in the mould. The bars B are each concentrically curved on their inner edges, and are notched at the ends B¹, and are separated from each other by the gibs B² and plaster of Paris B³. Two bolts or rivets, B⁴, pass transversely through the ends of the bars and through the gibs, and bind the mass together. The mass of bars thus bound together is heated to a red heat and placed in the mould in which the cores of the stationary magnets are to be cast. The molten
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metal being then poured in finds its way into the open spaces between the ends of the bars and fills the space above and below the notched ends of the bars, as shown in figure 31. The bars B, which are thin wrought iron plates, are by this means securely incorporated into the casting, and made to occupy equidistant parallel positions. It will be understood that the upper side of the mass of bars conforms to the face of the mould opposite the convex surface upon which the mass of bars rests.

The armature (composed of a series of parallel discs) which is used in combination with the magnets constructed as above described is made of thin wrought iron plates or of the rings B⁵, shown in figure 31; and in either case the rings or discs are made of the same thickness as the bars B, and are arranged upon the armature shaft exactly in line with the bars B, as shown in figure 32, for the purpose of providing free exits through the spaces between the bars B for air drawn into the interior of the rotating armature, and discharged therefrom at its periphery through the spaces between the discs or rings.

In order to maintain independent currents of electricity simultaneously in several distinct circuits, a number of separate insulated coils are wound upon the cores C of the stationary magnets, as shown in figures 31 and 33. The number of separate insulated wires coiled on the cores of the stationary magnets may be varied at will. The drawings show four, which may be advantageously wound, as shown in figure 31, in which it will be seen that the separate coils form four superposed layers, and the order in which they are superposed is indicated by the black dots representing the course of one of these coils in passing around the four sections of the core. By this mode of arrangement, each coil has not only the same number of convolutions around the cores, but is of the same length. One group of the free ends of the coils are joined together in the cable c, which is connected to one of the commutator brushes, as shown in figure 33, and their other opposite free ends, C¹, C², C³, and C⁴, are respectively connected to the binding posts C¹¹, C²², C³³, and C⁴⁴, which are supported in a bed of insulating material secured to the top of the curved pole of the upper stationary magnet. The binding posts are also connected with the line wires C⁵, C⁶, C⁷, and C⁸; each of these line wires is carried to an electric lamp or other apparatus where work is to be done, and from such apparatus is carried back to the machine, and the several line wires are formed into the cable C⁹, which is connected with the other commutator brush. By this mode of construction four independent operative circuits are obtained from one commutator on the machine.

It has been heretofore proposed to divide the line wire of a single circuit machine into branches or loops, thus forming a number of derived circuits, but in such case a break in the continuity of either of the branches diverts the entire current into those of the branches which remain unbroken. In this invention, on the contrary, the operative circuits are wholly independent of each other, and a break in one simply renders that portion of the coil with which it is connected inoperative, leaving the other portions of the coil as before to continue the generation of currents for the unbroken circuits respectively; and the same thing will be true of any number of circuits formed as described, by including as a part of each of them a separate insulated wire, embodying an independent portion of the coils around the cores of the stationary magnets.

In order to explain the above-mentioned method of winding the armature with two systems of coils the armature core is shown in the drawings as divided into eight sections, and it is therefore adapted to carry four separate divisions of the coils. In this case the coils on the armature are practically composed of an endless wire, but they may be most conveniently considered and described as two similar systems of coils, the free ends of which are connected with each other. Fig. 34 is a diagram representing these coils as they would appear if their free ends were disconnected from each other, and if the coils were detached from the core and laid alongside of each other upon a flat surface. One system of coils is represented by the full lines, and the other system by the dotted lines. Heavy black lines 1, 2, 3 and 4 within the groups of coils are arbitrary representations of the armature core; fig. 35 is an arbitrary representation of the end of the armature, showing the relative positions of the several divisions of the coils, and also showing the loops for connection with the commutator. Similar letters of reference in figs. 34 and 35 indicate like parts which appear in both figures.

In tracing the mode of winding, it will be convenient to start from the top of fig. 34, at the upper end D of one system of coils; from this point the wire traverses the core longitudinally in, for example, a vertical plane, which may be represented by the vertical lines E on fig. 35. Having made the desired number of turns on this division of the core, a long loop, D¹, is left for connection with one of the commutator strips, and the wire is then wound upon the next adjoining division of the core, in a plane at an angle of forty-five degrees, as represented by the lines E¹ on fig. 35. Having completed the number of turns on this angle, the loop D² is formed and the wire is then wound longitudinally around the core in a horizontal plane represented by the lines E² in fig. 35. The loop D³ is then formed, and the wire wound around the next division of the core on the reverse angle of forty-five degrees, as represented in fig. 35 by the lines E³. Having completed the number of turns around this division of the core, the free end D⁴ is brought out and connected with the free end F of the other system of coils, or in other words connected to that strip of the commutator with which the free end F is connected.

To trace the course of the other system of coils, it will be convenient to commence near the bottom of fig. 35 at F, whence the wire proceeds as indicated by the dotted lines, either overlapping or lying alongside of the first system of coils, and having made the proper number of turns, forming the loop F¹, from which the wire is carried to the next division, and is there wound longitudinally either upon or alongside that division of the first coil, which is wound on an angle of forty-five degrees. The loop F² is then formed, and the wire is carried to the next division, where it is wound in a horizontal plane, and is then brought out to form the loop F³, from which it is carried to the next division and wound in a plane at a reverse angle of forty-five degrees, and the upper end F⁴ is carried out and connected with the free end D of the first system of coils, or otherwise is connected with that strip of the commutator with which the free end D is connected. Each loop is connected with a separate strip of the commutator. The loop of each division of the first system of coils is connected with the commutator strip, which is diametrically opposite to the strip which is connected with the loop of the overlapping or adjoining coil of the same division. For example, the loop D¹ is connected with the strip diametrically opposite the strip with which the loop F¹ is connected, and so on. Assuming one of the brushes to be in contact with that strip of the
commutator

Improvements in Apparatus for generating Electric Currents

commutator with which the loop D^1 is in contact, and the other brush to be in contact with the strip diametrically opposite, with which the loop F^1 is connected, and assuming that the loop D^1 is positive and the loop F^1 is negative, the direction of the currents simultaneously generated in the coils is indicated by the arrow-heads, from which it will be seen that two currents starting from the loop D^1 diverge and pass in opposite directions through double systems of coils and meet in the loop F^1 , by which they are conveyed to the commutator strip immediately opposite that with which the loop D^1 is connected.

It will thus be seen that the whole of the double system of coils is utilized for the production of each electrical impulse collected by the brushes.

The commutator G consists of a cylinder provided with eight separately insulated strips, and the division between the strips, instead of being parallel with the axis of the commutator, as usual, are slightly inclined thereto or are spiral. There is therefore no break in the circuit as the commutator revolves, because the brushes, before they lose contact with one strip, acquire contact with the next following strip, and this arrangement of the commutator with reference to the brushes and in connection with the armature coils wound in the peculiar mode described, results in the production by this machine of a continuous current. The continuity of the current results from the fact that when, for example, the positive brush is in contact with the strips connected with the two loops D^1 and D^2 , and the negative brush is in contact with the strips connected with the two loops F^1 and F^2 , the diagonal divisions E^1 of the coils are alone short-circuited, the other divisions remaining more or less active in the generation of the current.

The commutator G is mounted on one of the projecting ends of the armature shaft, which is provided with bearings in the bracing pieces $H H$, composed of brass or some other non-magnetic material. Each of these bracing pieces has flanges, $H^1 H^2$, which are securely bolted to the upper and lower edges of the poles of the stationary magnets respectively. The pieces $H H$ thus serve the double purpose of affording the bearings for the armature shaft and of firmly bracing apart the poles of the stationary magnets. The commutator brushes I and I^1 are supported in the slotted studs I^2 and I^3 , which are respectively inserted in the concentric slots I^{22} and I^{33} in the adjustable oscillating plate K , which is loosely mounted on the outside of the bearing of the commutator-shaft, and is provided with the set-screw K^1 , by means of which it may be fastened in any desired position. The hub of the oscillating plate K is provided with the radially projecting pointer K^2 for employment in connection with a curved scale, which is formed upon the upper curved edge of the sector K^3 affixed to the bracing H immediately in the rear of the lating plate. The range of oscillation of the plate K is such that the brushes when adjusted at the proper lengths in their respective holders may be moved from the point where the current collected by them from the commutator is of the minimum intensity to the point where the current so collected will be of the maximum intensity; and in order to provide for accuracy in operating the adjusting mechanism for regulating the intensity of the current, curved wires, K^4 and K^5 , are attached to each of the studs I^2 and I^3 . These curved wires serve as gauges for indicating respectively the length required for that portion of each brush which projects from the side of the stud towards the commutator. It will be seen that either brush may be made to bear at different points of the commutator by being lengthened or shortened, and, by means of the gauge-wires K^4 and K^5 , an accurate indication is given for such an arrangement of the brushes that their bearing points upon the commutator will be respectively at the opposite ends of a line or plane bisecting the axis of the commutator.

The improvements in the second form of dynamo-electric machine, whereby it is converted into a compound multiple circuit machine, are shown in figs. 36 and 37. In this case the stationary coils h (four in number) traverse the exterior of a skeleton cylinder. Fig. 36 is an end view of the coils so wound upon the cylinder, showing the two free ends of each coil carried to two binding posts, $p n$. The two ends of four independent coils are connected respectively with the four pairs of binding posts.

As there are four separate divisions of coils this machine supplies four operative circuits, and the armature, which is shown in isometrical perspective in fig. 37, is charged from a battery or other source of electricity, by means of the line wires $L L^1$, respectively connected with the brush standards L^2 and L^3 , which support the brushes L^4 and L^5 . The brushes bear respectively upon the collars L^6 and L^7 , one of which is mounted on the insulated brushing L^8 on the armature-shaft, and is thus insulated from the other collar. The two free ends of the armature coil are respectively connected with the two collars as shown. The free end L^9 is connected with the innermost collar, which is insulated from the shaft by the non-conducting bushing L^8 , and the free end L^{10} is connected with the shaft, and hence is in electrical connection with the collar L^7 , which is mounted directly upon the shaft. By this organization, currents generated in the stationary coils are conducted directly into the operative circuits without the intervention of commutators, and it will be seen that in this case each of the operative circuits is independent of all the others.

The improvements in electric lamps are shown in figs. 38 to 45. Fig. 38 is a side elevation of an electric torch provided with an igniter; fig. 39 is a front elevation, and fig. 40 is a plan or top view of the same.

In this part of the improvements the torch, which may be used either with or without the igniter, consists of two stationary carbon electrodes fixed parallel to each other in metallic holders, which are respectively connected to the opposite poles of a battery or other source of electricity. The two electrodes may be made of the same size if alternating currents are to be employed; but as it is preferable to use a current of unchanging polarity, the positive electrode M is represented as having twice the area in cross section of the negative electrode N . The positive electrode is longitudinally grooved upon one of its wider sides. On the outer side of the positive electrode, that is, upon the side opposite to that which is adjacent to the negative electrode, a cylinder or piston, M^1 , of lime, glass, or other material, such as has been described, is placed for the purpose of affording by volatilization at its point an excess of conducting vapour, which vapour by its passage over the end of the positive electrode to the negative electrode, defines the path of least resistance for the current, and hence keeps the arc at the points of the electrodes. The metallic holders M^2 and N^1 of the electrodes are insulated from each other, and are respectively connected with the binding posts M^3 and N^2 , to which the circuit wires are to be connected.

In operation, when the torch is required for use the binding posts are connected with the line wires M^4 and N^3 respectively, and a piece of carbon or other conducting matter is introduced between the points of the electrodes, thus bridging the gap in the circuit at that point, and causing the establishment of the arc.

and for producing Electric Light.

arc. The distance between the parallel electrodes is fixed with reference to the capacity of the current employed to leap across from one electrode to the other, and after the arc is once established the intervening piece of carbon or other conducting matter is removed. If the current be kept up, the arc will continue to be maintained until the electrodes are consumed.

An automatic lighter may be employed in connection with the electric torch, which consists, as above stated, of a bar of carbon or other conducting material. This carbon is shown at O, and is mounted in a tilting holder, O¹, the hub of which is provided with a laterally projecting arm, O², of iron; this arm O² is the armature of an electro-magnet, O³, the coil of which is included in the circuit. The electro-magnet O³ is thus polarized by the current which supplies the torch, and so long as the arc is established the arm O² is attracted by the electro-magnet, and the igniter is thus held back from the torch in the position shown by the dotted lines in figure 38. If the arc be disestablished the electro-magnet loses its polarity, and the rocking holder O¹ being then subjected to the preponderating influence of the spring O⁴, is rocked in the opposite direction, thus causing the igniter to enter between the points of the electrodes, as shown by the solid lines in figure 38. By this entrance of the igniter between the points of the electrodes the gap in circuit is closed, and the arc is re-established. Upon the establishment of the arc the electro-magnet is again polarized, and the igniter is again rocked backwards. As the igniter oscillates in a plane which coincides with the space between the parallel electrodes, it will be seen that the burning down of the torch does not prevent the igniter from performing its functions. When the torch is long the igniter rocks but a short distance before reaching the points of the electrodes, and as the torch becomes shorter the igniter rocks further. In any case, so soon as any portion of the igniter is interposed between the points of the electrodes the arc is established, and the igniter rocked backward out of the way.

The above improvements, it will be seen, provide for the automatic ignition of a torch in which both the electrodes are stationary, and which therefore is subject to constant reduction in length as the electrodes are consumed. It will be readily seen that there are various ways in which the operation of the automatic igniter may be governed by the current other than that chosen for illustration. Thus, the functions of the electro-magnet and spring may be relatively reversed, the force of the spring or of gravity may be made to withdraw the igniter from proximity with the electrodes, and the force of an electro-magnet or electro-helix may be employed to move the igniter up to the electrodes for the re-establishment of the arc when required. To effect this result the line wires will be connected directly with the two electrode-holders, and the electrode-holders will be connected with a differential circuit containing an electro-magnet or an electro-helix, and also containing a rheostat of suitably proportioned resistance. In this case the force of the electro-magnet will be so proportioned as to be insufficient to overcome the force of the spring, excepting when by the extinguishment of the arc the entire current is compelled to pass over the differential circuit. Instead of using an electro-magnet two helices or coils may be employed, one being fixed in position and the other attached to the rocking arm O² of the igniter. In this case, as before, the action of a spring or of gravity is enlisted to move the igniter in one direction, and the force due to the polarization of the helices or coils, tending to alter their positions relatively to each other, acts upon the igniter in the direction opposite to that in which the spring acts.

Figures 41 and 42 show in front and side elevation an igniter that has a vertical reciprocating motion. In these figures, P is a rod of carbon affixed to the lower end of a rack, P¹, which is driven by a pinion, P². The shaft P³, upon which the pinion is mounted, is provided with a pulley, P⁴, which is connected by a band or belt, P⁵, with another pulley, P⁶. A lever, Q, oscillating upon the pivot Q¹ is provided upon its shorter arm with the armature Q². This armature is acted upon by the electro-magnet Q³, the coil of which is included in the circuit which supplies the torch R. The longer end of the lever Q is provided with a clutch composed of the stationary jaw S and the pivoted jaw S¹. A spring, S², tends to rock the face of the pivoted jaw against the stationary jaw S. When the arc is disestablished and the current ceases to flow, the electro-magnet Q³ is depolarized, and the longer end of the lever Q, under the influence of gravity, then drops down until the projecting arm S³ of the jaw S¹ strikes against the stop-pin S⁴. This lifts the jaw S¹, and thus opens the clutch and allows the band P⁵ which is introduced between the jaws of the clutch to move freely. Under these circumstances the weight of the rack P¹ causes it to fall, thus dropping the carbon P down until its lower end enters the space between the upper ends of the electrodes. By this method of arrangement it will be seen that the igniter is allowed to fall any distance that may be required to enable it to reach the torch. When it has reached the torch it bridges the gap between the electrodes, and the arc is immediately re-established. This polarizes the electro-magnet Q³, and causes it to attract the armature Q², and thus rock the longer end of the lever Q upward; the effect of this is to lift the arm S³ of the pivoted jaw from the stop S⁴, thus allowing it to press the band P⁵ against the face of the stationary jaw. By this means the band P⁵ is firmly clutched, and is moved upward with the longer arm of the lever by the force of the electro-magnet. The upward movement of the side of the band upon which the clutch acts is transmitted by the pinion P² to the rack P¹, which is thus lifted a prescribed distance, that is to say, two, three, or more inches, or whatever distance the gearing is arranged for. This motion of the rack elevates the igniter, which remains elevated above the torch until the arc is again extinguished, when it immediately drops down and re-establishes the arc as before. It will be observed that the peculiarity of this arrangement is that the igniter has a variable range in its downward movement, but a limited range in its upward movement. It is only necessary to lift the igniter a short distance from the end of the torch, and thus it is so lifted from such variable starting-points as may be due to the gradual reduction in the height of the torch.

Figures 43 and 44 show a modification of the torch, one of the electrodes being made capable of tilting so as to act also as an igniter. In this case the holder of the stationary electrode will be connected with one pole of the battery or other source of electricity, and the tilting holder will be connected with the other pole, the mechanism for operating the tilting holder being substantially the same as that already described. If desired, both electrodes may be mounted in tilting holders, which are geared or otherwise so connected as to oscillate together in the same plane as shown in figure 45. For many purposes an electric lamp constructed upon this principle will be found of superior usefulness. Either the stationary electrode or the tilting electrode may be provided with the cylinder of lime, glass, or other material, which will in this case also effectually preserve the arc at the points of the electrodes.

This

Improvements in Apparatus for generating Electric Currents.

This part of my improvements includes the combination with the electro-magnet and spring which operates the electrodes, of a curved lever or cam, by means of which the force with which the spring acts upon the tilting electrode-holder is varied to correspond as nearly as possible with the variable attractive force of the electro-magnet upon the armature in the different positions which the armature occupies as the electrodes diminish in length.

In the apparatus represented in figures 43 and 44 the negative electrode-holder T is stationary, and like the other electrode-holder is provided with a sleeve, T¹, wherein the lower end of the electrode U is held by the set-screw T². The positive electrode U¹ is similarly mounted in a sleeve affixed to the end of the lever *a*, which is pivoted upon a standard, *a*¹, affixed to a metallic plate, *a*². The longer end of the lever *a* rests upon the curved upper edge of the lifter *b*, which is pivoted at its end to the standard *b*¹, and is lifted by the action of a spring, *b*², linked to the outer end *b*³ of the lifter, and secured to the lower end of the adjusting screw *b*⁴, supported in an intermediate standard, *b*⁵. An electro-magnet, *c*, the coil *c*¹ of which is included in the circuit, has its core so inclined that its longitudinal axis bisects the axis of the lever *a*. The armature upon which the magnet acts is a bar of iron, *c*², affixed transversely to the lever *a*. One end of the coil of the electro-magnet is affixed to the binding-post *c*³, and the other end is affixed to the inclined metallic standard *c*⁴, to which the core of the magnet is attached, and is thus electrically connected, through the plate *a*², standard *a*¹, and lever *a*, with the electrode U¹. It may be convenient to use two electro-magnets as shown in figure 44, the coils of both being included in the circuit. The other electrode U is electrically connected with the binding-post T³; when the arc is established between the points of the electrodes the electro-magnet is polarized and attracts the armature *c*², causing it to swing towards the centre of the magnetic field without contact with the core.

As the arc moves downwards the points of the electrodes are separated, and the resistance being thus increased the force of the electro-magnet is diminished. The spring *b*² then acts in the contrary direction, tending to move the point of the tilting electrodes towards the point of the stationary electrode. It is an easy matter to so adjust the relative forces of the magnet and of the spring that the points of the electrodes are maintained at the proper distance apart.

It will of course be understood that it is immaterial whether the negative electrode be mounted in the stationary holder or the tilting holder. In figure 43 the positive electrode is represented as being mounted in the tilting holder, and being provided upon its outer side with the cylinder or prism U², of lime, glass, or other foreign material added to the electrode, for the purpose of affording an excess of conducting vapour at the point where the arc is to be maintained. Figure 45 simply illustrates a lamp of this class in which both electrodes are mounted in rocking holders, the rocking holders *e* and *f* having parallel axes of oscillation, *e*¹ and *f*¹, and being geared together by means of the toothed sectors *e*² and *f*². If desired, the electro-magnet lifter and spring may be duplicated as shown, acting in one case upon the longer end *e*³ of one lever, and in the other case upon the longer end *f*³ of the other lever, but this will not ordinarily be necessary. The longer end *f*³ of the lever which carries the holder *f* may be weighted to counterbalance the weight of the electrode, and a single electro-magnet will then answer to operate both rocking holders, by means of the geared sectors *e*² and *f*² which connect them. It will of course be seen that the electrodes, instead of being mounted in tilting holders, may be mounted in laterally sliding holders and in relatively inclined positions, so that the points of the electrodes can be brought together by a spring or springs, tending to move the sliding holder or holders in one direction, and can be separated by a magnet or magnets, tending to move the sliding holder or holders in the opposite direction.

I claim, with respect to the said third portion of my invention—

First—A system of independent operative circuits, established by winding upon the cores of the stationary magnets separately insulated wires, the opposite ends of each wire being electrically connected, the one with one of the commutator brushes, and the other with an outside circuit or line wire, the opposite ends of such line wires being electrically connected with the other commutator brush, substantially as and for the purpose set forth.

Second—In a dynamo-electric machine, substantially such as shown and described, the iron standards A¹ A¹ connecting the outer ends of the stationary magnets, and provided with the series of parallel slots A⁶, as and for the purpose set forth.

Third—Constructing the stationary magnets with curved parallel plates of wrought-iron (constituting the poles thereof), as and for the purpose above described.

Fourth—In combination with the curved stationary magnets, the bracing pieces H H, composed of brass or some other non-magnetic material, and affording the bearings for the armature shaft, substantially as shown and described.

Fifth—The binding posts C¹¹, C²², C³³, and C⁴⁴, arranged upon insulating material placed upon the upper curved pole, substantially as shown and described.

Sixth—In combination with the commutator and brushes of a dynamo-electric machine the fixed gauges K⁴ and K⁵, substantially as and for the purpose set forth.

Seventh—An armature wound with a double system of coils in separate divisions, such divisions being looped together and the loops connected with the commutator strips, substantially as and for the purpose described.

Eighth—A double system of armature coils wound and connected, substantially as shown and described, in combination with a commutator composed of separately insulated strips, divided from each other on lines at an angle to the axis of the commutator shaft, and two brushes, each adapted to hold contact with one strip until after it has acquired contact with the next adjoining strip, substantially as and for the purposes set forth.

Ninth—A system of separated stationary coils, having their free ends respectively connected with separate operative circuits, in combination with an armature rotating within the stationary coils, and having its coils electrically connected with an outside machine or other source of electricity, as described with reference to figures 36 and 37.

Tenth—In an electric lamp or torch, the combination of one or each of the electrodes with a cylinder or prism, composed of lime, glass, or other material which is capable of volatilization by the heat of the arc, and which, when volatilized, affords a vapour of superior conductivity, as and for the purpose set forth.

Eleventh—

and for producing Electric Light.

- Eleventh—An electric torch, composed of two stationary electrodes mounted in suitable holders in parallel positions, and respectively connected with the opposite poles of a battery or other source of electricity, and having cemented or otherwise attached to the outer side of one or each electrode a cylinder or prism of lime, glass, or other material, substantially as and for the purpose set forth.
- Twelfth—In combination with an electric lamp, candle, or torch, in which the position of the arc varies as the electrodes are consumed, an automatic igniter, composed of a movable conducting rod, a spring, and an electro-magnet or helix, the coil of which is included in the circuit which supplies the current for the arc, the spring operating to move and hold the igniter against or between the points of the electrodes when the arc is extinguished, and the electro-magnet operating to move and hold the igniter away from the points of the electrodes when the arc is established, substantially as described.
- Thirteenth—In combination with the negative electrode N of an electric lamp or torch, the positive electrode M of greater area in cross section than the negative electrode, and provided with a longitudinal groove, in which is cemented or otherwise secured the cylinder or prism M' of lime, glass, or other material, as and for the purpose set forth.
- Fourteenth—In combination with an electric torch or candle an igniter, operated in one direction by a spring or by gravity, and in the other direction by an electro-magnet or electro-helix, and having an endwise movement towards and from the torch or candle, in a line coinciding with the space between the electrodes composing the torch or candle, substantially as and for the purpose set forth.
- Fifteenth—In combination with an electric torch or candle, in which the position of the arc varies as the electrodes are consumed, an igniter having variable ranges of movement, substantially as and for the purpose set forth.
- Sixteenth—In combination with an electric candle or torch of the apparatus shown in figures 41 and 42, for operating an igniter affixed to the end of a reciprocating rack or slide moving in line with the torch, substantially as shown and described.
- Seventeenth—In combination with an igniter for an electric lamp, candle, or torch of a self-adjusting movable clutch, adapted to grip and operate the mechanism for withdrawing the igniter from the electrodes when the arc is established, and to free itself from such mechanism for the purpose of allowing the igniter to approach the electrodes when the arc is disestablished, substantially as shown and described.
- Eighteenth—The combination with an electric lamp, candle or torch, in which the position of the arc varies as the electrodes are consumed, of an igniter which has a variable capacity of movement, and is automatically governed in its operation by the current, substantially as described.
- Nineteenth—An electric lamp, provided with electrodes of cylindrical or prismatic form, placed in nearly parallel positions in the same plane; one or both of the electrodes being mounted in a movable holder or holders, whereby the points of the electrodes are maintained in the required proximity as the electrodes are progressively reduced in length by their combustion.
- Twentieth—In an electric lamp, electrodes of a cylindrical or prismatic form, arranged in nearly parallel positions in the same plane, and mounted, one or both of them, in a movable holder or holders, in combination with an electro-magnet or magnets, and a spiral spring or springs so arranged with reference to the electrode holders that the outer ends of the electrodes are separated when the attractive force of the electro-magnet or magnets preponderates over the force of the spring or springs, and the outer ends of the electrodes are brought together when the force of the spring or springs preponderates over the attractive force of the magnet or magnets, substantially as described.
- Twenty-first—In an electric lamp, two tilting or rocking electrode holders, having parallel axis of oscillation, and geared or connected together, in combination with an electro-magnet and a spiral spring, whereby the forces of such electro-magnet and spring act upon one only of the tilting or rocking holders, and are transmitted to the other rocking or tilting holder by means of the gearing or other connection of the electrodes with each other, substantially as described.
- Twenty-second—In an electric lamp, provided with one or two tilting electrodes, an electro-magnet, and an armature adapted to swing across the magnetic field in front of the core of the magnet, in combination with a spiral spring and a curved arm or lifter, for the purpose of transmitting the force of the spring to the armature-carrier with a variable leverage, substantially as shown and described.

In witness whereof, I, the said Edward Weston, have hereto set my hand and seal, this seventh day of February, one thousand eight hundred and eighty-two.

Witness—

W. S. BAYSTON,
Clerk to Edwd. Waters,
Patent Agent, Melbourne.

EDWARD WESTON,
By his Agent,
EDWD. WATERS.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to Edward Weston, this fourth day of April, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Improvements in Apparatus for generating Electric Currents, &c.

REPORT.

Sir, We do ourselves the honor to report, in reply to your blank cover communication of the 13th ultimo, No. 2,182, transmitting Mr. Edward Weston's application for the registration of an invention entitled "Improvements in Apparatus for generating Electric Currents and for producing Electric Light," that we are of opinion the prayer of the Petitioner may be granted, in terms of his specification, drawings, and claim.

The Under Secretary of Justice.

Sydney, 1 March, 1882.

We have, &c.,

E. C. CRACKNELL.
GOTHER K. MANN.

[Drawings—eight sheets.]

Fig. 1.

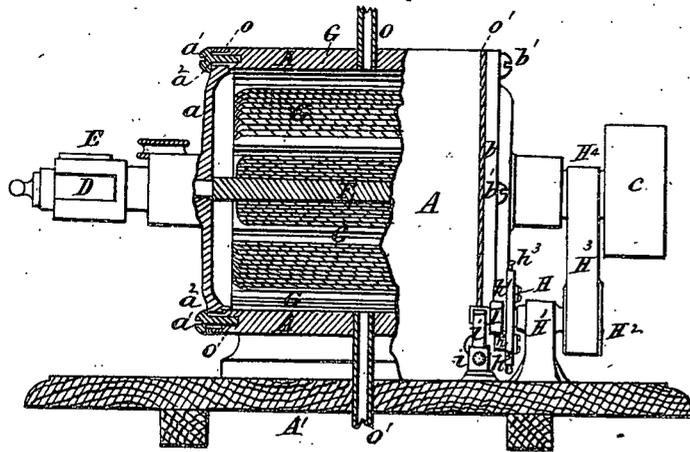


Fig. 4.

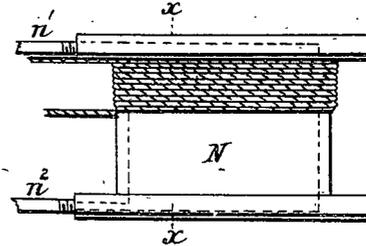


Fig. 5.

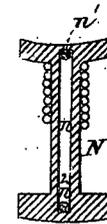


Fig. 2.

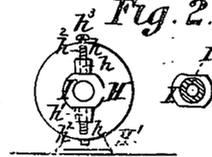


Fig. 3.

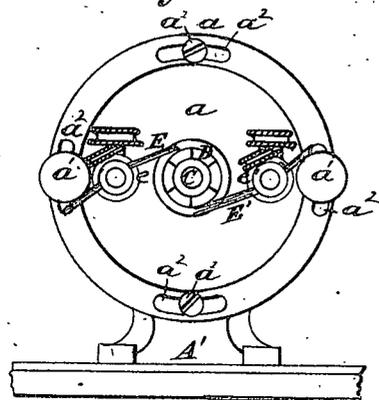
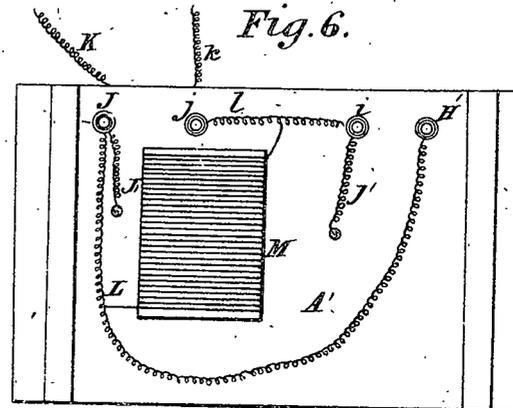


Fig. 6.



This is the Sheet of Drawings marked B. referred to in the annexed Letters of Registration granted to Edward Weston, this fourth day of April, A.D. 1882

Augustus Loftus.

Fig. 32.

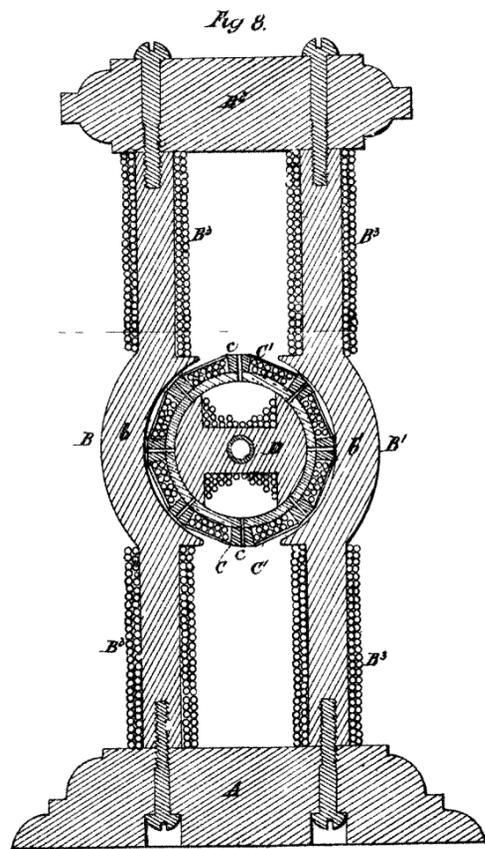
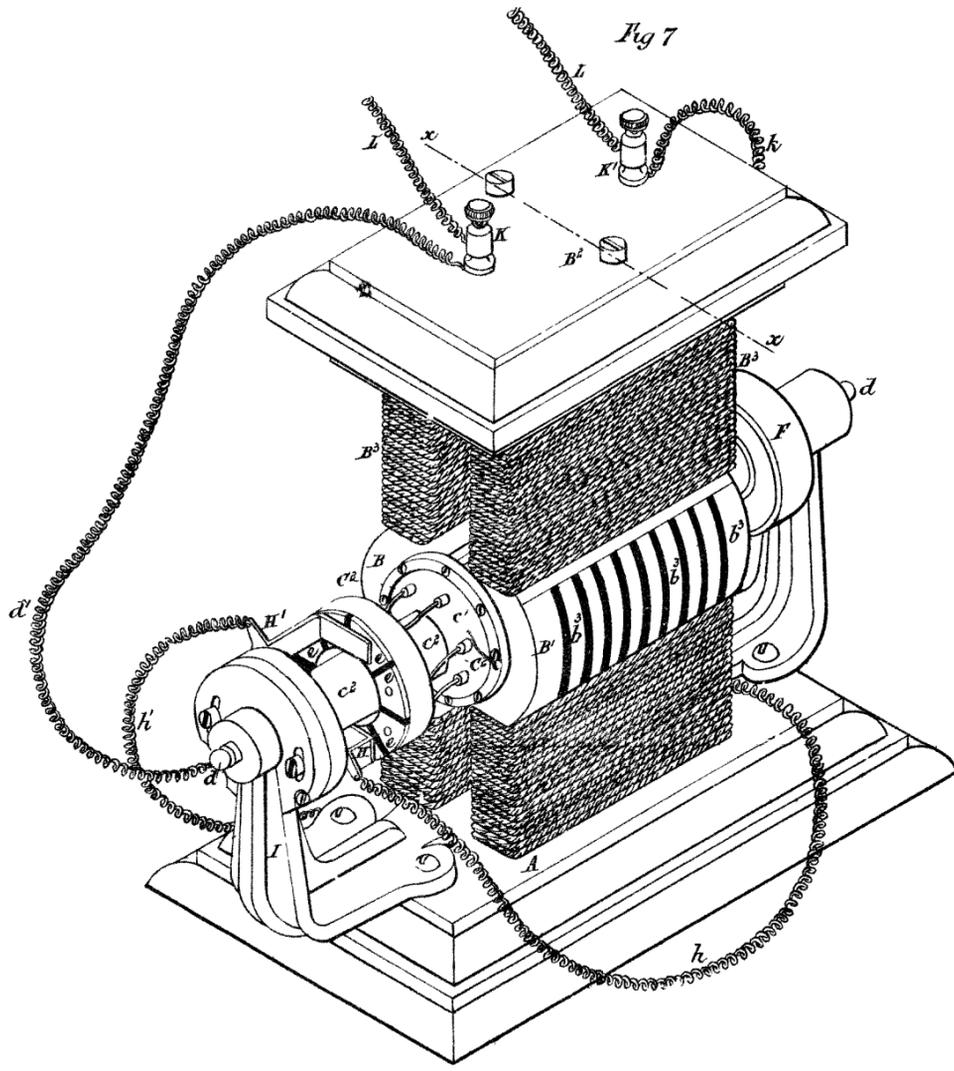


PHOTO-LITHOGRAPHED AT THE GOVT PRINTING OFFICE, SYDNEY, NEW SOUTH WALES

This is the Sheet of Drawings marked C referred to in the annexed Letters of Registration granted to Edward Weston, this fourth day of April, A.D. 1882.

Augustus Loftus.

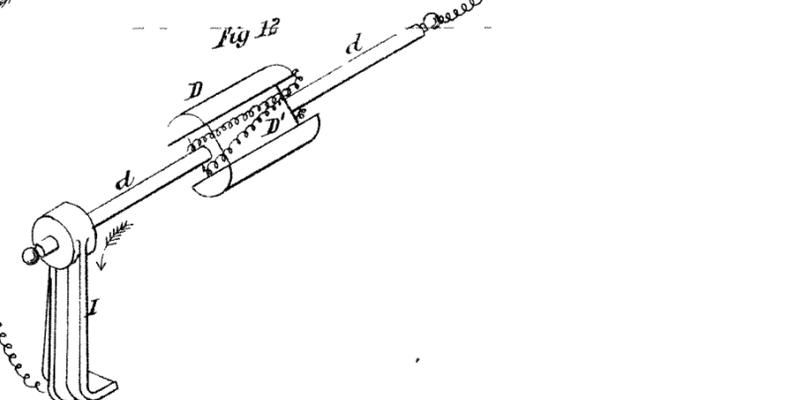
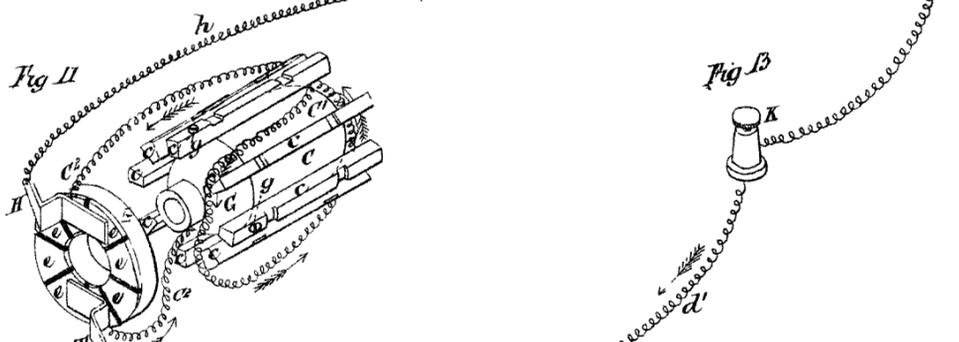
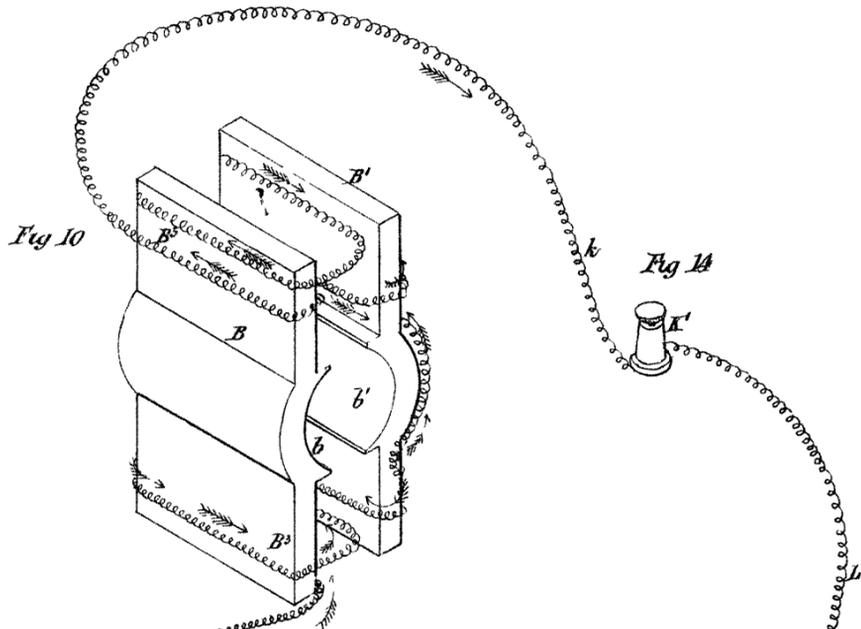
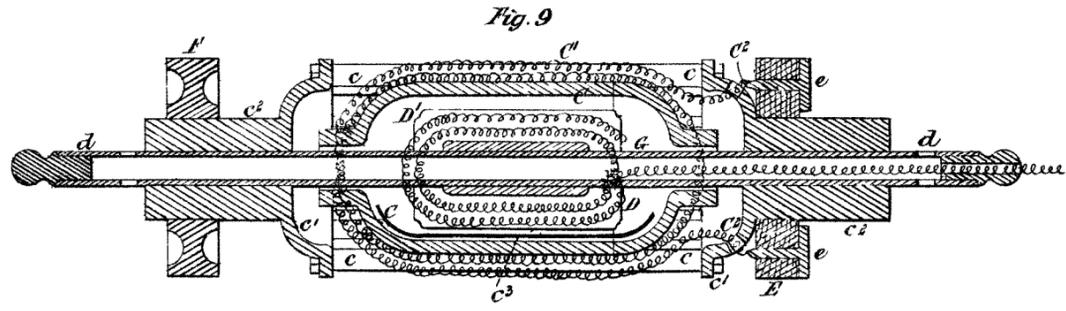


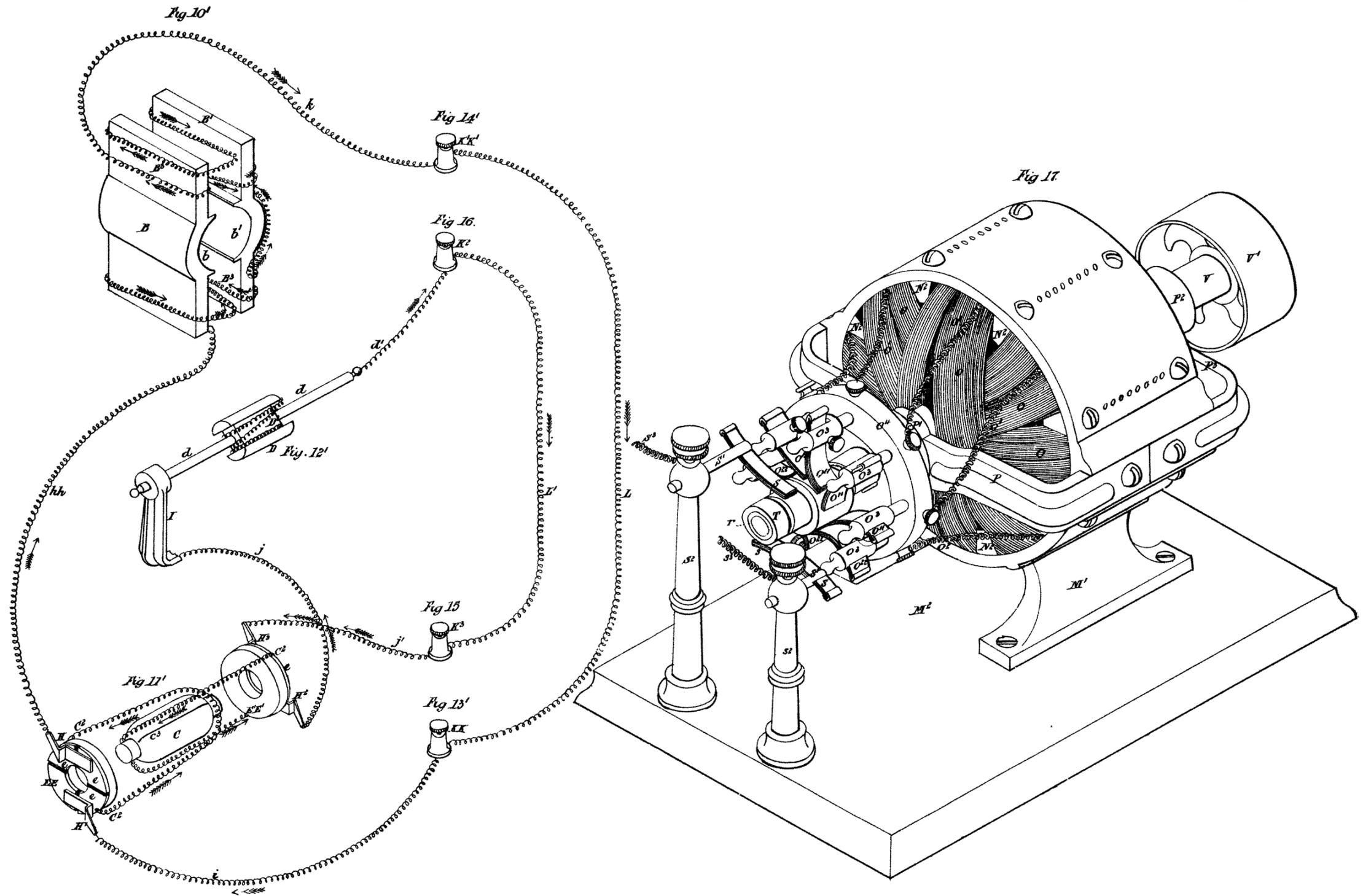
PHOTO-LITHOGRAPHED AT THE GOVT. PRINT'NG OFFICE, SYDNEY, NEW SOUTH WALES

This is the Sheet of Drawings marked D referred to in the annexed Letters of Registration granted to Edward Weston, this fourth day of April, A. D. 1882.

Augustus Loftus.

E.

1055



This is the Sheet of Drawings marked E referred to in the annexed Letters of Registration granted to Edward Weston, this fourth day of April, A.D. 1882.

Augustus Loftus.

(32-)

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

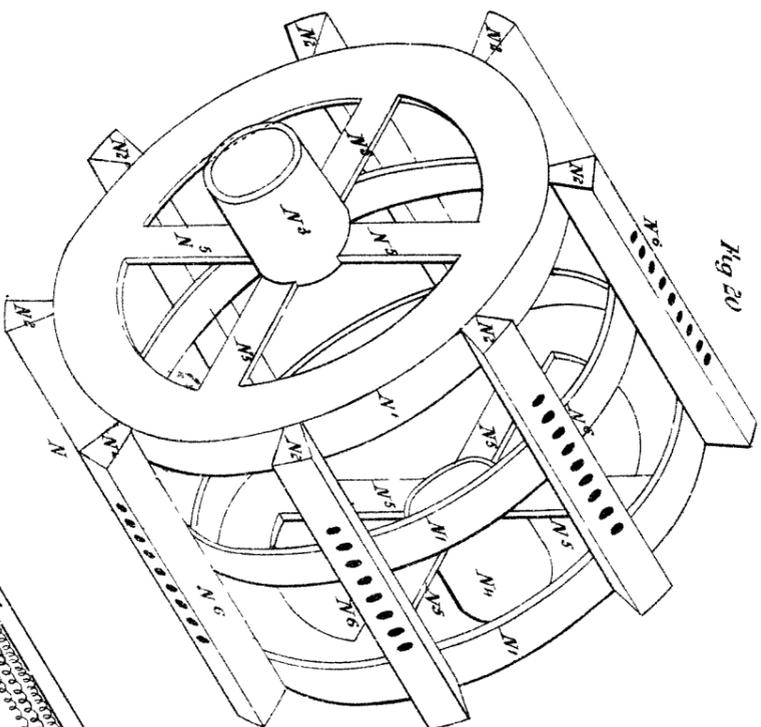


Fig 20

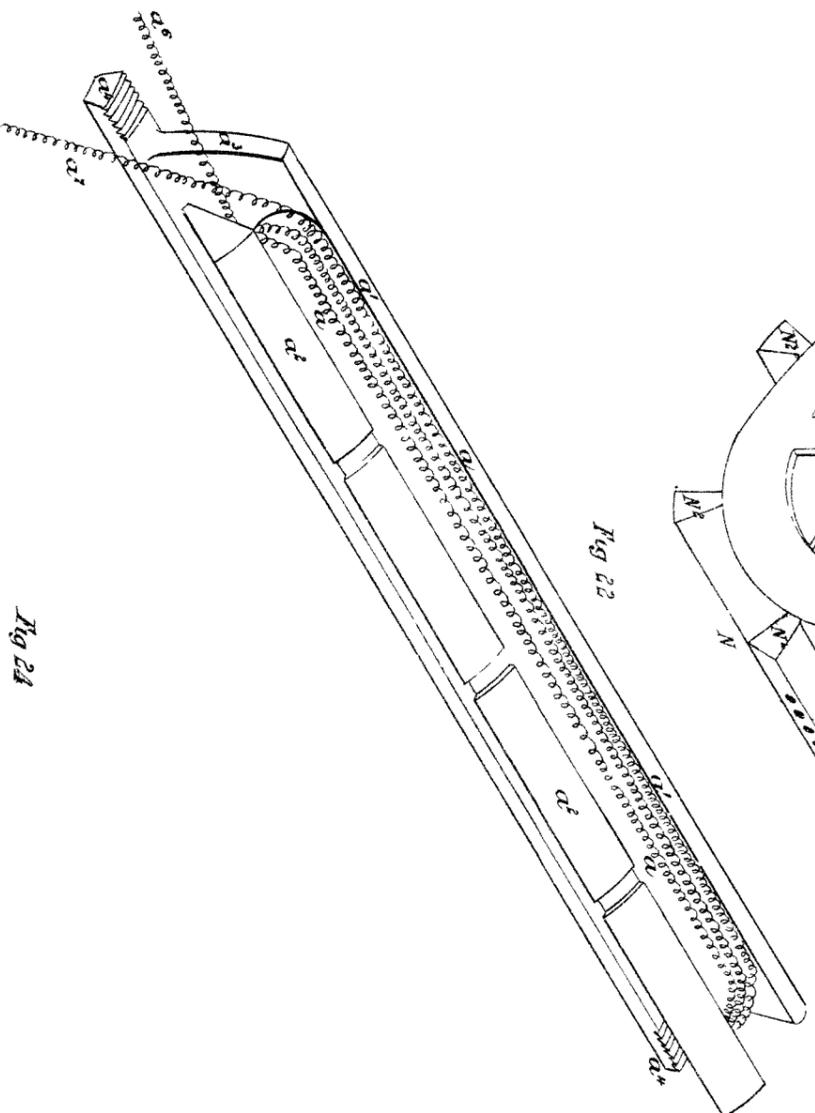


Fig 22

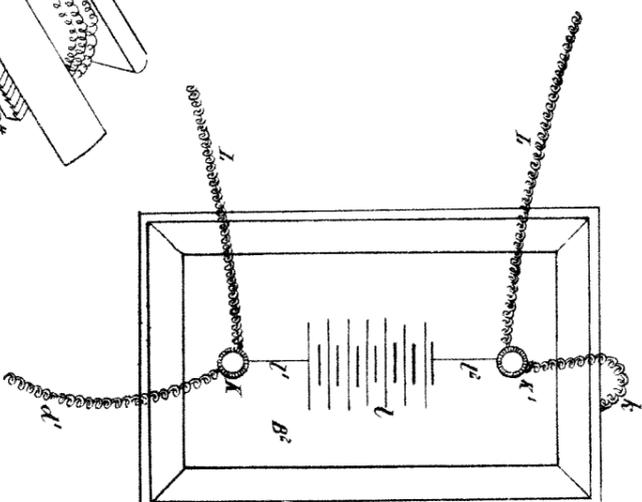


Fig 21

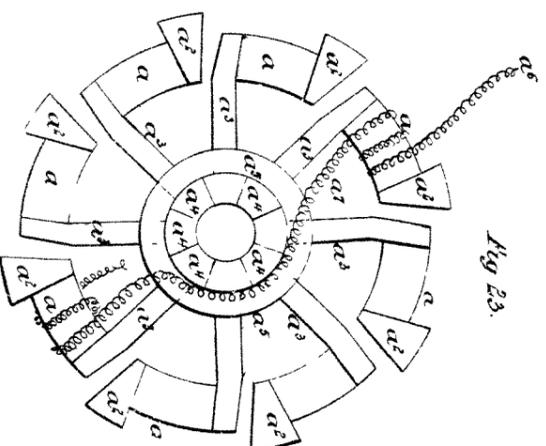


Fig 23.

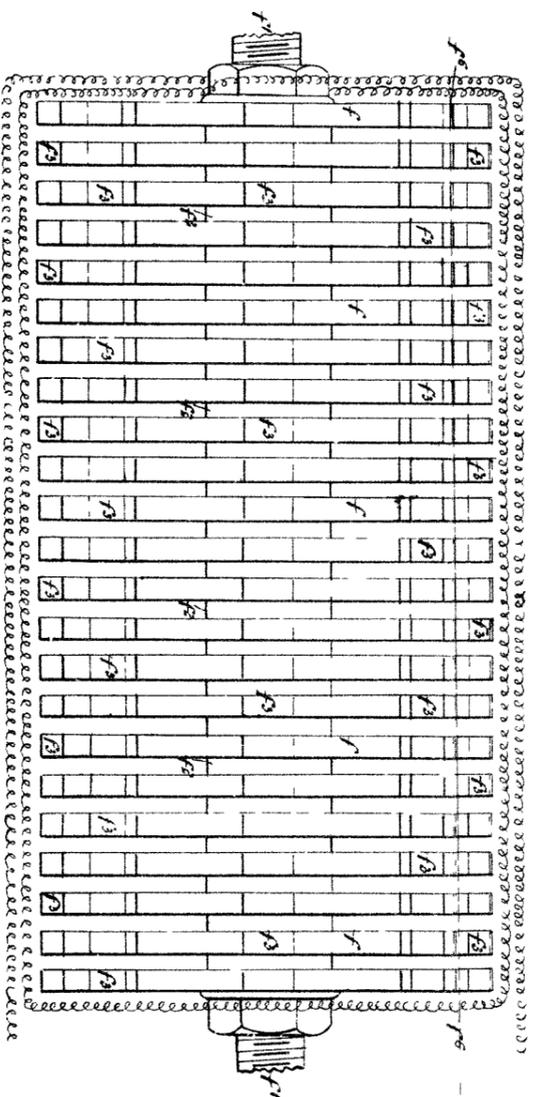


Fig 24

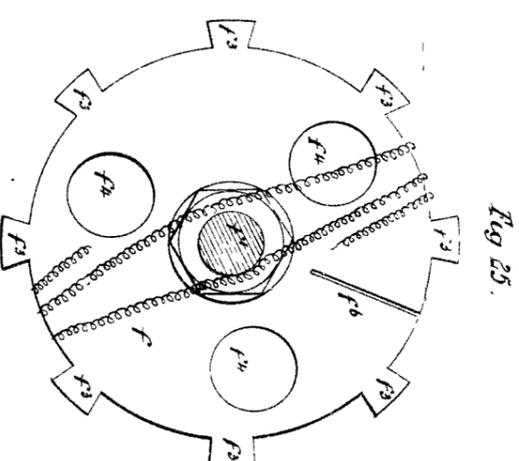


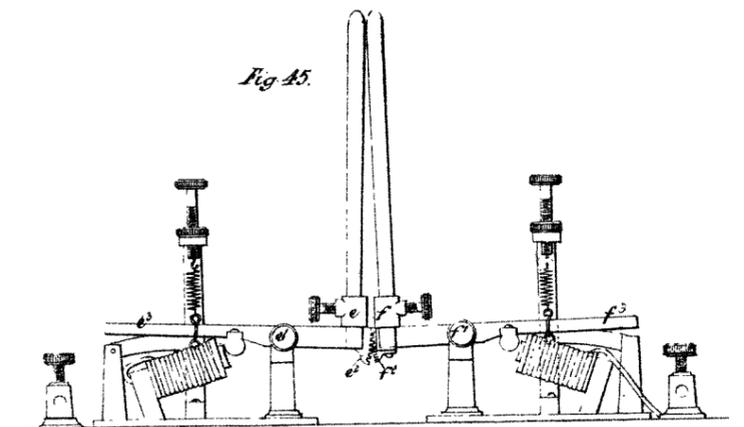
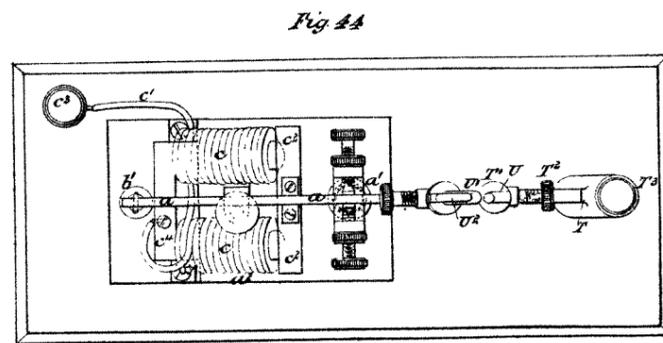
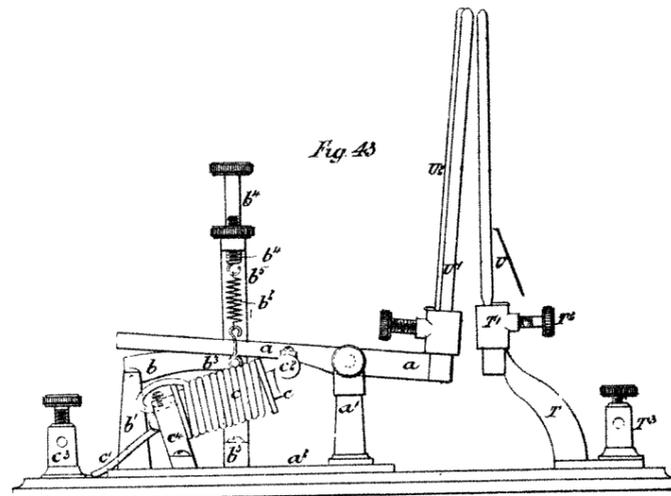
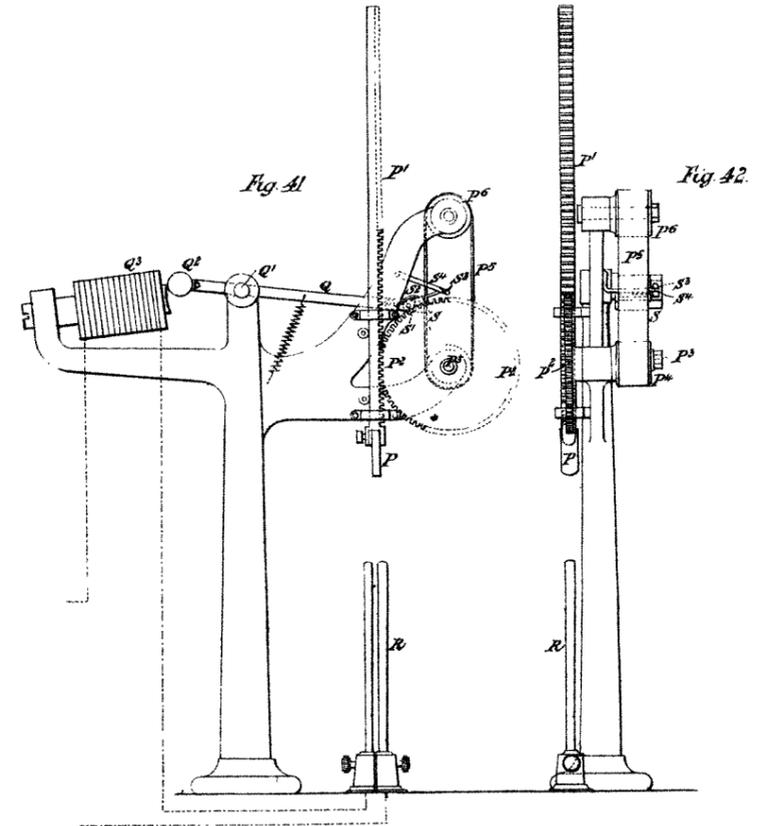
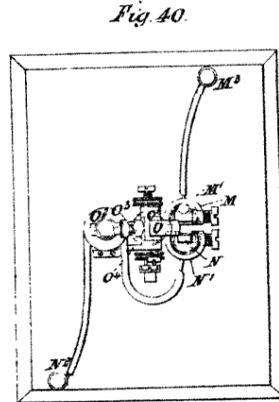
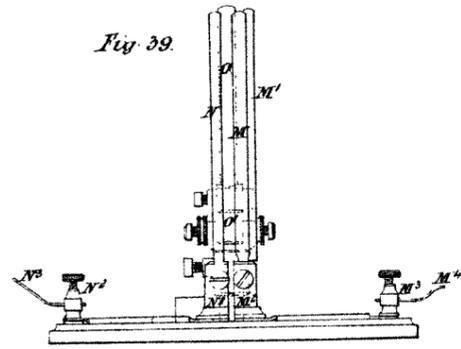
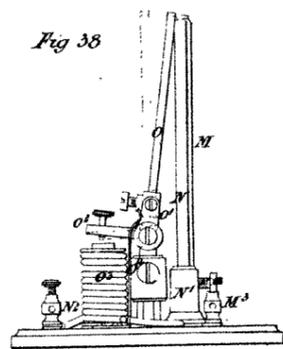
Fig 25.

*This is the Sheet of Drawings marked & referred to in the annexed
Letters of Registration granted to Edward Weston, this fourth day
of April, A.D. 1882.*

Augustus Loftus.

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

(Sq 32.)



This is the Sheet of Drawings marked I referred to in the annexed Letters of Registration granted to Edward Weston, this fourth day of April, A.D. 1882.

Augustus Loftus.



A.D. 1882, 18th April. No. 1056.

IMPROVEMENTS IN BILLIARD AND BAGATELLE TABLES.

LETTERS OF REGISTRATION to Walter Buttery, for Improvements in Billiard and Bagatelle Tables.

[Registered on the 19th day of April, 1882, 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 WALTER BUTTERY, of the firm of Burroughes and Watts, of Soho Square, London, in the county of Middlesex, in England, billiard-table makers, 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 Billiard and Bagatelle Tables," 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 Walter Buttery, 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 Walter Buttery, 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 Walter Buttery 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 eighteenth day of April, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Billiard and Bagatelle Tables.

SPECIFICATION of WALTER BUTTERY, of the firm of Burroughes and Watts, of Soho Square, London, in the county of Middlesex, in England, billiard-table makers, for an invention entitled "Improvements in Billiard and Bagatelle Tables."

MY invention relates to certain improvements in the construction of billiard-tables, whereby a billiard-table is rendered convertible into an ordinary or dining-table and reconvertible for billiards with great facility and rapidity; and it consists essentially in the use of sliding blocks so arranged as to automatically fix the table to the proper level for playing at billiards, supporting it solidly and securely in that position, and to be easily removed when it is desired to lower the table.

I attain these objects by the mechanism illustrated in the accompanying drawings, in which similar letters refer to similar parts throughout the several views:

Figure 1 is an end view of my improved table, arranged and fitted for dining purposes; figure 2 is a similar view of it, as it appears after the removal of the top boards and its being raised to the level for billiards; figure 3 is an inverted plan of figure 1, showing position of end cross piece or rail and sliding block; figure 4, an inverted plan of figure 2; and figure 5, a perspective view of the table arranged for billiards.

A indicates the legs or supports, which may be of any desired shape and material; B, end cross piece or rail; C, boards or leaves forming top of ordinary or dining-table; D, billiard-table with ordinary bed cushions and pockets; E, sliding block—there is one at each end of the table; F, gussets or corner-pieces; G, guide plate; H, spring bolt; I, spiral spring; K, hand lever.

To convert this table, as at figure 1, for billiards, as at figures 2 and 5, the boards or leaves C are removed; the table D is then lifted at one end, and the block E pushed on to the cross piece or rail B by the string bolts H immediately secures the table D at the proper height at that end; the same operation is then performed at the other end; or both ends may be raised, and the sliding blocks move into position simultaneously.

To reconvert the table for dining or general purposes, the table D is slightly raised and the block E pushed off the cross piece or rail B by means of the hand lever K, when the table lowers of itself.

The arrangement shown is equally applicable to bagatelle as to billiard tables.

The frame of the table with its bed and cushions is constructed in the ordinary manner, but the end cross pieces, B, of the frame are set upon the table legs or supports and the rail between them in such a manner that they may be raised vertically in suitable guides, G. The sliding blocks E, which extend across each end of the table inside of and parallel with the end of the frame of the table when lowered, may be of wood or of any suitable material, but of a depth equal to the difference of level between a billiard and an ordinary table, and of any suitable breadth, these blocks being set in guides; and instead of the springs H I, any suitable spring or springs may be used which will keep the block pressing against the end of the frame when this latter is resting upon the cross rail B and the legs or supports A. In lieu of the hand lever K, I may use any suitable means to compress the spring or springs when the sliding block E is to be pushed off the cross piece or rail B. The board or boards C, with which I cover the table when it is to be used for dining or general purposes, rest upon the frame or edge of the cushions, and I may prevent any lateral movement across these cushions by forming a recess or flanging the under side of the board or boards, which I may connect and keep down upon the frame by any suitable catch or catches.

A modification of the above is shown in figures 6 and 7, in which figure 6 represents an inverted plan of a table with sliding bar pushed back; figure 7 being a similar view, but with sliding bar shown in the position it occupies when the table is raised.

In this arrangement the gussets F are dispensed with, the guides being altered as shown.

L is a thumb-screw passing through the end of the guide G, and working within a slot in a metal plate, M, attached to inner face of the leg A.

N N are stay bolts extending immediately below and bearing upon the middle rail of the under frame of the table, whereby any deflection at its centre is prevented.

Having now described and ascertained the nature of my said invention and in what manner the same is or may be performed, what I claim as of my invention and desire to secure by Letters of Registration is—

In a billiard or a bagatelle table, the sliding blocks E, arranged to operate substantially as described and for the purposes specified.

In witness whereof, I, the said Walter Buttery have hereto set my hand and seal, this ninth day of December, one thousand eight hundred and eighty-one.

WALTER BUTTERY.

Witness—

N. E. GEDGE,
Patent Agent,
11, Wellington-street, Strand, London; England.

This is the specification referred to in the annexed Letters of Registration granted to Walter Buttery, this eighteenth day of April, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Improvements in Billiard and Bagatelle Tables.

REPORT.

Sir,

Having examined the specification and plans accompanying the Petition of Mr. Walter Buttery for an invention entitled "Improvements in Billiard and Bagatelle Tables," we have the honor to report that we see no objection to Letters of Registration being issued as prayed for.

The Under Secretary of Justice.

Sydney, 24 February, 1882.

We have, &c.

JOHN WHITTON:
JAMES BARNET.

[Drawings—one sheet.]

No. 1057.

[Assignment of No. 1036. See page 35.]

No. 1058.

[Assignment of No. 992. See Letters of Registration for 1881, page 323.]

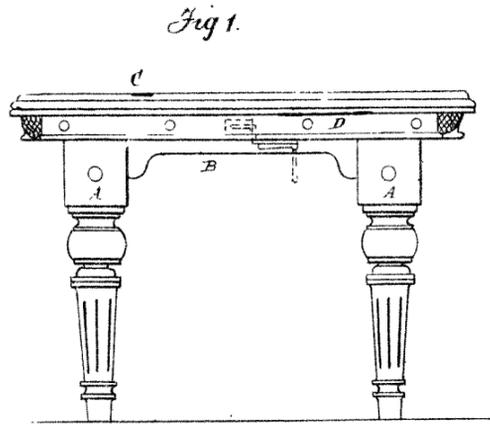


Fig. 1.

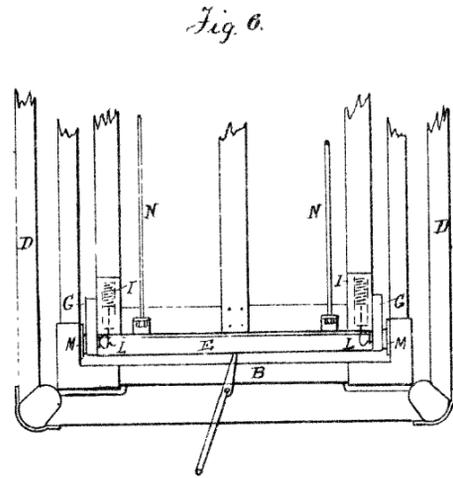


Fig. 6.

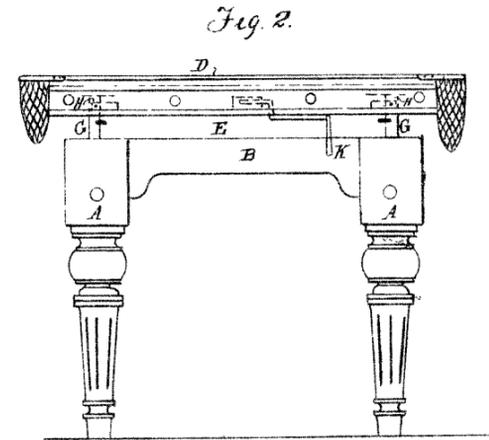


Fig. 2.

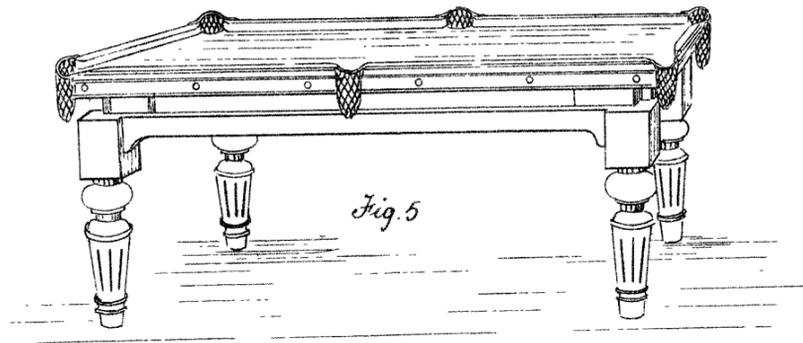


Fig. 5.

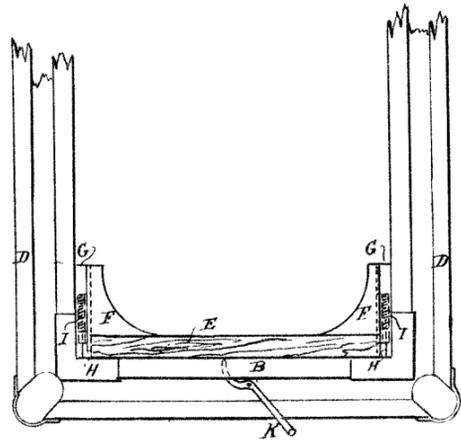


Fig. 3.

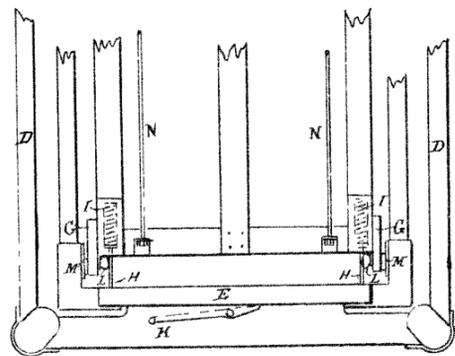


Fig. 7.

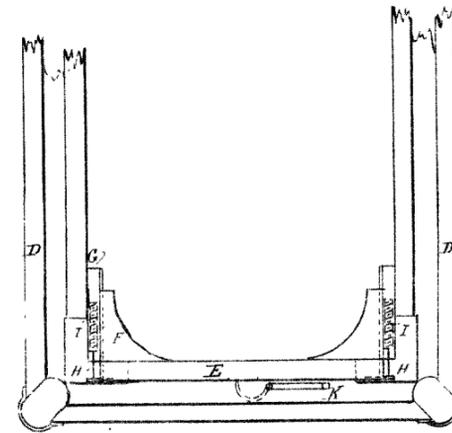


Fig. 4.

*This is the Sheet of Drawings referred to in the annexed
 Letters of Registration granted to Walter Buttery, this eighteenth
 day of April, A.D. 1882.*

Augustus Loftus.

(Sig. 32.)



A.D. 1882, 26th April. No. 1059.

E. B. PARNELL'S PYRITES PROCESS.

LETTERS OF REGISTRATION to Elizabeth Barnston Parnell, for an invention entitled "E. B. Parnell's Pyrites Process."

[Registered on the 26th day of April, 1882, 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 ELIZABETH BARNSTON PARNELL, of 383, Bourke-street, Sydney, hath by her Petition humbly represented to me that she is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "E. B. Parnell's Pyrites Process," 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 she, 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 her 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 Elizabeth Barnston Parnell, her 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 Elizabeth Barnston Parnell, her 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 Elizabeth Barnston Parnell 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 April, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

E. B. Parnell's Pyrites Process.

SPECIFICATION.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, ELIZABETH BARNSTON PARNELL, of Sydney, in the Colony of New South Wales, 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 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 the extraction of gold and other metals from pyrites and other ores, by a mechanical series of inventions forming one process, to be designated "E. B. Parnell's Pyrites Process"; and in order to obtain the said Royal Letters Patent I must, by an instrument 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:—

The grinder is a hollow sphere, which may be of one casting, or it may be in two or more sections bolted together; the casting should be about 2 inches thick. Upon each centre on the outer side I attach axis rollers, which I prefer to be about 18 inches in diameter by 8 inches thick; their edges are rounded, with a view to their gearing into a pair of friction wheels (on each side the said hollow sphere), grooved on the edge in such a manner as to permit the said axis rollers to run. The friction wheels are keyed on to shafts eccentrically, each pair of wheels being geared so as to alternate the stroke (or I may place each pair of wheels on a separate shaft), thereby communicating an oscillating motion to the grinder, whilst at the same time it revolves. These friction eccentric wheels to be about 3 to 4 feet in diameter; the whole weight of the grinder being on the said friction wheels and driving shaft or shafts, fitted into plummer blocks and heavy framing, which latter may be of wood or iron. I furnish the grinder with a number of cast iron balls, say fifty, more or less, about four pounds in weight each. By this method the maximum amounts of grinding power is obtained by the circular and the eccentric motion of the balls against each other and the sphere. I provide a man-hole and door, which latter may be made fast, either by nuts and bolts or by hand-bar and screws, as shown in the plans, sheet 2, figure 3 and 4. This man-hole is provided for the purposes of charging and discharging, and may be about 12 inches by 7 inches or thereabout. The shafts are provided with driving pulleys. The furnace for the purposes of this invention is, in general form, that of a reverberatory, but differing in the construction of the hearth, which I construct of a series of fire lumps set at such an angle that when complete the hearth forms a number of furrows and ridges, thus . The under side of the hearth forms a number of flues communicating with (at one end) the fire-box, and at the opposite end with an inclined cellar at right angles. This cellar serves the purpose of discharging the pyrites or ore when deemed sufficiently calcined. The upper part of the hearth forms a corresponding series of furrows, into which the raw mineral is fed through feed-ports pierced in the crown of the furnace. Each of these furrows is closed by a brick wall to crown of furnace next the fire-box, to intercept the course of the fire, which escapes by uptakes into a transverse flue built on the crown. I provide each furrow with a number of rabblers carried on a hollow shaft, the whole of which are made to travel along the course of the hearth about 18 inches, more or less, so that a constant and perfect rabbling may be secured. The ends of these shafts travel in bearings provided in side plates which secure the sides of the furnace together. (These side plates form no part of this patent.) I prefer that the rate of speed at which these rabblers travel shall be about eight revolutions per minute, from a driving pulley and crank shaft in connection with the hollow rabble shafts. The flame will therefore travel from fire-box under the hearth and ascending the open ends of furrows over the cellar, turn over and back through the body of the furnace to flue on the top of the crown as described. I may make this furnace of any dimensions, but I prefer (say) 20 feet by 8 feet or thereabout. The hearth lumps are made to tongue and groove; the tongue being at each end and the groove along the sides, which is more clearly shown in the first sheet of drawings at figure 4. The boiler is a vessel of wood or metal capable of resisting the action of sulphurous or other acids, which I prefer to be 8 feet long, 2 feet more or less deep, and 4 feet more or less wide. Its timbers should not be less than 2½ inches thick. It is covered with a strong cover of wood, through which I provide a door about 12 inches by 7 inches more or less for a feed door, which is secured by bolts and nuts of copper or brass, or on copper hinges or other convenient means, provided that no iron is used in any position with which the liquid contained in the boiler will come in contact. At one end of the boiler I provide a similar door for the purpose of discharging its contents. I provide also a steam pipe to any upper portion of the boiler, to which I attach a flexible steam hose for the purpose of injecting steam into the boiler. I provide a safety-valve for the escape of steam. I provide a series of tapping holes at one end of the boiler, to draw off the water clear from the pyrites, at levels 2 inches apart more or less. The boiler so far described is fastened securely to an iron frame, which I propose to be as shown in the drawings, sheet 3, figure 1. The centre of the boiler is poised by means of its being provided with trunnions and pivot bar working in bearings attached to a strong frame. I provide a lever arm made fast to the lower centre of the boiler secured transversely to the pivot bar, its other end being attached to a connecting rod communicating with a crank or eccentric, by which a rocking motion is given to the boiler. I provide the boiler on its inner bottom with a number of studs or agitators, which I prefer to be of wood, and a section of each should describe a triangle. These I prefer to fix into a false bottom of wood about 3 inches thick.

The amalgamator is a circular iron pan, which is made to revolve about forty or fifty revolutions per minute more or less. It is carried on and made to revolve by under gearing (crown and bevelled wheels). I provide an upper frame of wood or iron carrying one or more (I prefer two) cross heads, from which depend a number of studs or agitators, which I prefer of the form shown in the drawings, sheet 2, figure 1, and perforated at their lower ends or shoes with holes about ¼ inch diameter. Behind each of these agitators I furnish a steam pipe which, together with the agitators, is adjustable, and I prefer that the agitators are set so as to nearly touch the bottom of the pan, and the steam pipes about

E. B. Parnell's Pyrites Process.

1 inch more or less above the level of the shoe $1\frac{1}{4}$ inch clear from the bottom of the pan. These steam pipes are provided for the purpose of more thoroughly effecting amalgamation by the division of the mercury through the pyrites, this being effected without the possibility of any flowing of the mercury, by the direct application of a series of jets of steam under pressure. The mode of treatment is as follows:—The pyrites are first put through a fine screen, then fed into the grinder, with sufficient cold water. In this machine they will be rapidly reduced to slimes. They are then dried, fed into the furnace, and roasted at a moderate red heat for a period of four to six hours. The duration of this first roasting, also the temperature at which it is conducted, will depend on whether the pyrites are single or conglomerate; that is, I consider them as conglomerates when other base metals exist in addition to copper, sulphur, and arsenic. In the case of such, the heat for the first three or four hours must be moderate, to allow of the base metals being thoroughly oxidized, when the heat may be raised; also pyrites from a granite formation take a less heat than those from a slate formation. Pyrites found in limestone require an extreme heat. After this first roasting I put the pyrites again through the grinder, for the purpose of grinding fine any particles of pyrites which may not be perfectly calcined (but without any water). They are then returned to the furnace and roasted at a high temperature for a further period of six to ten hours, as experience of their nature directs. The pyrites are then placed in the boiler with sufficient hot water to reduce them to the consistency of cream. Steam is then turned in and the charge is boiled, that is to say, kept at a temperature of 212° for the space of half an hour. They are then allowed a few minutes to settle, and the water is drawn off, after which the charge is washed with hot water twice. The first water will hold in solution all the copper and residues of base metal salts which may be soluble in water. This water will, if copper be present, be of a fine greenish-blue colour; even when there is no copper in the pyrites, boiling is essential to the thorough extraction of the precious metals. The pyrites are now in a fit state for amalgamation, and sufficient mercury (say 150 pounds) added; steam is then turned on at such a pressure as shall keep the mercury in a state of constant motion all through the pyrites and water contained in the pan till amalgamation is complete. I estimate the charge for amalgamation to be about 6 cwt. The mercury should be used for successive charges till fully charged with gold and silver, and then retorted. By the above mode of treatment I find that the most refractory pyrites may be treated with unvarying success; the cause of failures in the treatment of this mineral being that such portions only as are really treated give up the gold and silver and copper contained, the balance being found in the tailings, never having been touched either by fire or machine. Further, I find that unless the pyrites are absolutely boiled, that is kept at 212° for about half an hour, that the copper is not thoroughly dissolved out, thereby fouling the mercury and causing loss of the precious metals. For these reasons I have designed the several machines and furnace herein described, each and all of which are absolutely requisite to the success of my process. Four sheets of drawings accompany this specification, with references thereto as follows:—Sheet 1, figure 1, plan of hearth; A A A A, outside, side and end walls; B B B B B B, rabble holes; C, plan of hearth, showing furrows and bonding of hearth lumps; D D, floor-plates at furnace doors, carrying fire-bars, marked F F; E E, discharge cellars; W, point of section referred to at figure 3. Figure 2, end elevation (section); A, interior of furnace; B, crown; C C, side walls; D, fire-box; E, floor-plate; F, ash-pit; G, foundation; H, discharge cellar; I, under part of hearth, forming series of flues carrying fire from D; J, furrow; K, rabble hole; L, uptake and stack flue; S S, shaft carrying rables, marked T T; V V V, feed ports. Figure 3, cross section at W W (figure 1); A A, end walls and crown; B B B B B B, end of crown, showing uptakes S S S S into top flue, marked L at figure 2; C C, interior of furnace; D D D D D D, furrows; E E E E E E E E, lower side of hearth lumps, marked F, forming flues carrying fire from fire-box G; H, moulded lump to secure a footing for hearth lump (F); H H, discharge cellars; I, foundation; J J, cellar openings through lower part of walls (A A); K, crown of stack flue, marked P P. Figure 4, enlarged section of hearth lumps. Figure 5, view of rabble head (enlarged); A, shaft carrying rabble. Sheet 2, figure 1, amalgamator (elevation section); A A A, frame; A", cross-head, carrying agitators and steam jets; C C C C C, agitators; D D D D D, steam jets; B B B, section of pan; E E, crown and bevel wheels rotating B B B; H H, shaft and driving pulley; G G, journals; F, step journal carrying pan. Figure 2, ditto plan; A A A, frame; A", cross-head carrying agitators and steam pipes, the latter only shown by B B B B. Figure 3, elevation of grinder, showing it on its centre; A, body of sphere; B, balls; C C, rotating axis wheels; D D, eccentric friction wheels carried by shaft E; G, driving pulley; F F F F, journals; parts marked H, bed-frame, carrying shaft; I, feed and discharge. Figure 4, ditto, showing grinder rotating; A, body; C C, rotating axis wheels; D D, eccentric friction wheels; E, shaft; H, bed-frame logs. Sheet 3, elevation side section of boiler; A, body of boiler (interior); B B B, iron frame; C C C, studs or agitators and false bottom; D, gudgeons carrying boiler in journals (G), made fast to pivot bar marked R; E", lever made fast to pivot bar (R); E, connecting rod actuated by crank shaft marked K; H, cross-head of frame carrying boiler; I, frame logs and stringer frame; F, driving pulley; M, discharge door; N, steam hose; P P P, let-off plug holes. Figure 2, plan of false bottom and arrangement of studs or agitator, positions indicated by triangles. Figure 3, general plan showing driving gear, &c.; A, body of boiler; D D, gudgeons working in bearings marked G G; R, pivot bar; E", lever made fast to R; E, connecting rod actuating E" by crank shaft K; J J, journals carrying K; F, driving pulley; I stringer frame; H, cross-head frame carrying boiler. Sheet 4, diagram showing side elevation and its position at the highest and lowest pitch of the eccentric wheels. Figure 1 shows its position when the eccentric wheels are at their highest; A, grinder; B, friction rollers; C, eccentric wheels; D, driving pulleys; E, end of shaft and plummer block. Figure 2 shows position of grinder when the eccentric wheels meet the lowest pitch; A, grinder; B, friction roller; C C, eccentric wheels; E E E E, plummer blocks and shaft, pulleys not shown in this diagram, figure 2.

I claim, as new inventions and improvements in the treatment of pyrites and other conglomerate ores or minerals for the extraction therefrom of gold, silver, and any other metals, the following:—I claim the herein described hollow sphere and balls as applied; I claim the axis rollers; I claim the friction wheels, as described; I claim the construction and application of fire lumps, and the form of the ridge and furrow hearth, as described; I claim the form and application of rables, as described herein; I claim the form of the boiler for the purposes of this invention and the manner in which the same is put in motion, as herein described; I claim the lever arm attached to the body of the boiler; I claim the studs or agitators;

E. B. Parnell's Pyrites Process.

agitators; I claim the application of steam under pressure to this boiler; I claim the amalgamator, in so far as it is a pan provided with steam jets as herein described; I claim the form of the agitators; I claim the application of steam under pressure for the purposes of effecting the extraction of gold and other metals from their gangues, and for the rapid and effectual amalgamation of gold and silver; I claim the whole of these appliances conjointly as forming one process for the purposes of this invention. And I do hereby, for myself, my heirs, executors, administrators, and assigns, covenant with Her Majesty, Her Heirs and Successors, that I believe the said invention to be a new invention as to the previous 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 within-claimed patent, and that I will not leave 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 January, one thousand eight hundred and eighty-two.

ELIZABETH BARNSTON PARNELL.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to Elizabeth Barnston Parnell, this twenty-sixth day of April, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

We do ourselves the honor to report, in reply to your blank cover communication of the 27th ultimo, No. 3,013, transmitting Mrs. Elizabeth Barnston Parnell's application for the registration of an invention entitled "Parnell's Pyrites Process," that we are of opinion the prayer of the petitioner may be granted, in terms of her specification, drawings, and claim.

Sydney, 13 March, 1882.

We have, &c.,

A. LEIBIUS.

GOTHER K. MANN.

The Under Secretary of Justice.

[Drawings—four sheets.

Fig. 2.
End Elevation Section

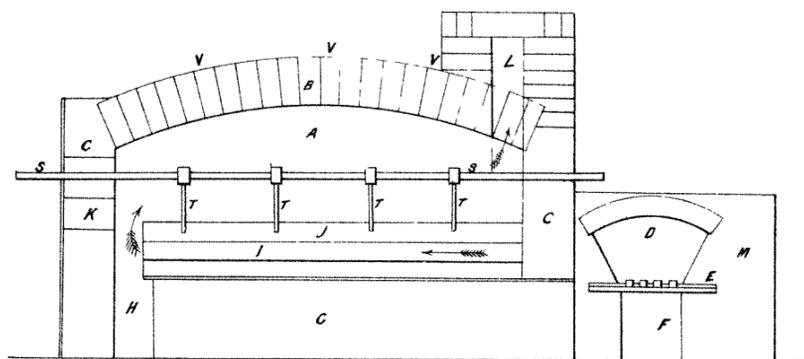


Fig 1
Plan of Hearth

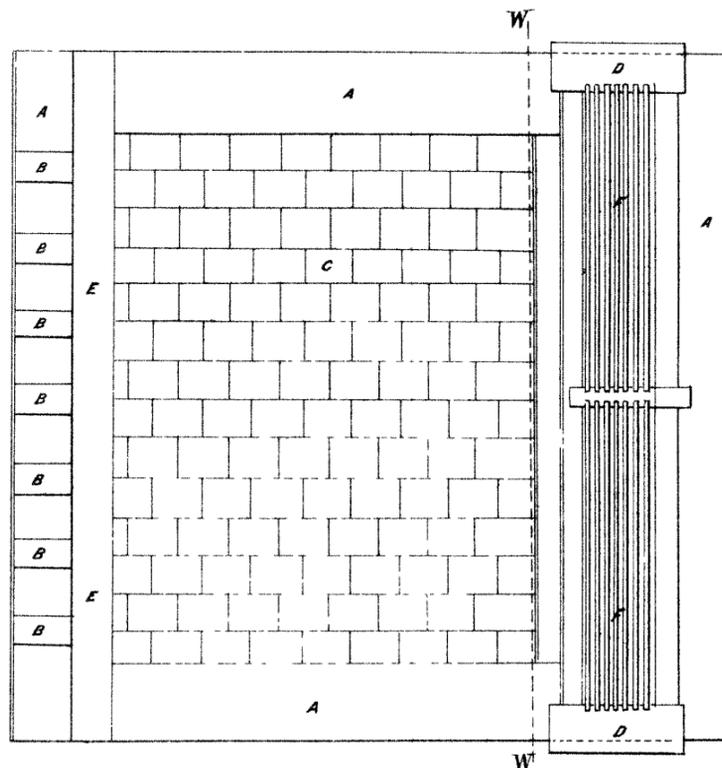


Fig. 3.
Cross Section at WW Fig 1

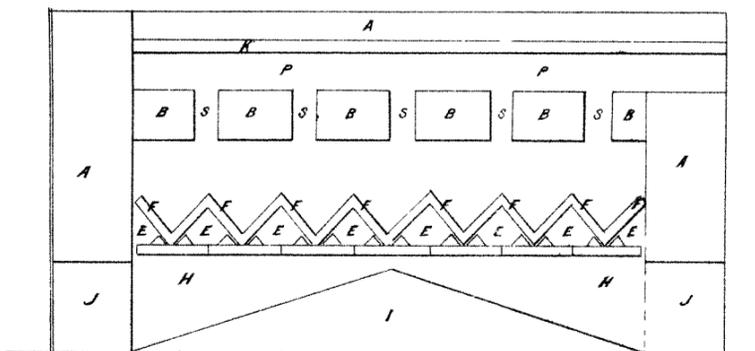
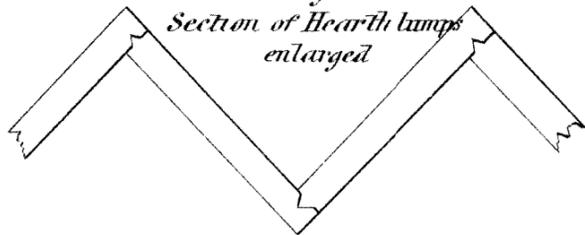


Fig. 4.
Section of Hearth lamps
enlarged



FURROW CALCINING
FURNACE

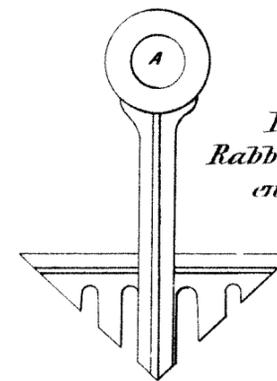


Fig. 5.
Rabble Head
enlarged



This is the Sheet of Drawings marked B, referred to in the annexed
Letters of Registration granted to Elizabeth Barnston Parnell,
this twenty sixth day of April, A D 1882

Augustus Loftus.

Fig. 1.
Amalgamator. Elevation. Section.

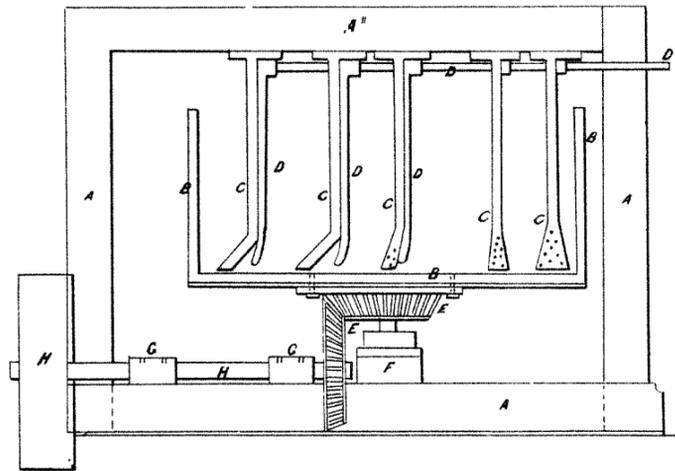


Fig. 2.
Amalgamator. Plan.

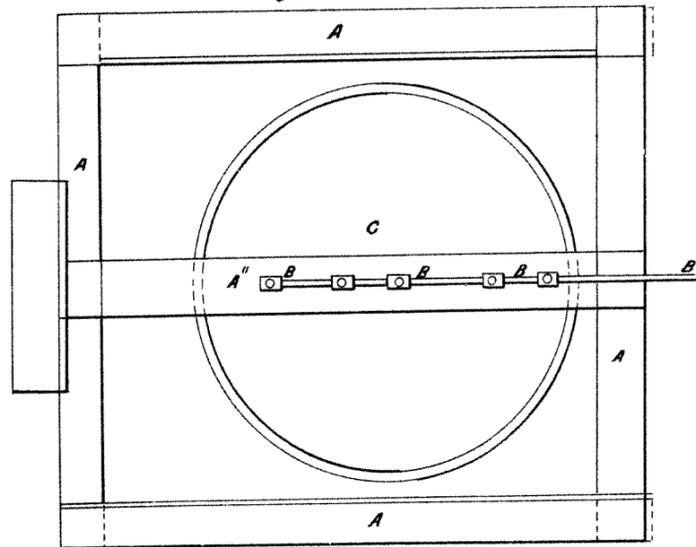


Fig. 3.
Grinder (on Centre) Elevation. Section.

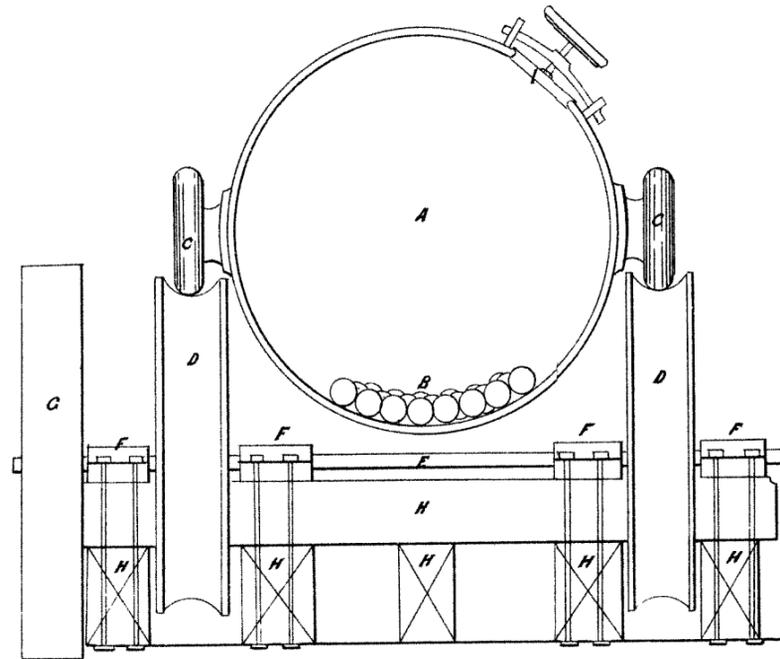
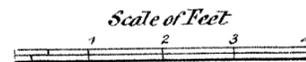
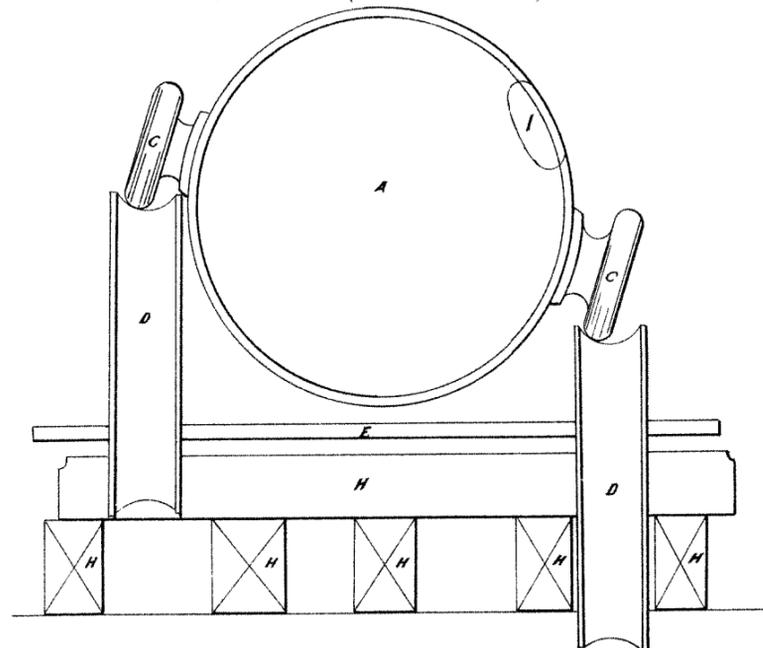


Fig. 4.
Grinder (on Eccentric) Section.



This is the Sheet of Drawings marked C. referred to in the annexed Letters of Registration granted to Elizabeth Barnston Parnell. this twenty sixth day of April, A. D 1882.

Augustus Loftus.

BOILER

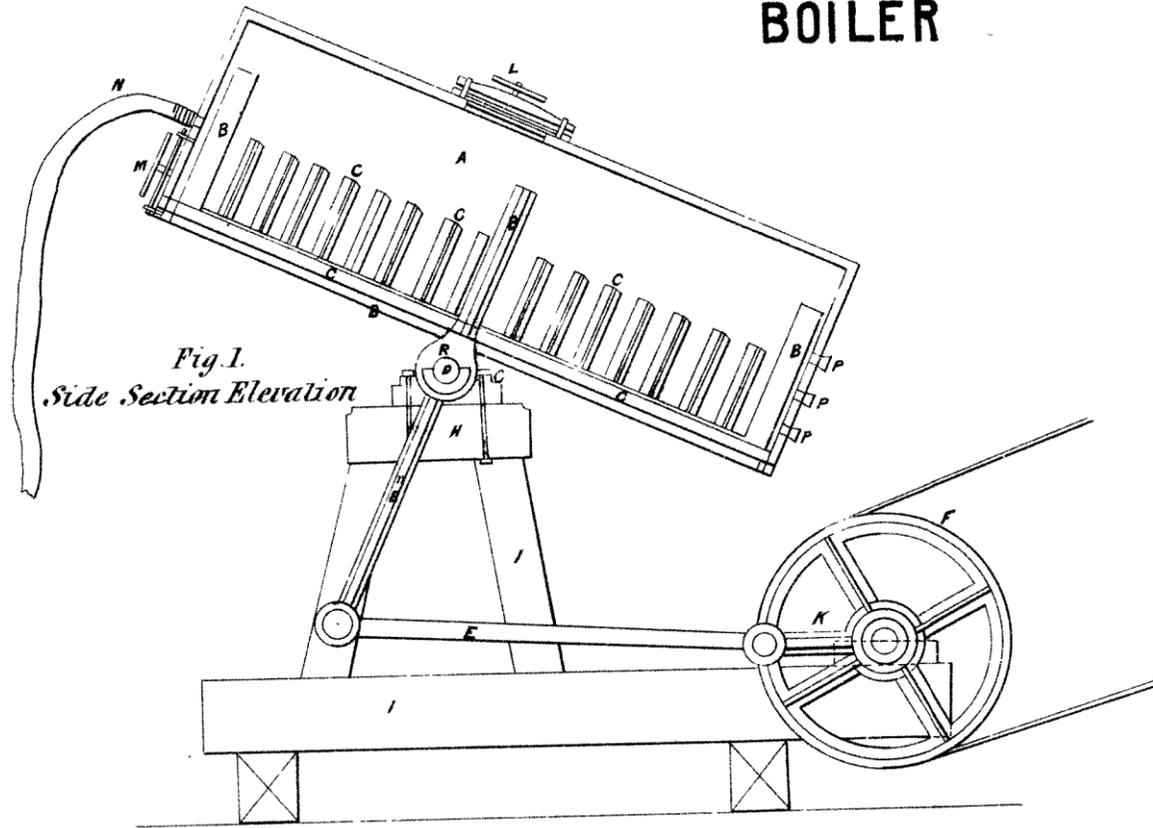


Fig. 1.
Side Section Elevation

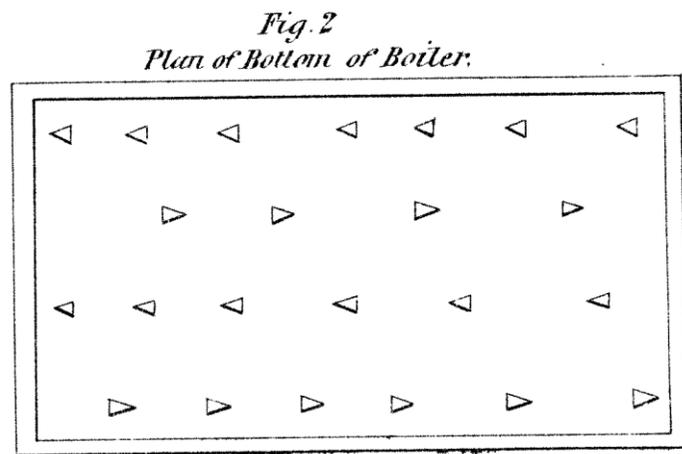
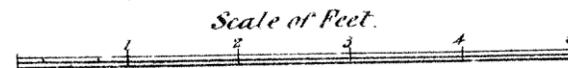
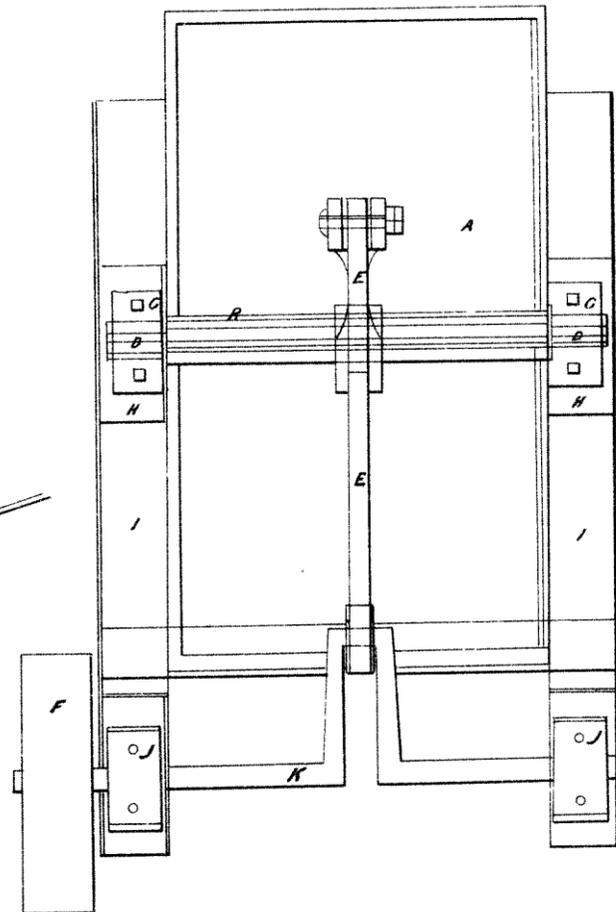


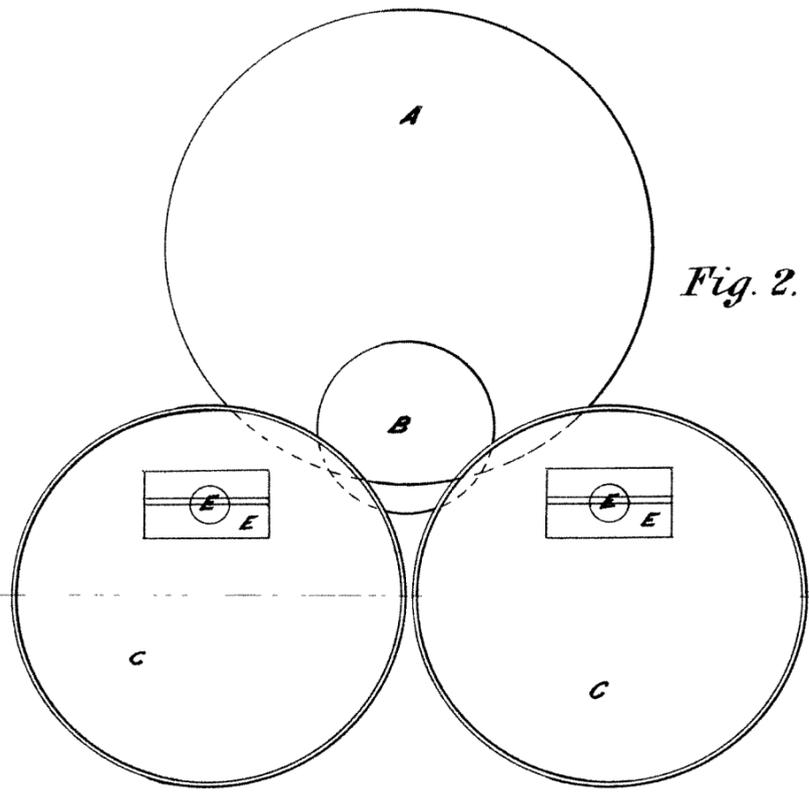
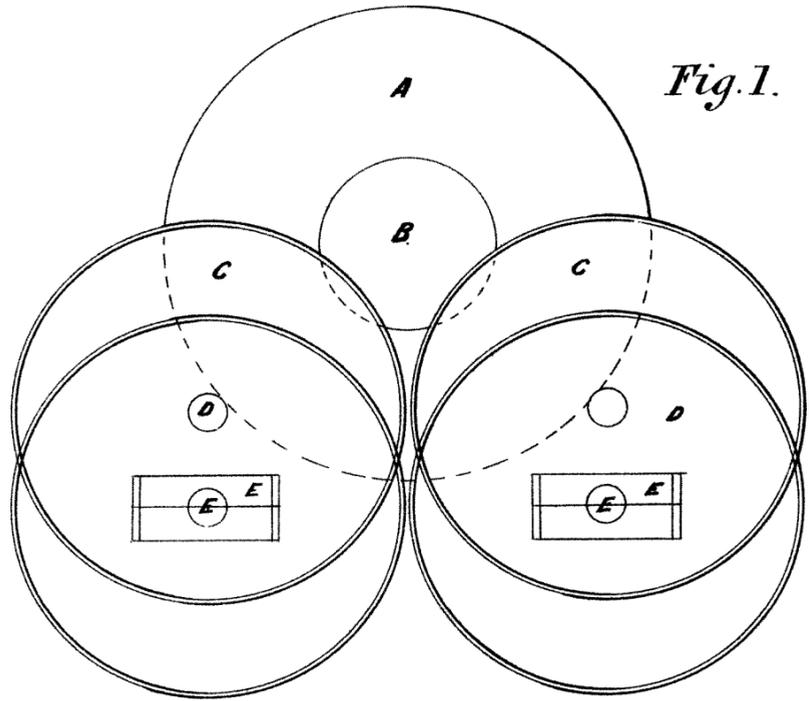
Fig. 2
Plan of Bottom of Boiler.

Fig. 3.
Plan shewing Driving gear &c.



This is the Sheet of Drawings marked D. referred to in the annexed Letters of Registration granted to Elizabeth Barnston Parnell this twenty sixth day of April AD. 1882.

Augustus Loftus.



This is the Sheet of Drawings marked E, referred to in the annexed Letters of Registration granted to Elizabeth Barnston Parnell, this twenty sixth day of April, A.D. 1882.

Augustus Loftus.



A.D. 1882, 26th April. No. 1060.

IMPROVED METHOD FOR ASCERTAINING THE GRADIENT OF ANY INTERNAL OR EXTERNAL SURFACE, &c.

LETTERS OF REGISTRATION to Ebenezer Farie Macgeorge, for an improved method of and Apparatus for ascertaining the gradient of any internal or external surface, together with the magnetic bearing of such gradient.

[Registered on the 26th day of April, 1882, 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 EBENEZER FARIE MACGEORGE, of St. James's Park, Hawthorne, near 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 "An improved method of and Apparatus for ascertaining the gradient of any internal or external surface, together with the magnetic bearing of such gradient," 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 Ebenezer Farie Macgeorge, 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 Ebenezer Farie Macgeorge, 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 Ebenezer Farie Macgeorge 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.

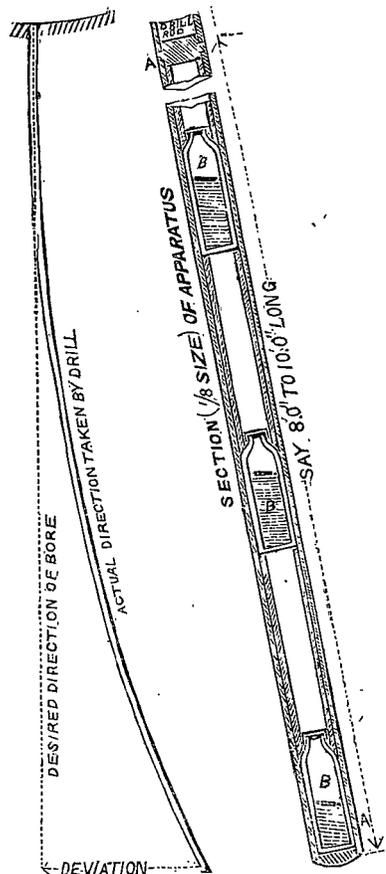
In witness whereof, I have hereunto set my sign manual, and have caused the present Letters of Registration to be sealed with the seal of the said Colony of New South Wales, at Government House, Sydney, in New South Wales, this twenty-sixth day of April, in the year of our Lord one thousand eight hundred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

[L.S.]

AUGUSTUS LOFTUS.

Improved method of ascertaining gradient and magnetic bearing.

SPECIFICATION of EBENEZER FARIE MACGEORGE, of St. James's Park, Hawthorne, near Melbourne, in the Colony of Victoria, gentleman, for an invention entitled "An improved method of and Apparatus for ascertaining the gradient of any internal or external surface, together with the magnetic bearing of such gradient."



My invention consists of an improved method of and apparatus for ascertaining the gradient of any internal or external surface, together with the magnetic bearing of such gradient, and is principally applicable to bore-holes made in the earth. When used in a diamond drill or artesian well hole, I fix to the boring end of the drill a length of tubing, say 8 or 10 feet, of as great a diameter as the bore will conveniently admit. This is made of copper, brass, or other non-magnetic metal, and must be strong enough to withstand any pressure of water that may exist at the depth to be tested, and be securely plugged and capped at each end, for the same reason. Inside it I place one or more phials or tubes of clear glass, secured at top and bottom so as to contain a hot solution, say of gelatine, of a proper strength, capable of congealing when cooled down to the temperature of the position to be examined. These phials must accurately fit the copper or brass tube already described, so that their sides shall be parallel with the tube and the drill rod, and they should be placed with spaces of 9 inches or thereabouts between them at intervals in the said tube until it is filled, such spaces being filled with heated bolts of copper, with hot water, or oil, or with any slowly-cooling material, so as to delay the congealing of the fluid in the phials until they are in position in the bore to be tested. The fluid in the phials may be a hot solution of gelatine, or it may be any other fluid, hot or cold, which will become solid or of firm consistency after the lapse of the time requisite to place the whole apparatus in its destined position. A crystallizing solution would answer the purpose, melted sperm or wax, or a chemical mixture, either hot or cold, which has the property of being at first fluid and then, after a time, of becoming solid or of firm consistency.

Upon the surface of the fluid contents of each phial I place a floating card of wood, cork, or hollow metal, with a magnetic needle immovably attached to it, and the card divided into the points of the compass or into degrees, as thought desirable.

When the apparatus above described is introduced into the position to be tested, it should be allowed to remain a sufficient time for the fluid contents of the phials to congeal or crystallize or become of firm consistency, and then be withdrawn.

Taking out any one of the phials and supporting it on a levelled table in such a position that the surface of the congealed fluid is in its natural and level position, and the compass card so that the north point is towards the north, the angle which the phial makes with the surface of the table will be the angle made with the level line or surface of the earth by the phial when in the place where its contents congealed, and the direction in which the phial inclines is the magnetic bearing of the gradient tested. From these data the exact deviation of any bore-hole, &c., from the initial direction may be exactly ascertained.

As an illustration of this invention, the drawing on margin hereof shows a bore-hole containing my apparatus. A is the non-magnetic metal tubing; B the phials therein, showing the position in which their contents would solidify, holding the compass card on the top.

Having thus described the nature of this invention and the manner of performing same, I would have it understood that what I claim as my improved method of and apparatus for ascertaining the gradient of any internal or external surface, together with the magnetic bearing of such gradient, is—

First—The ascertaining it by means of vessels containing a fluid which will solidify, and also of a compass card and needle floating on top of such fluid, such vessels being conveyed to the position to be tested, allowed to remain there until the fluid has ceased to be fluid, and then withdrawn, substantially as herein described and explained.

Second—The apparatus herein described and illustrated hereon for effecting this object.

In witness whereof I, the said Ebenezer Farie Macgeorge have hereto set my hand and seal, this twenty-second day of February, one thousand eight hundred and eighty-two.

Witness—EDWD. WATERS, Melbourne, Patent Agent.

E. F. MACGEORGE.

This is the specification referred to in the annexed Letters of Registration granted to Ebenezer Farie Macgeorge, this twenty-sixth day of April, A.D. 1882. AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 7 March, 1882.

We do ourselves the honor to report, in reply to your blank cover communication of the 28th ultimo, No. 3,000, transmitting Mr. Ebenezer Farie Macgeorge's application for the registration of an invention entitled "An improved method of and Apparatus for ascertaining the gradient of any internal or external surface, together with the magnetic bearing of such gradient," that we are of opinion the prayer of the petitioner may be granted, in terms of his specification, drawing, and claim.

The Under Secretary of Justice.

We have, &c.,

E. C. CRACKNELL.
GOTHER K. MANN.



A.D. 1882, 26th April. No. 1061.

IMPROVEMENTS IN PORTABLE REFRIGERATORS AND REFRIGERATING CHAMBERS.

LETTERS OF REGISTRATION to Edmund Taylor and William Humble, for Improvements in and connected with portable Refrigerators and in Refrigerating Chambers.

[Registered on the 26th day of April, 1882, 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 EDMUND TAYLOR, of Pevensey-street, Geelong, in the Colony of Victoria, chemist, and WILLIAM HUMBLE, of the Vulcan Foundry, Geelong aforesaid, engineer, have by their Petition humbly represented to me that the said Edmund Taylor is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in and connected with portable Refrigerators and in Refrigerating Chambers," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed ; and that they, the said Edmund Taylor and William Humble are the assignees of the said Edmund Taylor of and in the said invention, 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 Edmund Taylor and William Humble, 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 Edmund Taylor and William Humble, 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 Edmund Taylor and William Humble 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 April, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in portable Refrigerators and Refrigerating Chambers.

SPECIFICATION of EDMUND TAYLOR, of Pevensey-street, Geelong, in the Colony of Victoria, chemist, and WILLIAM HUMBLE, of the Vulcan Foundry, Geelong aforesaid (the assignees of said Edmund Taylor), for an invention entitled "Improvements in and connected with portable Refrigerators and in Refrigerating Chambers."

THIS invention relates, first, to portable refrigerators; second, to refrigerating chambers; third, to the medium through which the latent heat of the chamber is conveyed to the refrigerator; and fourth, to the means used for preventing the deposition of snow on the outer side of the vessel containing such medium.

Our portable refrigerators consist of two chambers, a boiler, and a condenser, preferably in the shape of vertical cylinders, connected together by two distinct lines of piping, the one larger than the other, the smaller one reaching down a considerable distance into the boiler and terminating at top of condenser, and the larger one simply connecting boiler and condenser together. In each of these pipes there is a valve.

Our refrigerating chambers have a well in the centre, of larger dimensions than the boilers, and this well contains a solution (say of salt), having a lower freezing-point than water. This is our medium for conveying the latent heat of the refrigerating chamber to the refrigerator. On the other side of the said well, and inside the refrigerating chamber, we place a hygroscopic material, such as salt or chloride of calcium, in such a position that as it gathers to itself the moisture in the chamber it will become liquid and run down the outside of the well, thereby preventing the deposition of snow.

Referring to our drawings, figure 1 shows elevation of the whole of our apparatus (partly in section); figure 2, plan of same—the dotted lines showing the position of the pipes when the boiler is on the fire, and the full lines showing their position when refrigerating; in each case one of the cylinders is placed in the cold water tank. Figure 3 shows section on the line *aa* on figure 2. A is the boiler, connected by pipes B and C to condenser; D, B¹ and C¹ are valves in said pipes; E is the refrigerating chamber; F, the well therein; G is the fire-place, and H the cold water tank. B¹ and E² are respectively a plug and a lid in the refrigerator; E³ is a tin case for containing water to be frozen; F¹ is the receptacle for the hygroscopic material; and F², the receptacle for the condensed moisture.

The boiler and condenser we prefer to make of wrought-iron, and the well, water tank, and furnace, of sheet iron.

The refrigerating chamber we prefer to make of wood lined with zinc, and jacketed with some non-conductor of heat, such as sawdust.

Our mode of operation is as follows:—We put liquid ammonia in the first-named vertical cylinder, A, place it over a fire (as in dotted lines, figure 2), and open the valve B¹ in the large pipe B, until the bulk of the ammonia has gone over in the other vertical cylinder, D, which is the condenser. We then remove it from the fire, shut off both valves, B¹ and C¹, to prevent the ammonia from returning, and keep the apparatus thus prepared until it is needed. When this is the case, we place the condenser in the well of the refrigerating chamber, and the boiler at the other end into a cold water tank, as in figure 1. Either of the valves in the connecting pipes are now opened, with this result, that the latent heat of the refrigerating chamber E is absorbed (through the salt water medium) by the ammonia in the condenser, which, becoming volatile, passes back again in the shape of gas into the boiler or chamber A, in which it was first heated, there to be re-heated and raised in the manner already stated.

Having thus described the nature of this invention, we would have it understood that what we claim as new is—

First—The construction of the refrigerating chamber E, with a well, F, a receptacle, F¹, for hygroscopic material, and another receptacle, F², for the condensed moisture, all to be used in the manner and for the purposes herein described and explained.

Second—The combination of the boiler and condenser, with the furnace and refrigerating chamber arranged and worked in the manner and for the purposes herein described and explained, so as to form our portable refrigerating apparatus.

In witness whereof, we, the said Edmund Taylor and William Humble, have hereto set our hands and seals, this twenty-third day of December, 1881.

Witness—

WILLIAM HENRY CARR,
Geelong, Book-keeper.

EDMUND TAYLOR.
WILLIAM HUMBLE.

This is the specification referred to in the annexed Letters of Registration granted to Edmund Taylor and William Humble, this 26th day of April, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 1 February, 1882.

We have the honor to return herewith the papers having reference to the application of Messrs. Edmund Taylor and William Humble, of Geelong, Victoria, for Letters of Registration for "Improvements in and connected with portable Refrigerating Chambers."

In reporting upon this application, we have to state that very little novelty is disclosed in the drawings and specification; but as this may be regarded as somewhat of a legal question, we do not feel justified in reporting against the granting of Letters of Registration in this case.

The Under Secretary of Justice.

We have, &c.,
CHAS. WATT,
JAMES BARNET.

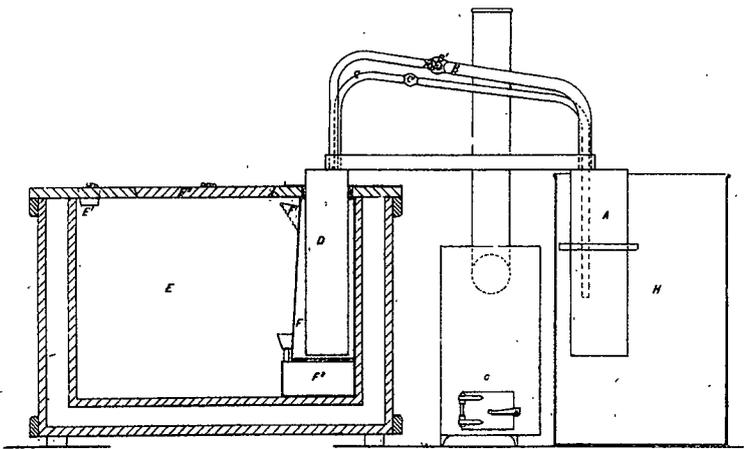


Fig 1.

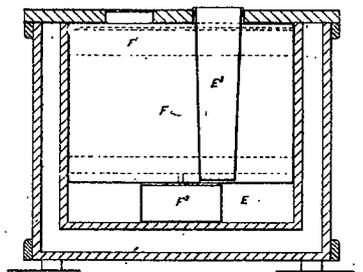


Fig 3.

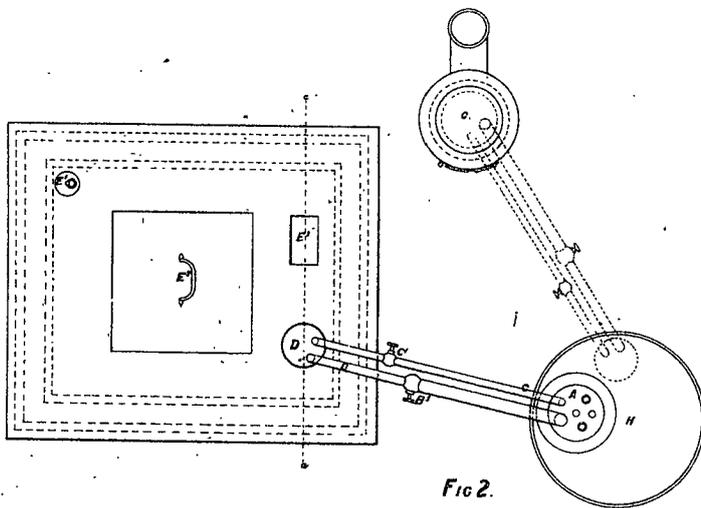


Fig 2.

This is the Sheet of Drawings referred to in the annexed Letters of Registration granted to Edmund Taylor and William Humble, this twenty-sixth day of April, A.D. 1882.
Augustus Loftus.

PHOTOGRAPHED AT THE GOVT. PRINTING OFFICE,
 SYDNEY, NEW SOUTH WALES.

(Sig. 875.)



A.D. 1882, 26th April. No. 1062.

IMPROVEMENTS IN LOCK-STITCH SEWING-MACHINES.

LETTERS OF REGISTRATION to Ewald Brüncker, for Improvements in Lock-stitch Sewing-machines.

[Registered on the 26th day of April, 1882, 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 EWALD BRÜNCKER, of Cologne on the Rhine, Prussia, 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 Lock-stitch Sewing-machines," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed ; and that he, the said Petitioner, had 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 Ewald Brüncker, 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 Ewald Brüncker, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and under 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 Ewald Brüncker 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 hereof, 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 April, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Lock-stitch Sewing-machines.

A.

SPECIFICATION of EWALD BRÜNCKER, of Cologne on the Rhine, Prussia, for his invention of "Improvements in Lock-stitch Sewing-machines."

THIS invention relates to double-lock-stitch sewing-machines, *i.e.*, to machines in which the upper and the lower thread are interlaced by causing the spool containing the lower thread to pass through the loop of the upper thread; and the improvements consist, firstly, in placing the lower spool into a round shuttle to which a continuous rotative motion is imparted, whereas the spool does not rotate, and secondly, in providing for the upper thread a new kind of tension-device.

The invention is represented on the annexed one sheet of drawings.

Fig. 1 is a top view, and fig. 2 a side view, of the rotating shuttle; fig. 3, section of shuttle on line $z z$ of fig. 1, with mechanism for propelling the same faster at a certain point of its rotation; fig. 4, tension-device for the spool of the lower thread, in plan and elevation; fig. 5, the spool in section; fig. 6, section showing the shuttle-bed or bearing and the shuttle, in which are inserted the spool together with the tension-device; fig. 7, top view of shuttle and bed, with parts appertaining thereto; fig. 8, view of shuttle-driver; fig. 9, side view of shuttle, bed, &c.; fig. 10, rear view, and fig. 11 side view, of the shuttle and its driver in working-position; in fig. 11, the shuttle-bed and frame for the driver axle are also shown; figs. 12, 13, and 14, modified forms of rotating shuttle; fig. 15, front end-view of the machine; fig. 16, front side-elevation of the same; fig. 17, section of tension-device for the upper thread; fig. 18, modification of the shuttle-driver.

The spool C, fig. 5, is placed on the central tubular part i of the device B, fig. 4, by which the necessary tension is imparted to the thread f . According to the drawing, the thread, after having been conducted through a slit cut into the lower edge of B, and into a notch at its upper edge, is passed from the side into the interstice between the inside and outside top-plate of B, and around the tongue a , so that it will finally come out by the hole b . The manner of conducting the thread may, however, be varied, and does not constitute any essential part of the invention. The tension-device B fits with its tubular part i tightly on the bush d , fig. 3, revolving on a pin c fixed in the centre of the shuttle A. The bush d is prevented from slipping off the pin c by the knob e , which is somewhat smaller in diameter than d , so that the shuttle A may freely rotate, while the part B and the spool C are held stationary by the thread f . The spool, of course, turns within the part B by the winding off of the thread during the operation of sewing. If it should be preferred, the spool and its tension might be placed loose into the shuttle.

The shuttle, which in its outward shape resembles two truncated cones united at their base, rotates in a bearing, D, by preference composed of two plates, k and l , fig. 6, provided at g with a slit for the needle and the loop to pass through. This figure also shows the spool and the tension-device introduced into the shuttle. The outer form of the shuttle may, however, be modified as is represented in figs. 12, 13, and 14; moreover, the bearing D may be formed of a series of anti-friction rollers, of suitable shape. The shuttle is recessed on a part of its circumference in the manner shown by figs. 1 and 2, and so that on the left-hand side (with regard to these figures) a hook, v , and on the opposite side a shoulder, o^2 , are formed, the object of the hook being to catch the loop of the upper thread, whereas the shoulder o^2 is the point against which the driver y , fig. 8, acts by its edge k^2 . This driver consists of a disc fixed on a shaft c^1 , fig. 11, and provided with a projecting part, $k^2 l^2$, forming a skew surface. The said part $k^2 l^2$ fits in such a manner into the recessed part of the shuttle that the edge l^2 (which is vertical to the disc of the driver) will lie in the throat of the hook o , whereas the edge k^2 is in contact with the shoulder o^2 , as already stated. (See also figs. 7 and 10).

The bed D of the shuttle is by preference fitted in an inclined position to the bed-plate of the machine, as shown by figs. 11 and 15, and so that the needle will pass through the slit g of the bed and along the lower conical side of the shuttle; but the shuttle may also be arranged in a vertical or a horizontal position if desired. When placed horizontally, the needle should, however, make a stop during its upward motion, so as to allow the shuttle to pass freely through the loop.

The driver is rotated by the bevel-wheels p^2 and q^2 (figs. 3, 11, 15, and 16), the wheel q^2 being keyed on the main shaft u .

Between the shuttle and the driver there is sufficient play for allowing the upper thread to pass, except at the point where the driver, by its edge k^2 , bears against the shoulder o^2 of the shuttle. An arrangement is therefore required which acts instead of the driver y at the moment the thread has to pass between k^2 and o^2 , and which separates these points from each other during such passage. The mechanism serving for this purpose is represented in fig. 3. It consists of a finger, h^1 , attached to the shaft u , and so timed with regard to the rotation of the shuttle that it will at every rotation enter into the recess n^2 of the shuttle; the radius of the finger h^1 being, moreover, somewhat larger than the radius drawn from the axis of A to the recess n^2 , the said finger will during its action accelerate the rotative speed of A by so much as to cause the required separation of the points o^2 and k^2 . As soon as h^1 leaves the recess n^2 , the driver y again resumes its operation. If preferred, the speed of the end of the finger h^1 and the recess n^2 may be equal, but in this case the arrangement must be so made that h^1 upon entering into n^2 will cause the shuttle to be advanced by as much as is required for causing the necessary play between k^2 and o^2 .

The loop of the upper thread, when passing around the shuttle, is operated upon in the manner to be described hereafter, by a tongue, r , figs. 7, 9, 10, and 11, and by a projection, e^1 , with which the shuttle may be provided on its lower face. The tongue r is jointed at s to the shuttle-bed D, and a spring, l^1 , serves to keep it in its place, while it may be turned aside by the knob t when the spool is to be exchanged. The point of the tongue reaches to the centre of the shuttle, and just leaves sufficient room between it and the tension B for the passage of the thread.

A modification of the driver is shown by fig. 18. It consists in this case of a disk, y^1 , with three or more driving-pins, and it is placed at a certain angle to the shuttle, so that at least one of the driving-pins will always be out of engagement to let the loop pass around the shuttle.

The figures 15 and 16 show the general arrangement of the improved machine. The needle-bar is worked from the shaft u , by an eccentric, eccentric-rod v , rocking shaft x , and rocker-arm z , coupled by a connecting link to the bar a^1 ; but any other known and suitable arrangement may be applied for this purpose.

For

Improvements in Lock-stitch Sewing-machines.

For imparting to the upper thread the requisite tension, and for allowing this tension to be regulated with facility, the device k^1 , fig. 16, and shown in fig. 17 in section, may be used. It consists of two discs or plates, secured together by the screws n^1 and o^1 , and between which the clamping-plates r^1 and s^1 , and a springing-plate, q^1 , are placed. The said plates r^1 and s^1 are bent so as to allow of being brought in contact with each other at the middle, and they may be pressed together more or less by the screw p^1 . The thread is drawn, in the manner shown by fig. 16, over the screw-bolts n^1 and o^1 , or the washers with which these are provided. It will thereby pass between the plates r^1 and s^1 , where its friction can be increased or diminished by turning the screw p^1 .

The operation of the machine is as follows:—

The motion of the needle and of the shuttle are so timed with respect to each other that the hook o of the shuttle will be close to the needle when the latter, after having descended, begins to rise. The hook consequently enters into the loop formed by the needle and enlarges the same, and, when the loop has slipped into the throat of the hook, it will be drawn over the shuttle. The under part of the loop passes into the space between the driver and the bottom surface of the shuttle, and here meets the projection e^1 , which causes a further extension of the loop; see fig. 10. (The said projection e^1 may, however, be omitted, if preferred, as in fact the machine will also work without it). The throat of the hook o having arrived at its lowest point, the upper part of the loop slips on the tongue r , as is also shown in fig. 10. The loop is now stretched to its greatest extent, so that the further motion of the shuttle causes it to become slack. This slack is still increased on account of the leading-edge of the projection e^1 , (which tapers out into the bottom of the shuttle), passing at this period under the lower loop-part and allowing it to slip off. A part of the slack thus produced is taken up by the needle, which is descending again, whereas a part is retained by the tongue r in the manner shown by fig. 7. Meanwhile, the finger k^1 has accelerated the motion of the shuttle, or thrown it forward by so much as to cause it to become free of the propelling edge of the driver, in consequence whereof the needle proceeding in its descent, draws the under part of the loop through the space thus produced. The entire loop, which has now encircled the under thread is thereby brought to the top of the shuttle and is there retained by the tongue r , but it is not taken up any further by the needle, which has finished its down stroke.

The second rotation of the shuttle now begins. Its hook o again enters into the loop of the needle, but the tension-apparatus of the upper thread presenting resistance, the shuttle first of all pulls the spare thread, *i.e.*, the remaining portion of the first loop, off the tongue r , and locks the stitch, as represented in fig. 11. The following stitches are formed by a repetition of the same process.

If it should be preferred, the stitch may be completed at the end of every single rotation of the shuttle, by means of a take-up provided for this purpose.

Having thus described the nature and object of this invention, and the manner in which it is to be carried out in practice, I hereby claim as new and important features of the same,—

1. In a double-lock-stitch sewing-machine, the rotating shuttle A containing the under-thread spool C, together with a suitable tension-device, and provided with a hook, o , in combination with a bed or bearing, D, and a driver which causes the rotation of the shuttle, substantially as and for the purpose described.
2. The combination with the shuttle A rotating within the bed or bearing D, of the tongue r , as hereinbefore specified.
3. The tension-device for the upper thread, consisting of the clamping-plates r^1 and s^1 , screw-bolts n^1 and o^1 , springing-plate q^1 , and adjusting-screw p^1 , as and for the purpose described.

In witness whereof, I the said Ewald Brüncker have hereunto set my hand and seal, this twelfth day of December, in the year of our Lord one thousand eight hundred and eighty-one.

EWALD BRÜNCKER.

Signed, sealed, and delivered by the within-named Ewald Brüncker, }
this twelfth day of December, 1881, before me,— }

HON. BLEICHROLLER,
British Vice-Consul at Berlin.

This is the specification referred to in the annexed Letters of Registration granted to Ewald Brüncker, this twenty-sixth day of April, A. D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 2 March, 1882.

The application of Mr. Ewald Brüncker for Letters of Registration for "Improvements in Lock-stitch Sewing-machines" having been referred to us, we have examined the drawings and 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.

We have, &c.

JAMES BARNET.
WILLIAM C. BENNETT.

The Under Secretary of Justice.

Fig. 10.

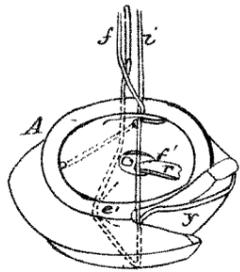


Fig. 1.

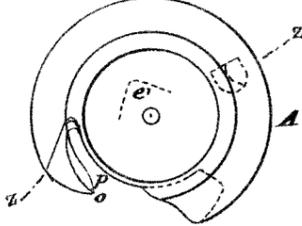


Fig. 2.

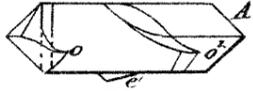


Fig. 3.

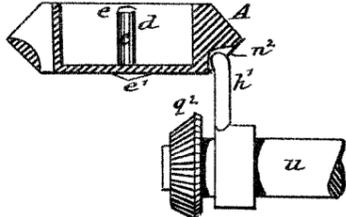


Fig. 7.

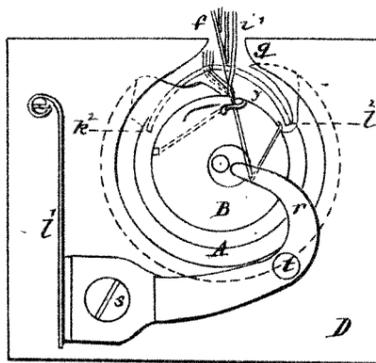


Fig. 9.



Fig. 6.

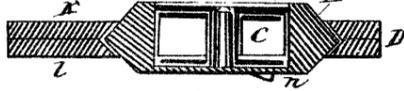


Fig. 12.

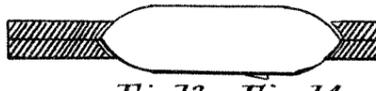


Fig. 13 Fig. 14



Fig. 11.

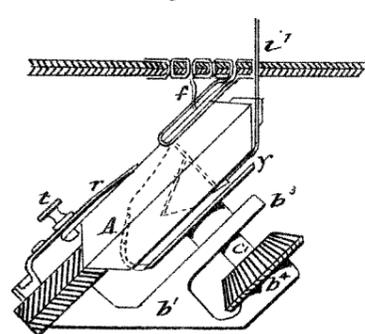


Fig. 8.

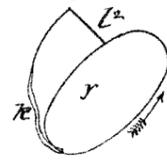


Fig. 4.

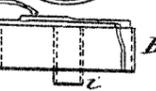
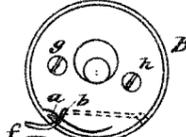


Fig. 5



Fig. 15.

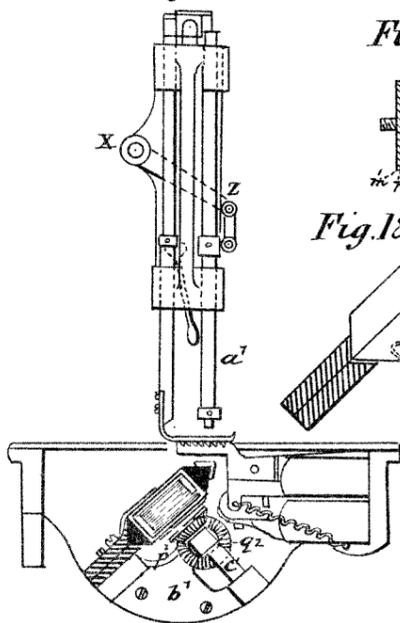


Fig. 17.

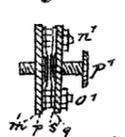


Fig. 18.

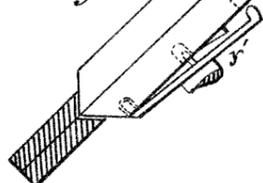
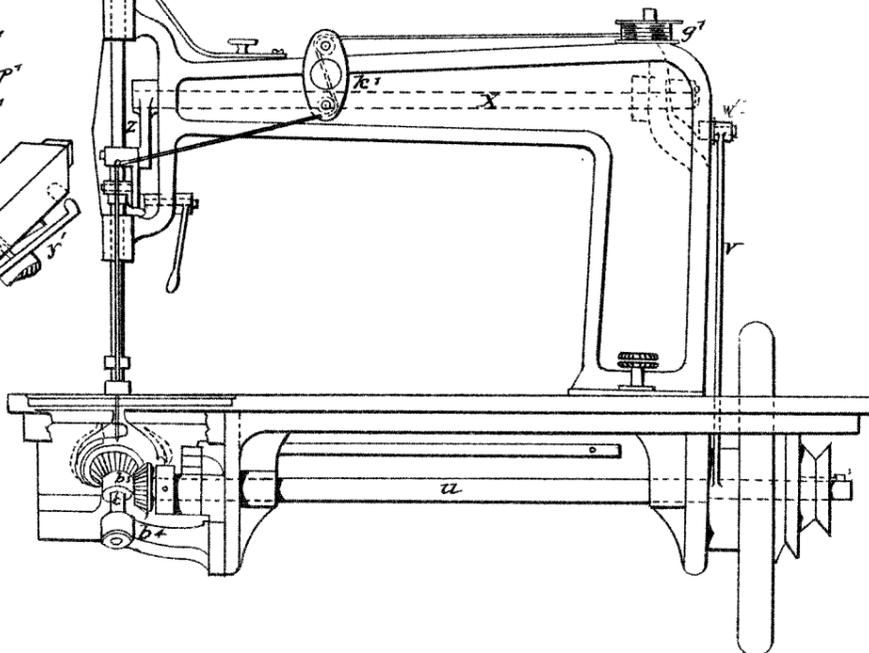


Fig. 16.



Signed at Berlin in the German Empire by the party aforesaid this twelfth day of December 1881.

Before me: *Thom. Beckroder*
British Vice Consul.

Ewald. Brüncker.

This is the Sheet of Drawings referred to in the annexed Letters of Registration granted to Ewald Brüncker; this twenty sixth day of April, A.D. 1882.

Augustus Loftus.



A.D. 1882, 29th April. No. 1063.

IMPROVEMENTS IN APPARATUS FOR BORING OR DRILLING IN STONE, &c.

LETTERS OF REGISTRATION to James Ker Gulland, for Improvements in Apparatus for Boring or Drilling in Stone and other matters.

[Registered on the 1st day of May, 1882, 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 KER GULLAND, of the "Westminster Palace Hotel," Victoria-street, in the city of Westminster, 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 Apparatus for Boring or Drilling in Stone and other matters," 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 James Ker Gulland, 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 Ker Gulland, 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 Ker Gulland 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 April, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Apparatus for Boring or Drilling in Stone, &c.

A.

SPECIFICATION of JAMES KER GULLAND, of the "Westminster Palace Hotel," Victoria-street, in the city of Westminster, England, mechanical engineer, for an invention entitled "Improvements in Apparatus for Boring or Drilling in Stone and other matters."

THE improvements relate, first, to means of applying the diamonds in the crown or boring bit, so that the same diamonds may at different times be used with crowns or boring bits of different sizes, and thereby the number of diamonds required to be kept for use may be reduced.

In carrying out this part of the improvements the diamonds are individually set in plugs or holders, which I generally form of steel; I also aid the correct holding of these plugs or holders in the crown or bit by means of solder, pins, or screws. These plugs or holders are formed to fit into corresponding passages formed for them in the directions desired in the operating ends of the crowns or boring bits.

Figures 1, 2, 3, and 4 of the drawings accompanying this specification represent sections of crowns or crown rings of boring bits, with several arrangements applied thereto, according to this part of the invention. In each of these figures *a* represents the diamonds, and each diamond is set in a separate plug or holder *b*, which, as already stated, I generally form of steel. In figures 1 and 2 the one end of each of the plugs *b* is reduced somewhat in diameter, as at *b*¹, the object of which is that when such plugs have been driven into the holes formed for them in the ring of the crown, the metal of such ring may then be hammered down around such part *b*¹ to assist in the better holding of such plugs against the strain put upon them in working. In these figures the transverse and angular holes *C C*¹ in the crown are formed to facilitate access to the inner ends of these plugs, for their removal by the action of suitable punches or drifts when required.

I also apply the diamonds in separate rings, adapted to the size of the crown or boring end of the tube required, and I set the plugs or holders of the diamonds by forcing them into taper holes in such rings. The larger end of such holes or back of the plugs or holders for the diamonds I fill in with solder, *b*², or other suitable material. These rings are fixed to their crowns or the ends of the tubes by solder, screwing, or otherwise.

Figures 2, 3, 4, and 5 show the crown formed in three separate rings, and each ring set with separate diamonds, *d* representing the section of one ring or part crown, *e* another, and *f* another ring or part crown. In each of these illustrations the middle ring or part crown *e* is formed with a screw thread at the part *e*¹ thereof, by which it may be screwed tightly into the end of the core tube *g*, which is formed to receive such part *e*¹; and it will be seen that by the shoulders *e*² *e*³ of the ring, *e* acting on the corresponding projections *d*¹, *f*¹, to the rings *d* and *f*; the ring *e* becomes the means of retaining the rings *d* and *f* in correct relative position on the core tube, but the means of holding of the part rings may be varied.

The diamonds to the crown, figure 5, are shown set immediately in the respective rings; in figures 3 and 4 they are set in plugs or holders *b* of an inclined or conical form, and are placed in correspondingly formed holes in the respective rings, and they are there held steadily by soldering or otherwise.

The improvements relate, secondly, to forming the cross-head which carries the drill-bar, so that such cross-head may swing upon one end of its ends. An arrangement of parts, according to this second head of the invention, is represented by figure 6. In this figure, *h* represents the cross-head, and it will be seen that this cross-head is guided in the vertical motion of the boring rod by a pair of pillars or parallel guides, *i j*, one of which pillars or guides, *i*, is formed to admit of one end of the cross-head turning upon it, whilst the other pillar or guide *j* is formed or provided with a guiding surface, *j*¹, to near the upper and lower, or other suitable part thereof, for the traverse of the cross-head *h*, such guiding surface or surfaces being adapted to receive the correspondingly formed end *h*¹ to the cross-head *h*. When the cross-head *h* is raised either above or below such guiding surface or surfaces (as opposite a part *j*²), the end *h*¹ of the cross-head *h* will be free of that pillar *j*, whilst the other end, *h*², of it may turn on the other pillar, *i*, to facilitate, when required, the throwing of the drill-bar *k* and cross-head *h* clear of the line of the bore-hole. Motion is given, as shown, to the drill-bar *k* in the following manner:—*k*¹ is a shaft supported in suitable bearings, and having rotary motion given to it from a steam-engine or other suitable power. On this shaft, *k*¹, is applied the bevelled-toothed wheel *k*², the teeth of which take into the teeth of the bevelled-toothed wheel *k*³, affixed on the shaft *k*⁴, and this shaft *k*⁴ is supported to turn freely in stationary bearings, and it is formed with a groove, *k*⁵, to receive a corresponding feather applied in the boss of the tooth-wheel *k*⁶, so as to cause that wheel *k*⁶ to rotate with the shaft *k*⁴ in its rotation, and yet admit of the wheel *k*⁶ being moved along the shaft *k*⁴ as that wheel is caused to move vertically with the wheel *k*⁷ by the flanges of the wheel *k*⁷ embracing the teeth of the wheel *k*⁶.

The wheel *k*⁷ simply rotates on the guide *i*, and is supported to traverse with cross-head *h*, whilst its teeth also take into the teeth of the wheel *k*⁸ applied on the socket or supporting-piece *k*⁹ of the drill-bar *k*. The socket-piece *k*⁹ is supported so as to be capable of revolving freely in the part *h*³ *h*⁴ of the cross-head *h*. The prolongation *k*¹⁰ of the tubular drill-bar *k* is connected with the part *k*⁹ by stuffing-box, so as to admit of the part *k*⁹ freely revolving in the cross-head, and this prolongation *k*¹⁰ is for the purpose of conducting water by the drill-rods to the drill, and for the clearance of the bore-hole.

Figure 7 shows by front view, and figure 8 by side view, a modification of this arrangement, by which, in place of the shaft *k*⁴ being separate from the pillar *i*, it is formed hollow, as a boss or sleeve to enclose the pillar *i*.

Figures 9 and 9^a represent respectively a sectional plan view and a plan view of the cross-head and parts immediately connected therewith. On the hollow shaft *k*⁴ I apply the wheel *k*⁷, which is formed with feathers, *k*⁸, to ride in corresponding grooves formed longitudinally in this hollow shaft *k*⁴.

Another part of the improvements relates to means by which the adjustment of the counterweight to the boring-rods may be more readily varied to the varying weight of them, or the amount of pressure desired to be exerted in boring.

An arrangement of parts adapted to carrying out this part of the invention is shown applied by front view, figure 7, by side view, figure 8, and plan view, figure 17. In these views *p* represents the framing

Improvements in Apparatus for Boring or Drilling in Stone, &c.

framing of the apparatus; k , the drill or boring rods to be counterweighted; r , the counterweight employed; and s is the chain or band for supporting the drill-rods during working. It will however be seen that the chains or bands s employed to support the drill-rods are connected at one end by elastic connection s^6 to the frame p , that these chains or bands thence pass under pulleys, s^6 , carried by the cross-head h , and up over the pulleys s^7 carried by the main framing, and, according to this part of the invention, in place of being connected directly to the counterweight r , are conducted from the guide pulleys s^7 on to drums or pulleys, s^1 , and that the axle of these drums s^1 is operated by wheels, s^2 s^3 , working together, but of different relative diameters and consequent speeds, so that a small weight, r , travelling at increased speed, attached by chain or band r^1 to a drum, r^2 , on the axis of the wheel s^3 , acts as a counterbalance to the greater weight of the rods; I apply a brake, s^4 , and disengaging arrangement to retain the parts in position during the shifting of the weight. Z indicates the chain or band for effecting the hoisting of the drill-rods or boring-bars by one end of such chain being connected to the drill-rods, and the other end of it being affixed to the drum N^3 of the hoisting tackle.

Motion is given to the various parts, according to the arrangement shown, from a steam-engine or other suitable power acting by a band or strap on the drum or pulley A applied to the main shaft or axis B , which is supported to revolve freely in suitable bearings, carried by the main framing p . On the axis B are applied the three pinions C , D , and E , each of which is formed with a clutch connection, so that either may by its clutch connection be so connected to the shaft B as to be controlled to rotate with it, as is well understood. These pinions, C , D , and E , are of diameters differing each from the others, and their teeth gear, with the teeth of other wheels, C^1 , D^1 , E^1 , of correspondingly different diameters, applied on the shaft F , so that the speed of such shaft F may be readily varied without varying the speed of the shaft B , and, if desired, other numbers of such gearing wheels of other varying relative dimensions may be adopted as may be found desirable in giving the required motions to the different parts for the differing circumstances that may arise. A pair of bevelled-toothed wheels, G G , is applied on and with capability of separate clutch connection with the shaft F , so as to bring the teeth of either one or other of them into working gear with the teeth of the bevelled wheel H affixed on the shaft or axis k^1 , and yet, by feather or other suitable means of causing the rotation of such wheels, and consequent rotation of the shaft k^1 in the direction desired.

The drums or pulleys s^1 are affixed to the shaft or axis I , which is supported so as to be capable of freely revolving in bearings carried by the main framing P , and is provided with a loose toothed wheel, J , capable of clutch connection with it, and the teeth of this tooth-wheel J are taken into by the screw-thread K formed on or applied to the axle k^1 , by which it may, when required, receive motion from that axle or shaft k^1 . Upon the shaft I is also affixed the toothed wheel s^2 , the teeth of which take into the teeth of the pinion s^3 , on the shaft or axis L , which is supported to revolve freely in bearings carried by the main framing, and on this shaft or axis L is affixed the drum r^2 and the brake-wheels M and s^4 . The drum r^2 receives one end of the band or chain r^1 , which passes over a pair of guide-pulleys, r^3 , and is thence connected to the comparatively small weight r , acting as the counterbalance-weight to the drill-bars. N indicates another pinion on the shaft F , the teeth of which take into the teeth of a wheel, N^1 , affixed on the axis N^2 , which is supported to revolve in the bearings carried by the main framing, and has applied to it the drum N^3 to receive and operate one end of the chain or band z , the other end of which is connected to the series of drill-rods for use when it may be desired to hoist them.

Having thus described my invention and means which I adopt in carrying the same into effect, I would have it understood that I do not confine myself to the precise arrangements of parts as shown and described, as the same may be varied without departing from the peculiar character of the invention; but what I do claim as my improvements in apparatus for boring or drilling in stone and other matters is—

First—The application of the cutting diamonds in plugs or holders, so that the same may be readily interchangeable for use in crowns or boring-bits of the same or different sizes, substantially as described. Also, I claim the arranging or combining parts forming the crowns by the use of separate rings provided with diamonds or other cutters, substantially as described.

Secondly—I claim the arranging or combining parts whereby the cross-head employed in such apparatus may be capable of readily turning on one of the guiding pillars, so that such cross-head may be turned clear of the bore-hole. Also, I claim the method of giving rotary motion to the drill-rods when using a cross-head turning on one of its ends, as described in respect of figures 6, 7, 8, 9, and 9^a. Also, I claim the arranging or combining parts operating with the counterweight, substantially as described in respect of figures 7, 8, and 17.

In witness whereof, I, the said James Ker Gulland, have hereto set my hand and seal, this thirtieth day of December, 1881.

JAMES KER GULLAND.

Witnesses—

W. LLOYD WISE,
Patent Agent, London, England.

H. J. TROTTER,
Clerk to Mr. Lloyd Wise.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to James Ker Gulland, this twenty-ninth day of April, A.D. 1882.

AUGUSTUS LOFTUS.

Improvements in Apparatus for Boring or Drilling in Stone, &c.

REPORT.

Sir,

Sydney, 2 March, 1883.

The application of Mr. James K. Gulland for Letters of Registration for "Improvements in Apparatus for Boring and Drilling in Stone and other matters" having been referred to us, we have examined the drawings and 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.

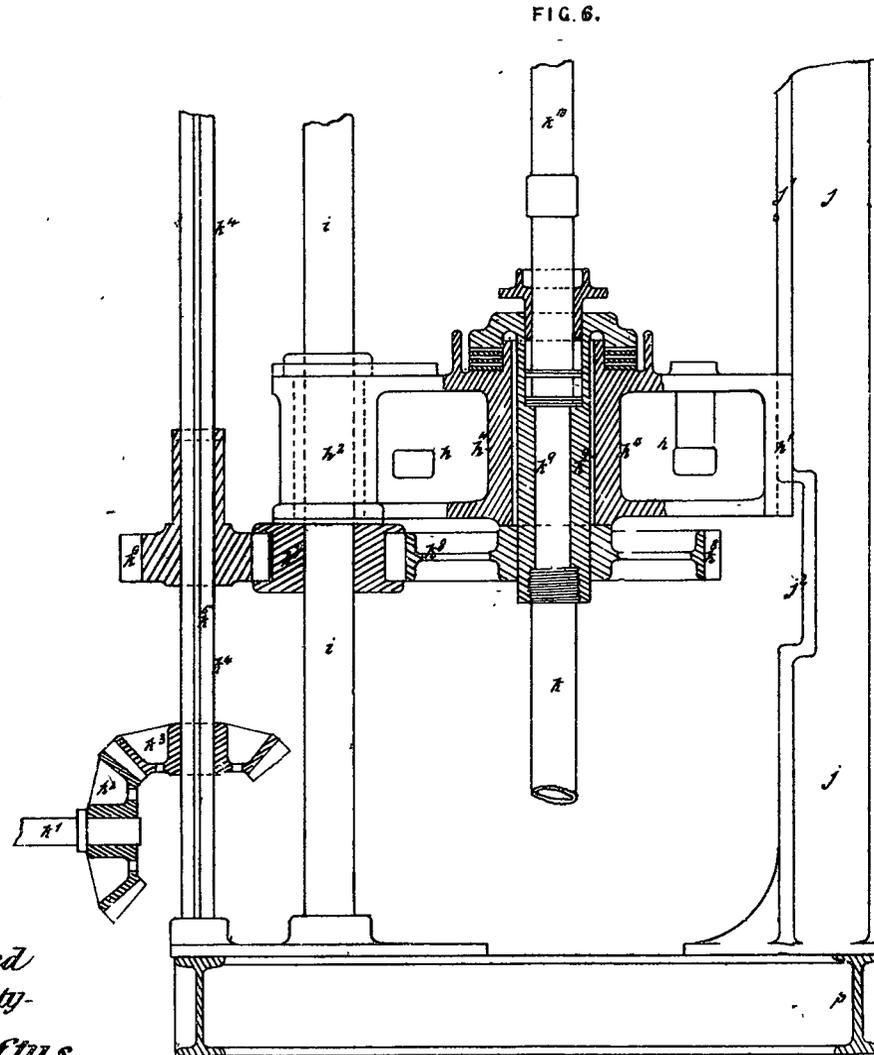
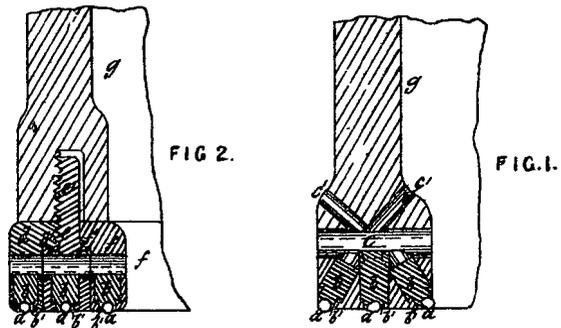
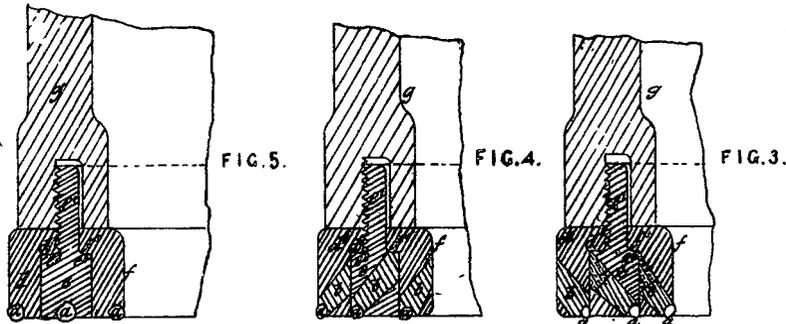
We have, &c.,

JAMES BARNET.

WILLIAM C. BENNETT.

The Under Secretary of Justice.

[Drawings—four sheets.]

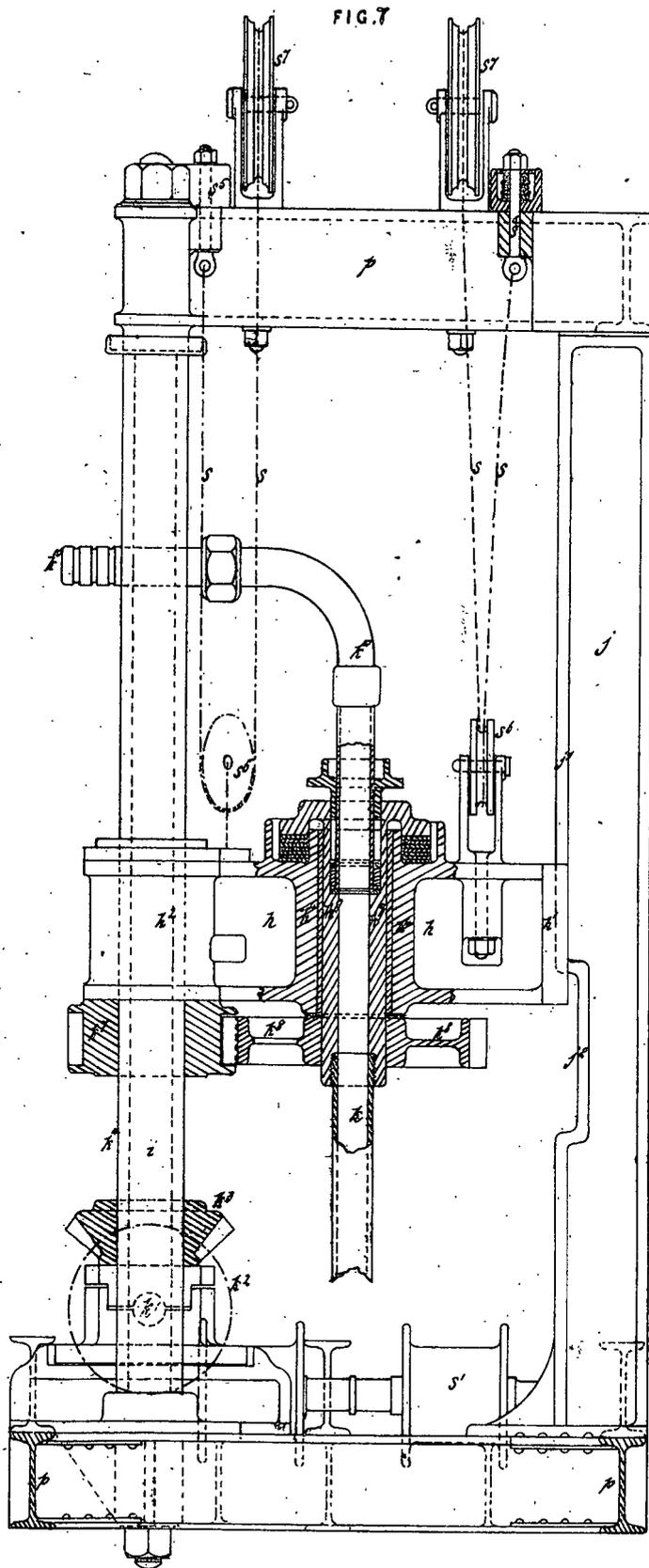


*This is the Sheet of Drawings marked B referred to in the annexed
Letters of Registration granted to James Ker Gulland, this twenty-
ninth day of April, A.D.1882.*

Augustus L. oftus.

Sig. 32.

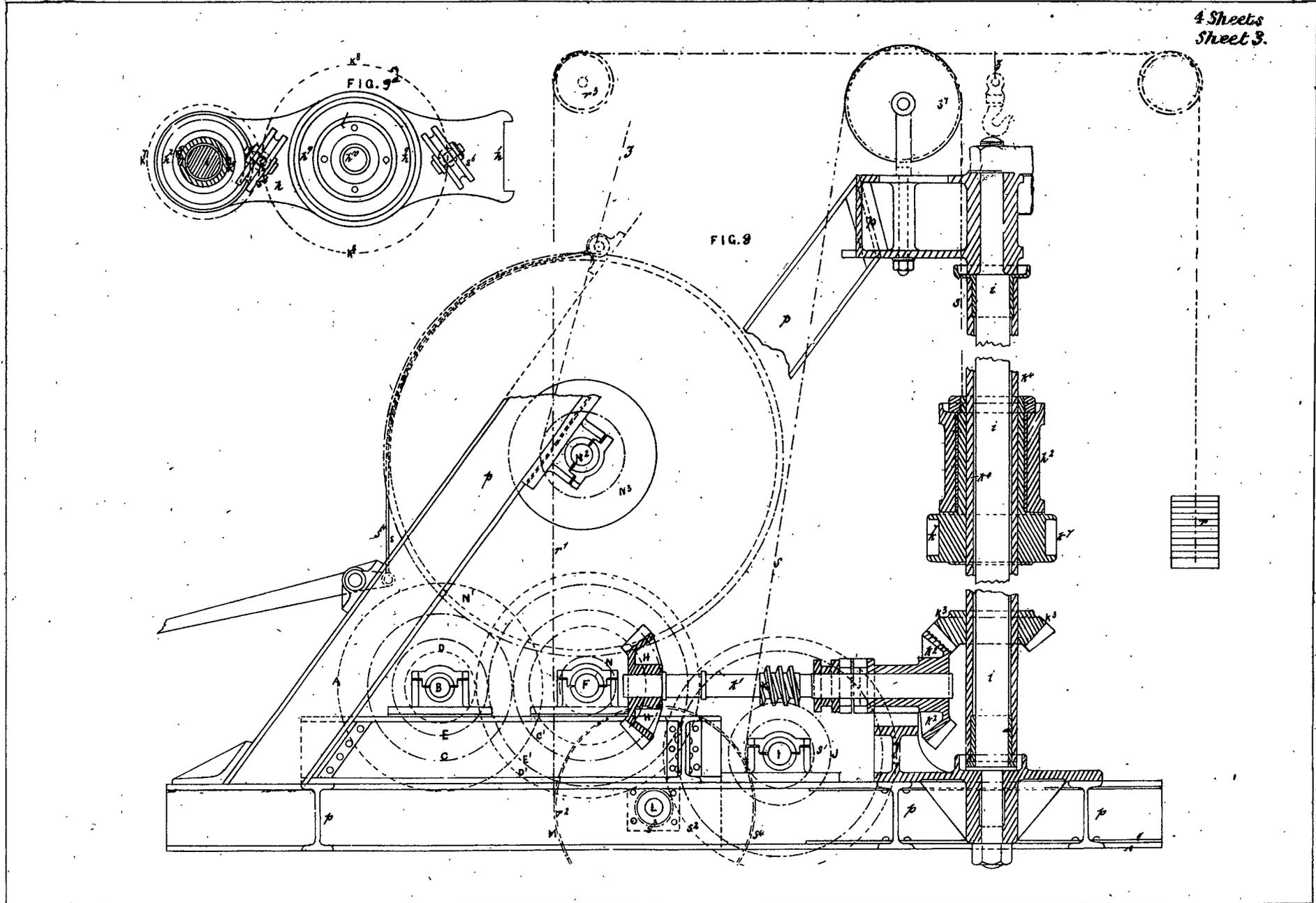
"C."



*This is the Sheet of Drawings marked C referred to in the annexed
 Lettes of Registration granted to James Ker Gulland this twenty ninth
 day of April, A.D. 1882.*

Sig. 32.

Augustus Loftus.

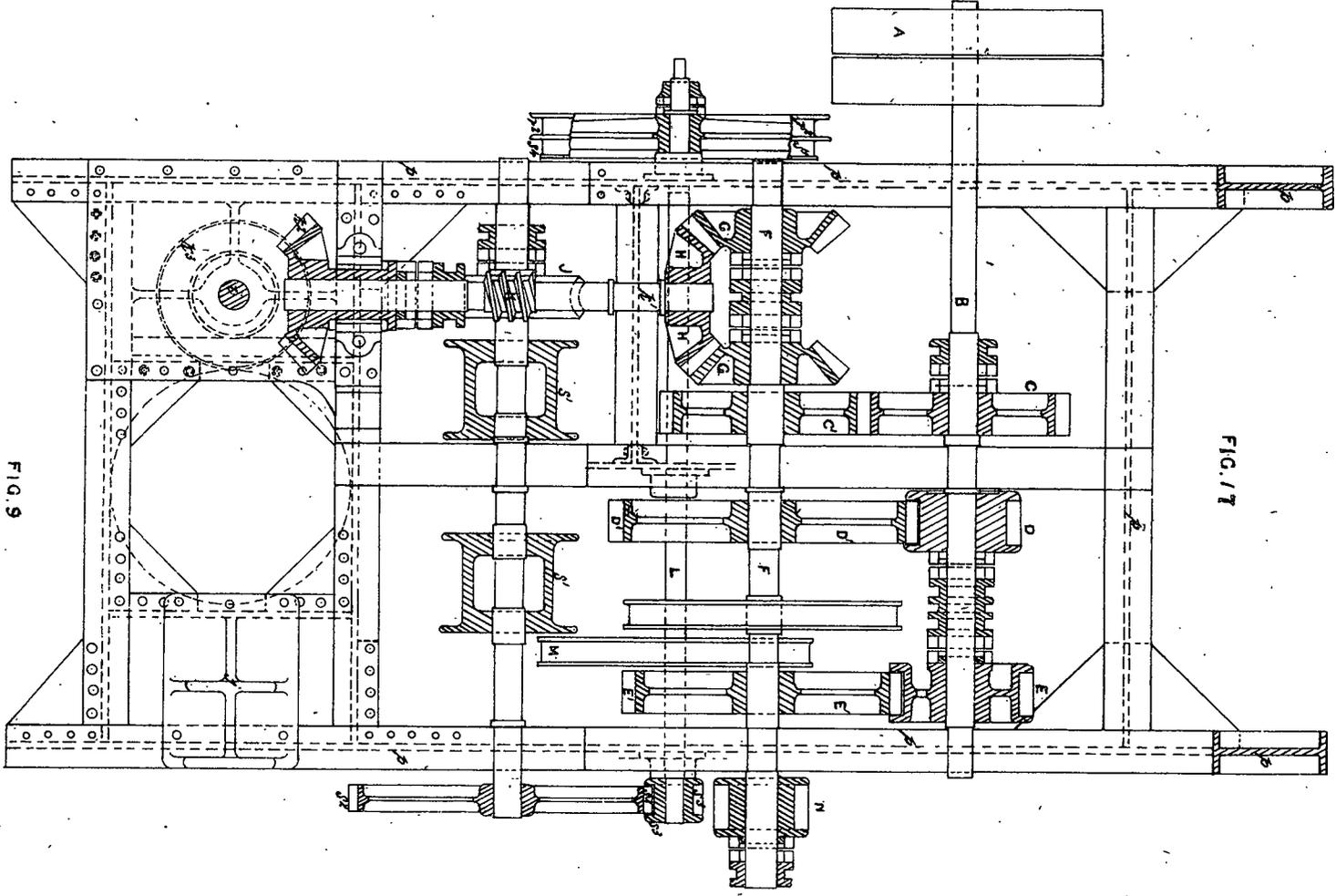
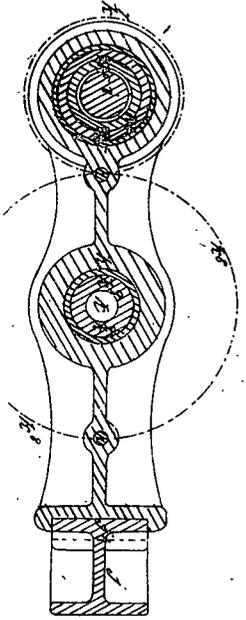


Witnesses - *W. Lloyd Wise*
H. J. Trotter

This is the Sheet of Drawings marked D referred to in the annexed Letters of Registration granted to James Her Galland, this twenty-ninth day of April, A.D. 1882.

James Her Galland

Augustus Loftus.



*This is the Sheet of Drawings marked E referred to in
 the annexed Letters of Registration granted to James
 Ker Gulland, this twenty-ninth day of April, A.D. 1882.
 Augustus Loftus.*



A.D. 1882, 13th May. No. 1064.

IMPROVED CONCAVE VEHICLE SPRINGS.

**LETTERS OF REGISTRATION to Joseph Walker Oakman, for Improved
Concave Vehicle Springs.**

[Registered on the 13th day of May, 1882, 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 JOSEPH WALKER OAKMAN, of Collins-street East, in the City of Melbourne and Colony of Victoria, merchant, hath by his Petition humbly represented to me that he is the assignee of Edward Spaulding, of New York, in 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 "Improved Concave Vehicle Springs," 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 Joseph Walker Oakman, 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 Joseph Walker Oakman, 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 Joseph Walker Oakman 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 May, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improved Concave Vehicle Springs.

SPECIFICATION of JOSEPH WALKER OAKMAN, of Collins-street East, in the city of Melbourne and Colony of Victoria, the assignee of Edward Spaulding, of the City of Brooklyn, county of King, State of New York, United States of America, the inventor of an invention entitled "Improved Concave Vehicle Springs."

THIS invention relates to elliptic or semi-elliptic springs, the plates of which are of concavo-convex form in cross section, and are so arranged in the spring that the edges of the plates are subject to compression only while in use or doing service, while the tension is borne by the mid-part of the width of the plates, and so adds greatly to the sustaining capacity of the metal.

Hitherto half springs have been constructed of several plates of steel and of concavo-convex form in cross section, with the convex sides of the plates located on the under side of the spring. This form of spring has been found defective in use, and abandoned, owing to the fact that the pressure exerted on the spring operated to produce a tensile strain on the opposite edges of each plate of the spring; and as the edges of the plates are the weakest part thereof, slight flaws, fissures, or weak points in the edges of the plates are very soon opened by the tensile strain, and so cause a break in the plate, and thus the efficiency of the spring is destroyed. Also, elliptic springs have been constructed with both the upper and lower halves of the spring made of concavo-convex form in cross section, and the two halves so united that the convex sides of both halves of the spring will be located on their upper sides, and the concave sides on their under sides. In this last form also the tensile strain is relieved from the edges of the plates of the lower half of the spring and transmitted to the central portion thereof, while the edges are submitted to a crushing force. Thus it will be observed that the lower half of the spring is prevented from cracking or opening at its edges. This form of spring was also found defective and impracticable in use, for the following reasons: The plates of the upper half of the spring being arranged with their concave sides underneath, their edges were subjected to the tensile strain caused by the pressure exerted on the spring, and hence their edges were soon opened and liable to cracks and fissures, and this operated to ruin and render useless the complete spring.

The object of my invention is to obviate the defects in vehicle springs heretofore referred to, and to provide a spring in which the tensile strain will be exerted on the central portions of the plate—that is to say, the mid part width of the plates composing the upper and lower halves of an elliptic spring, and causing the edges or outer portions of the width of the plates of the spring to sustain the crushing force due to the weight imposed upon the spring, thereby adding greatly to the sustaining power of the metal.

With this end in view, my invention consists in forming the improved elliptic spring as follows:— Each half of the spring being formed of a plate or plates of steel made concavo-convex in form in cross section, and the spring or springs arranged or constructed so that the convex sides of both the upper and lower halves of the spring will be located adjacent to each other, and the concave sides will be located on the upper and lower sides of the spring.

The longitudinal edges of the plates are preferably made somewhat thinner than their centres or mid-thickness; that is, the circle of the concavity and the convexity should be the same, thus giving the greater elasticity, and enabling the plates to fit well one upon the other, and allow the spring to have a uniform movement in all of its parts. The metal is thus disposed of to a greater advantage and more naturally, and in accordance with the demands of the service required, by gaining the larger portion to the locality where the tension is sustained, and the lesser to the parts of compression, and thus, for given quantities of metal, much greater power is secured; the plates bear alike upon each other throughout their whole area, and thereby are less liable to injury by friction, and their sustaining power is greatly increased.

When it is desirable to hold the several plates in place by means of a band, as for locomotives, cars, &c., there should be a stud raised on centre of each plate, to prevent their slipping endways. These studs should always project on the convex side, with the indentation on the concave side of the plates, thus keeping an unbroken surface on the side of the tensile strain, the projection on the convex side fitting into the indentation on the concave side of the next plate and also into the convex side of the band. A screw may be inserted through the concave side of the band, the point of which fits into the indentation of the plate next to it; thus any number of plates can be held firmly and securely together.

I am aware that indented studs have been used heretofore in securing the plates of springs within a band, but such have their points projecting on the side of the crushing force, thus leaving an indentation on the side of the tensile strain, and so weakening the spring.

I do not confine myself exclusively to the elliptic form of spring, but any form of spring for which my improvements are suited; as, for instance, in carriage springs the plate or plates may be formed or constructed of a varying curvature, and the bend longitudinally is made to suit the place for which it is designed, and may be flattened towards the ends of the spring.

In the accompanying drawings figure I is a view in perspective of an elliptic spring made of concavo-convex plates arranged for the convex sides to sustain the tension, while the edges of the plates take the compression as described. Figure II is a vertical longitudinal view of a semi-elliptic carriage or waggon spring. Figure III is a cross section of centre of an elliptic spring, showing both sides of the plates constructed on the same curvature, and made thinner in their edges, shown in the drawing by the dotted lines, which are prolonged beyond the edges of the plates, to show more clearly the taper of the plates from their middle to their edges, and also shows my arrangement of the stud indentations and improved band with screw for securing the plates in position within it.

By reference to the drawings, the construction of the spring will be readily seen. A represents the upper and B the lower half of an elliptic spring, said halves being secured at their opposite ends by bolts, C, or connected in any suitable manner. Each half of the spring is composed of one or more plates of steel, $a^1 a^1 a^1$, which are constructed of concavo-convex form in cross section. The curved form of the plate or plates ensures increased strength and elasticity thereto. I do not mean it to be understood that the concaving of a plate of steel increases its elasticity; but what I do mean is, that a thin plate of steel concaved will be more elastic than a flat plate of steel thick enough to sustain the same weight; hence one of the many advantages of my improvements is that much thinner plates of steel can be used to carry a much greater weight than flat plates of double their thickness; but in replacing the ordinary elliptic springs with the improved concaved spring, I would not recommend decreasing the number of plates in any spring

Improved Concave Vehicle Springs.

spring with six plates and under, but to decrease the thickness of the steel in each plate by about one-half; and when a compound spring is composed of several plates, the convex side of one plate will fit within the concave side of the next adjacent plate, thus preventing any lateral displacement of the several plates, and obviating the necessity for slots and studs usually employed in springs made of flat plates; and this is an important item in manufacture, as costly machinery and labour is required to produce springs with interlocking slots and studs, and further, the springs are materially weakened by forming slots therein.

The curve or convexity of said plates, in their transverse section, which has been found to give the best general results for all sections of steel, I find, is that which is an arc of the circle which would be described with a radius equal to the lineal width of the plate.

It will be observed that both the upper and lower halves of the spring, when subjected to pressure, will spring towards the concave sides, the tension of the spring being exerted on the convex sides. Thus the tensile strain due to the pressure imposed upon the spring will be exerted on the longitudinal centres of the plates of the upper and lower halves of the spring, while the opposite edges of the plates of both the upper and lower halves of the spring will be subjected to a crushing force, and hence the liability of a flaw, fracture, or fissure starting at the edges of the plates is avoided, by reason of the edges inclining to close up should any tendency to such fracture or fissure occur.

Both halves of the spring constructed in accordance with my improvements will be uniform in extent of movement, and also capable of withstanding an equal amount of strain, so that each half will sustain its proper share of work, and in use or service the several curves both in the cross section and in the longitudinal curves straighten out with uniformity, so that the several parallel plates with their thin edges will always remain in close contact with one another, the plates bearing alike upon each other throughout their whole length and area, and are thereby less injured by friction, and their sustaining power greatly increased.

These springs may be applied to all kinds of vehicles, from the locomotive and car to the lightest carriage or waggon, as well as for seal and buffer springs; and, in fact, wherever strength combined with lightness, ease and uniformity of action are desired.

Having thus described this invention, what I claim as new and desire to secure by patent is—

First—An elliptic spring, the upper and lower halves of which are of concavo-convex form in cross section, and arranged with their lower sides towards each other, substantially as and for the purpose set forth.

Second—A carriage or other spring composed of one or more curved plates arranged to spring towards their concaved sides, constructed substantially as set forth.

Third—An elliptic spring, the upper and lower halves of which are each composed of several plates, each being of concavo-convex form in cross section, and made thinner in their edges, said halves being arranged with their convex sides towards each other, as and for the purpose described.

Fourth—As a part of a vehicle spring composed of one or more plates curved in their cross section, with the plates made thinner in their longitudinal edges, and secured at their centres by indented studs and band for the purpose set forth.

Fifth—A locomotive and car spring made concavo-convex in their cross section, with the plates made thinner in their edges and tapering at their ends, and with indented studs at their centres in combination with a band as described.

In witness whereof, the said Joseph Walker Oakman has hereto set his hand and seal.

JOSEPH W. OAKMAN.

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 Joseph Walker Oakman, this thirteenth day of May, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 28 November, 1881.

We do ourselves the honor to report, in reply to your blank cover communication of the 19th instant, No. 10,851, transmitting the Petition of Mr. Oakman for the registration of "An improved method of constructing leaf Springs," that we are of opinion the prayer of the Petition may be granted, in accordance with his specification, drawings, and claim.

The Under Secretary of Justice

We have, &c.,
JOHN WHITTON.
E. O. MORIARTY.

Fig 1.

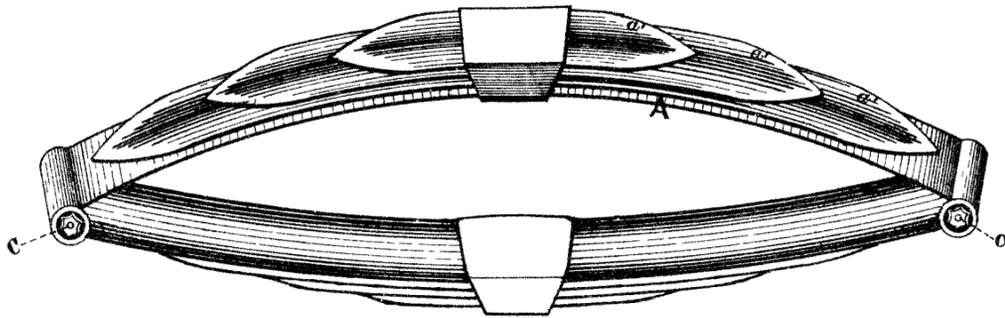


Fig 2.

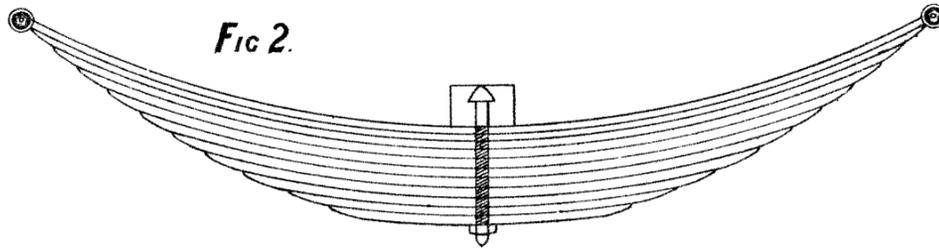
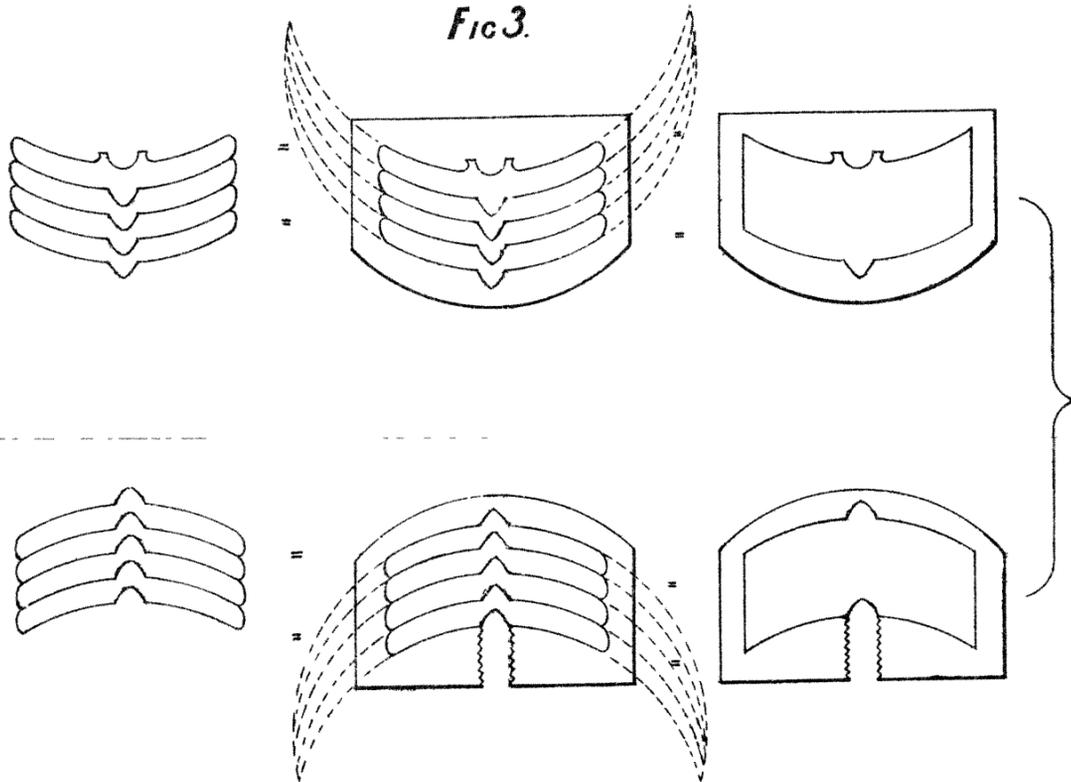


Fig 3.



*This is the Sheet of Drawings referred to in the annexed
Letters of Registration granted to Joseph Walker Oakman,
this thirteenth day of May, A.D. 1882. Augustus Loftus.*



A.D. 1882, 13th May. No. 1065.

IMPROVEMENTS IN PLOUGHS AND CULTIVATORS.

LETTERS OF REGISTRATION to Richard Bowyer Smith, for Improvements in Ploughs and Cultivators.

[Registered on the 13th day of May, 1882, 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 BOWYER SMITH, of St. Margaret's Hill, Tipara, in South Australia, 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 "Improvements in Ploughs and Cultivators," 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 Richard Bowyer 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 Richard Bowyer 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 Richard Bowyer 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 thirteenth day of May, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Ploughs and Cultivators.

SPECIFICATION of RICHARD BOWYER SMITH, of St. Margaret's Hill, Tipara, in South Australia, machinist, for an invention entitled "Improvements in Ploughs and Cultivators."

MY improvements in ploughs and cultivators have been designed for the purpose of overcoming the difficulty arising from the presence of stumps, stones, and other obstructions, when the operation of ploughing, scarifying, or cultivating is being carried on; and consists in supporting the ploughing, scarifying, or cultivating tool on a body which is hinged or pivoted directly or indirectly to the framing, so as to be susceptible of a backwardly swinging motion, whereby when it meets with the obstructions referred to, it automatically rises over them and falls into the ground again immediately it has passed them, so allowing the machine to proceed with its work uninterruptedly notwithstanding such obstructions. I prefer to connect the plough body, or the stem of the scarifying or cultivating tooth (as the case may be), to a beam hinged to or pivoted on a part of the framing of the machine. In some cases I suspend a weight on such beam, to give an increased impetus to the fall of the ploughing, or scarifying, or cultivating tool, so that it will enter the ground to a sufficient extent, and I make these tools adjustable on the hinged beams also, for the purpose of regulating the force with which and the depth to which they shall enter the ground. Springs may be substituted for the weights, but I prefer the weights. The size, number, and arrangement of the wheels, the number of tools in such machine, the arrangement of the draught, and the use or disuse of a coulter in the case of ploughs, are matters entirely disconnected from this invention, and therefore may be altered or varied at pleasure; but in the drawings hereto attached, I have shown in every respect that construction of machine which I prefer.

Referring to these drawings, figure 1 shows side elevation of my invention, as applied to a single plough, whilst figures 2 and 3 show respectively plan and side elevation of a triple furrow plough made according to my invention. Figure 4 shows side elevation of my invention as applied to a single scarifying or cultivating tooth, whilst figures 5 and 6 show respectively plan and side elevation of a complete scarifying or cultivating implement having seven such teeth. In every case A is the tool (plough, scarifier, or cultivator); A¹, its body or stem, adjustably attached to beam B, hinged or pivoted to cross-bar C. B¹ is the adjustable weight, kept in position by set screw B². The other parts of each machine are common to such implements, and form no part of this invention.

The mode of operation is as follows:—When the machines are at work, and any one of the tools (ploughs, scarifiers, or cultivators) meets with any sufficient obstacle such as a stone or a stump, it swings upward and backward until it has passed over the obstacle, when it falls back again into position, and so on, each tool acting automatically and independently of the others. In mallee country my machine is far superior to any other, while in ordinary land they work equally well with other machines, the tools in such case being, if so preferred, made so that they will not swing or jump. My machines are however specially designed for working what are commonly known as scrub lands.

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 for which I am desirous of securing protection by patent, is:—

First—Constructing ploughs and cultivators with the plough or cultivator body (as the case may be) hinged or pivoted, so as to have a backwardly swinging motion when it comes into contact with any sufficient obstruction, substantially as herein described and explained, and as illustrated in my drawings.

Second—Constructing such ploughs and cultivators with weights or springs, to increase the impetus of the falling tool, substantially as described.

In witness whereof, I, the said Richard Bowyer Smith, have hereto set my hand and seal, this twenty-first day of January, one thousand eight hundred and eighty-two.

RICH. B. SMITH.

Witness—

THOS. INNES, J.P.,
Moonta, Surveyor, S.A.

This is the specification referred to in the annexed Letters of Registration granted to Richard Bowyer Smith, this thirteenth day of May, A.D. 1882.

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 Richard Bowyer Smith, for an invention entitled "Improvements in Ploughs and Cultivators," as shown in the drawing and described in the specification attached to his Petition.

We have, &c.,

E. O. MORIARTY.
JAMES BARNET.

The Under Secretary of Justice.

== R.B.SMITH'S PATENT. ==

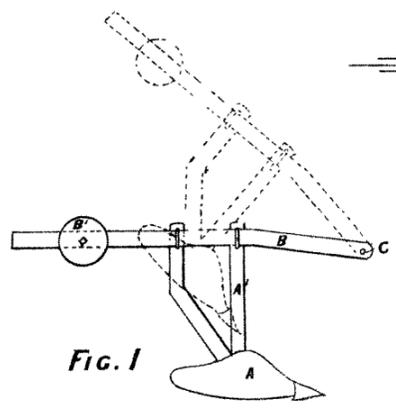


Fig. 1

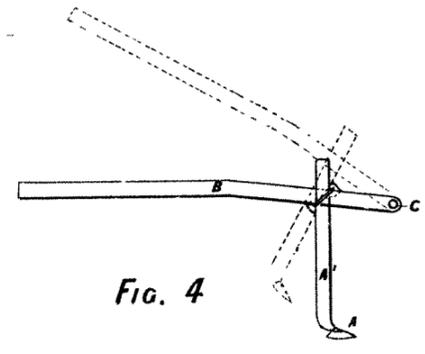


Fig. 4

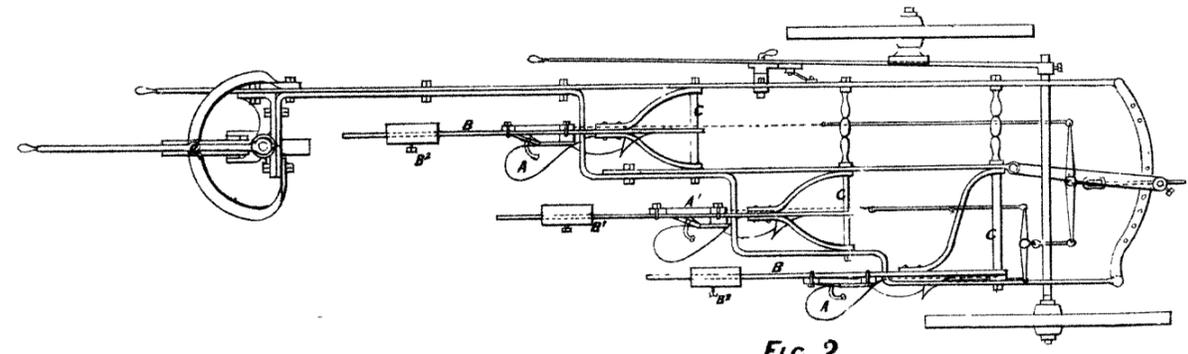


Fig. 2

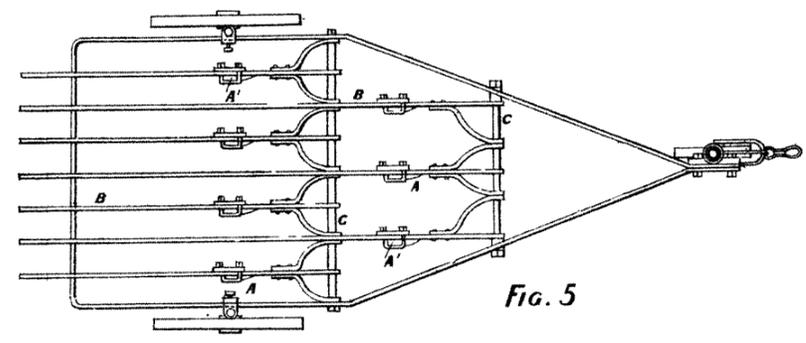


Fig. 5

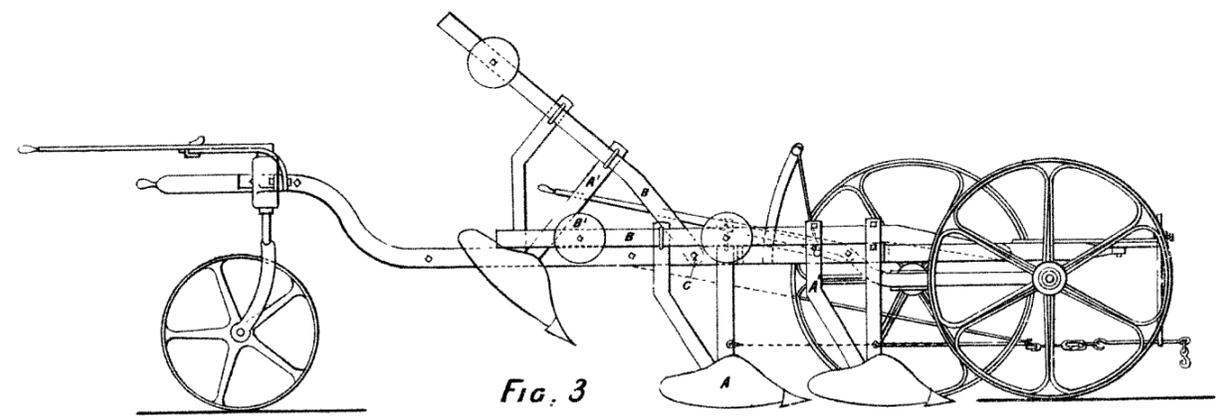


Fig. 3

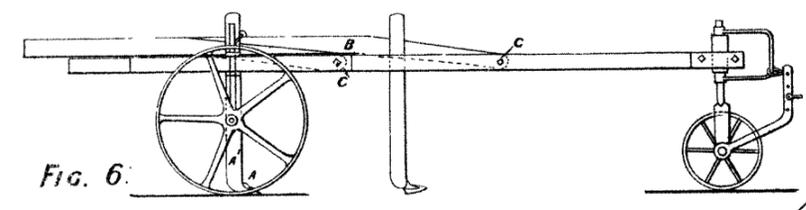


Fig. 6

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

(Sig. 32.-)

This is the Sheet of Drawings referred to in the annexed Letters of Registration granted to Richard Bowyer Smith, this thirteenth day of May, A.D. 1882. Augustus Loftus.



A.D. 1882, 13th May. No. 1066.

IMPROVEMENTS IN EARTH-SCOOPS.

LETTERS OF REGISTRATION to John Hammond Robinson and Charles James Robinson; for Improvements in Earth-scoops.

[Registered on the 13th day of May, 1882, 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 WHOM THESE PRESENTS SHALL COME, greeting :

WHEREAS JOHN HAMMOND ROBINSON and CHARLES JAMES ROBINSON, both of A'Beckett-street West, in the city of Melbourne and Colony of Victoria, agricultural implement makers, 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 Earth-scoops," 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 Hammond Robinson and Charles James Robinson, 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 Hammond Robinson and Charles James Robinson, 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 Hammond Robinson and Charles James Robinson 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 May, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Earth-scoops.

SPECIFICATION of JOHN HAMMOND ROBINSON and CHARLES JAMES ROBINSON, both of A'Beckett-street West, in the city of Melbourne and Colony of Victoria, agricultural implement makers, for an invention entitled "Improvements in Earth-scoops."

THIS invention consists of three improvements in earth-scoops, the first of which relates to self-fastening and releasing catches for the handles; the second to the use of a door which opens and closes automatically with the motion of the handles, and third, to the cutting edge of the scoop.

Our self-fastening and self-releasing catches have been devised for the purpose of preventing accidents through the carrying over of the handles, and for lessening the labour of working the machines. According to our invention, the catches on the excavator proper automatically release themselves from the handles soon after the excavator has commenced the process of turning over, and automatically fasten themselves again when it has completed that process. There is therefore no possibility of the man at the handles being thrown over the machine, because the handles never turn over; neither is there any possibility of the machine turning over more than once without first being held by the catches. By raising the handles to a convenient height, the catches release themselves and allow the scoop to turn over and empty, and by lowering them again the scoop is caught and held in position for re-filling. This we accomplish by making the handles and lugs as shown in our drawings, and by attaching the handles to the frame of the scoop eccentric to the stud or axle on which the scoop turns, so that when raising the handles (as in emptying) the lugs (by working on a different centre to the handles) are caused to move along the handles until they are at a part which is set off a sufficient distance to allow them to pass and release themselves, and thus allow the scoop to turn over and empty. After the handles are released they are lowered to any convenient height, so that as the scoop revolves the lugs are brought in contact with the handles, and are caught and held in position by spring catches working freely in holes through the handles.

Figure 1 shows side elevation of an earth-scoop embodying our improvements; figure 2, plan of same; figure 3, back end view; and figure 4, side elevation of a portion of machine showing an alternative method of carrying out our first improvement. In figure 1 the scoop and handles are shown in position for filling, the dotted lines 3 above the handles showing their position when being released, and the dotted lines 1 below showing the handles when travelling with the load.

A is the scoop body; B, the frame by which it is drawn; B¹, that part of the frame to which the handles C are attached; C, handles for holding the scoop in position, either when filling, travelling, or emptying; C¹ and C², cross-bars for connecting the handles together; C³, the part of handles which are set off to allow the lugs to pass and release themselves when emptying the scoop; D, pins on which the handles work freely; E, stud or axle on which the scoop A revolves, and to which the frame B is attached; F, lugs attached firmly to the back of the scoop A; F¹, top projection of lugs; G, catches working freely through holes in the handles C; H, springs to keep catches G in position.

When the scoop is required to be emptied, the handles C are raised up a sufficient distance (as shown in dotted lines 3 in figure 1) to release themselves and allow the scoop A to turn over. In raising the handles C, the lugs F are moved nearer to the pins D (on which the handles C work), until they reach that part of the handles C³ which is set off a sufficient distance to allow them to pass, and thus allow the scoop A to turn over and empty. As soon as the handles C are released they are lowered to any convenient point, and as the scoop A is being drawn forward to empty the load it continues to revolve until the lugs F come in contact with the catches G, which are then forced back, and allow the lugs to rise until the part F¹ is above the catches G, which then immediately spring under F¹ and prevent them falling back. The bottom portion F² of the lugs come in contact with the underside of handles C, and thus prevents them advancing any further forward, this with the catches G being under F¹ fastens the scoop A and handles C in proper position for working.

An alternative method is shown in figure 4. The studs D are attached to iron bars, M, which also work freely in clips N, and are set off and arranged with the lugs F in the same manner as the handles C and C³, the handles C being attached to and working freely on the studs E instead of the pins D. The clips N are attached firmly to the handle C, and allow the bars M to slide freely in them.

Our second improvement has been devised for the purpose of preventing the escape of the material from the scoop while it is being transported from place to place, and consists in the use of doors to the scoops, which are opened and closed by being connected to the handles in such a manner that when they are raised the door is opened and when they are lowered the door is closed. This we accomplish by continuing forward the handles behind the pins on which they work, and connecting them by means of links or rods to the door-frame. This frame is set back from the door so as to be parallel or nearly so with the sides of the scoop, and made to work freely on pins or studs fixed at any convenient height on the frame of the scoop, and is continued back behind these pins to a convenient distance and there connected by means of links to the front portion of the handles, as shown in our drawings. Referring to them, I is the door-frame, J the door, K links for connecting the door-frame I and handle C⁴.

When the scoop A is being filled, the door J is required to be raised a sufficient distance to allow the earth to enter the scoop freely. As soon as sufficient earth has entered the scoop the door J is then required to be closed, to prevent the loose earth from falling out in front of the scoop. This is done as follows:—When the scoop A is being filled, the man working it raises the handles C from position 1 to position 2, in doing which that part C⁴ of the handles C in front of the pins D is lowered, and being connected at I¹ to the door-frame I by links K, pull down the portion of the door-frame behind the pins L (on which it works), thus raising the front part, to which the door J is firmly attached. To close this door the handles C are lowered to position 1, shown in dotted lines, in doing which they press down the back part of the scoop A (being connected to it by the lugs F), which working on the studs E causes the mouth A¹ to be raised from the ground, as shown in dotted lines in figure 1, the door being lowered to it by the front part C⁴ of the handle C pushing up the links K, and they, by being connected to the door-frame I, raise the portion of the frame behind the pins L, and thus lower the door J to the mouth A¹ of the scoop A. This can be done by an alternative method shown in figure 4 in a reverse manner to the above, that is, by attaching the connecting links K to the door-frame in front of the pins on which it works, and to the handles C behind the pins on which they hinge.

Our

Improvements in Earth-scoops.

Our third improvement consists in so constructing the cutting edge of the bottom of the scoop as that when cutting it will run level or nearly level with the ground. This is for the purpose of presenting a keener edge to the earth, and so lessen the draught when filling, and also for the purpose of lessening its liability to turn over when the scoop strikes any obstruction harder than the loosened soil. This improvement is shown in section in figure 4, as applied to a scoop with a renewable mouth-piece of steel, which is so attached to the scoop that it runs level with the ground when filling, the bottom of the scoop being set at a convenient angle to the ground to enable the mouth to be raised a sufficient distance from the ground to enable it to travel freely. It is not necessary, however, that the front part should be a separate piece or of steel, as it can be made of any suitable metal; and, further, the bottom can be in one continuous piece, and its front set to any desired angle, instead of being made straight to the cutting edge, as is the present plan of making them. A is the scoop; A¹ is the steel front (or mouth-piece) fastened securely to the scoop A; A² is a packing piece placed between A and A¹ so as to set them on the required angle to each other.

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 as our improvements in earth-scoops is—

- First—Our self-fastening and self-releasing catches substantially as herein described and explained, in which the essential feature is—fastening the handle or its equivalent on the frame or draw-bar eccentric to the stud on which the scoop revolves.
- Second—The combination in earth-scoops of doors which are opened and closed by the motion of the handles, through the intervention of suitable levers, substantially as herein described, and as illustrated in our drawings.
- Third—The construction of earth-scoops with their cutting edge or mouth set on a different level from the bottom, substantially as herein described, and as illustrated in our drawings.
- Fourth—The combination of any two or more of these improvements with the other working parts of an earth scoop.

In witness whereof, we, the said John Hammond Robinson and Charles James Robinson, have here-to set our hands and seals, this twenty-second day of February, one thousand eight hundred and eighty-two.

Witness—

EDWD. WATERS,
Melbourne, Patent Agent.

J. H. ROBINSON.
C. J. ROBINSON.

This is the specification referred to in the annexed Letters of Registration granted to John Hammond Robinson and Charles James Robinson, this thirteenth day of May, A.D. 1882.

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 Messrs. J. H. and C. J. Robinson, for an invention entitled "Improvements in Earth-scoops," as shown in the drawing and described in the specification attached to their Petition.

The Under Secretary of Justice.

Sydney, 18 March, 1882.

We have, &c.,

E. O. MORIARTY.
JOHN WHITTON.

[Drawings—one sheet.]

J. H. & C. J. ROBINSON'S. PATENT

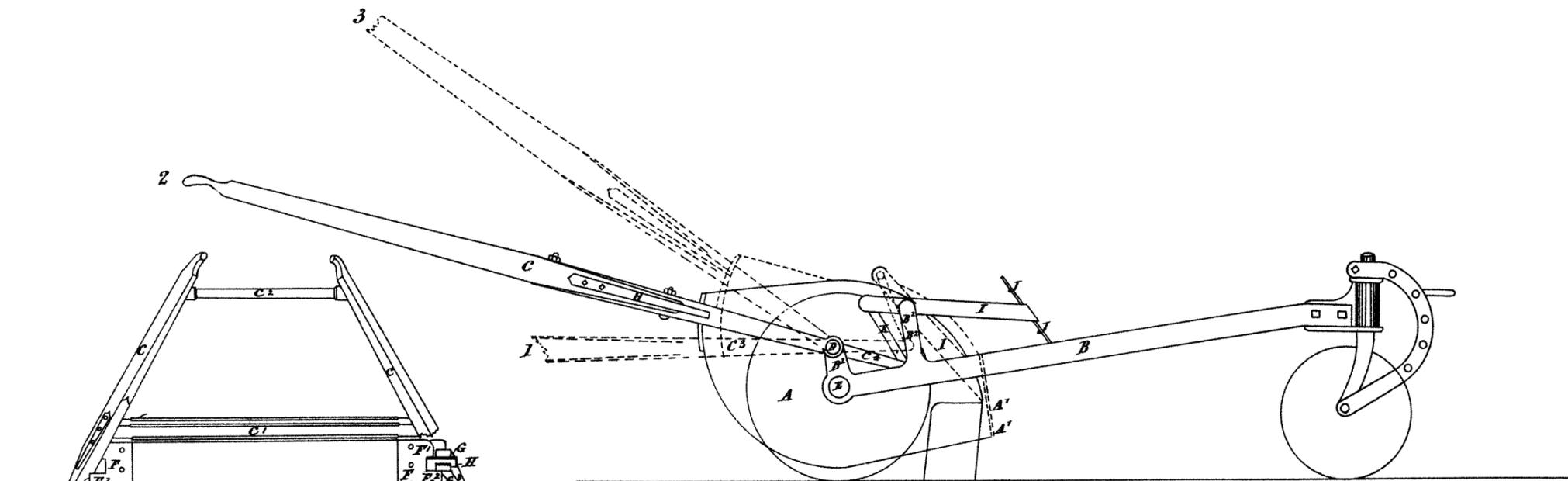


Fig. 1.

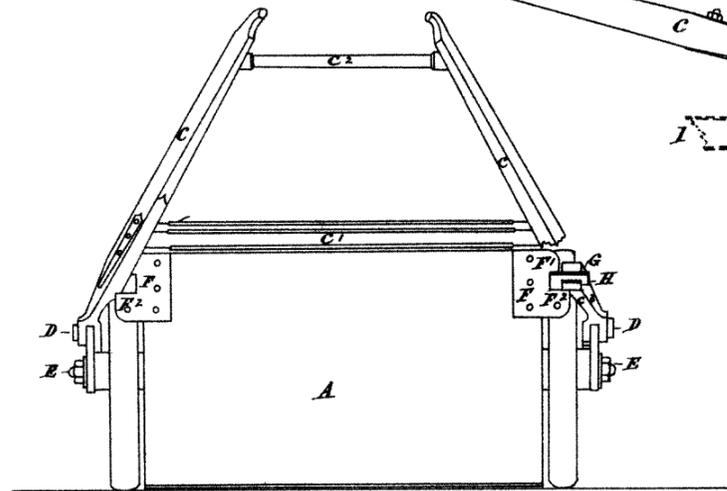


Fig. 3.

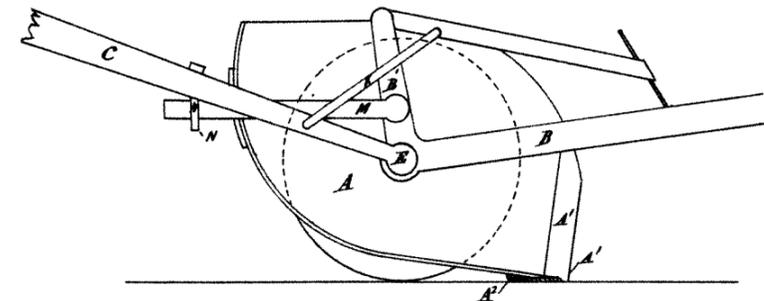


Fig. 4.

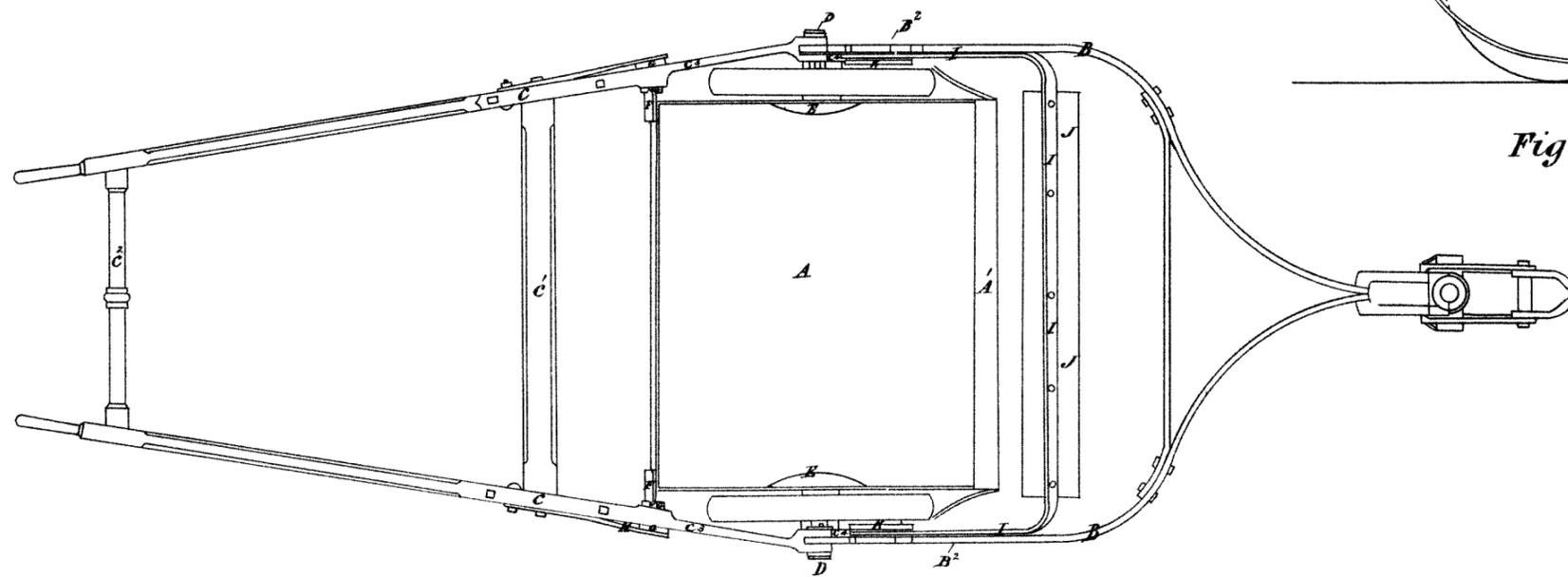


Fig. 2.

*This is the Sheet of Drawings referred to in the annexed
Letters of Registration granted to John Hammond Robinson,
and Charles James Robinson, this thirteenth day of May 1882.
Augustus Loftus.*



A.D. 1882, 13th May. No. 1067.

IMPROVEMENT IN GRAIN-STRIPPING MACHINES.

LETTERS OF REGISTRATION to James Morrow and William Henry Nicholson, for an Improvement in the construction of Grain-stripping Machines.

[Registered on the 13th day of May, 1882, 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, of the firm of Joseph Nicholson and Company, of Bouverie-street, Carlton, near Melbourne, in the Colony of Victoria, agricultural implement manufacturers, have by their Petition humbly represented to me that the said James Morrow is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "An Improvement in the construction of Grain-stripping Machines," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed ; and that they, the said James Morrow and William Henry Nicholson are the assignees of the said James Morrow of and in the said invention ; 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 thirteenth day of May, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvement in Grain-stripping Machines.

SPECIFICATION of JAMES MORROW and WILLIAM HENRY NICHOLSON, of the firm of Joseph Nicholson and Company, of Bouverie-street, Carlton, near Melbourne, in the Colony of Victoria, agricultural implement manufacturers, the assignees of said James Morrow, the inventor of an invention entitled "An improvement in the construction of Grain-stripping Machines."

GRAIN-STRIPPING machines, as ordinarily constructed, provide for the stripping of the grain from the standing crop, but make no provision for cutting the straw which is left. A machine was invented, but never came into use, which had such a provision in the shape of a knife or cutter bar placed underneath the machine and between the draught wheels. This was not likely to succeed, because when the straw met the knife it would be pressed forward by the machine instead of standing up to it. Now, our invention consists in constructing grain-stripping machines with a knife or cutter bar placed such a distance behind the body of the machine as will allow of the straw springing up again so as to assume a standing position before it meets such cutter or knife bar, and we prefer to so arrange such cutter or knife bar that it may be easily moved from its position when the stripped grain is required to be removed from its receptacle. This will be clearly understood on reference to the accompanying drawings which illustrate our invention. Figure 1 being a plan of the draught wheels of a grain-stripping machine with our improvement attached. Figure 2 is a side elevation, and figure 3 a back view of same. Figure 4 is a side elevation showing the position of knife or cutter bar when the grain is being removed, which position is also shown by dotted lines in figure 3. The mode of supporting all the other parts of such a machine is perfectly well known, and forms no part of our invention; therefore we have not shown them in our drawings.

On the axle A^1 of the draught wheels A is placed a bearing or bracket B^1 , to which is bolted a trailing beam B supporting bearings B^2 and B^3 , in which revolves spindle C, driven by bevel wheels C^1 and C^2 and spur pinion C^3 from the ordinary spur gear (or "segment wheel," as it is called) A^2 . On the lower end of spindle C is a disc, C^4 , with crank pin, giving motion by means of connecting rod C^5 to the knife bar D, working through fingers D^1 on bar D^2 . D^3 is a shoe at the outer end of the finger-bar D^2 , which bar may be removable, or preferably, as shown in the drawings, hinged at D^4 to the beam B, and supported when turned up by rod or stay D^5 . The lower end of the beam B and the shoe D^3 are supported by trailing wheels E, adjustably affixed so that the knife-bar may be raised or lowered as required, and as is well understood. The beam B is stayed by a rod F from the axle A^1 . G is a swath-board and rod as commonly used in reapers and mowers, but which may be dispensed with if so preferred.

In figure 2, by dotted lines we have shown a method of driving beaters from a pulley on the spindle of bevel wheel C^2 and pinion C^3 , should such beaters be required.

It will be seen that the knife and finger-bars operate upon just the breadth of crop that has passed through the comb of the stripper, no more and no less; and that being hinged to the beam B, they may be turned up into position, as shown in figure 4, to enable the grain to be removed from the receptacle.

Having thus described the nature of our invention and the manner of performing same, we would have it distinctly understood that we do not claim broadly the combination of knife or cutter bars with grain-stripping machines, because we know that such a combination is not new; but what we do claim as our improvement in the construction of grain-stripping machines is,—

First—The combination of a knife or cutter bar placed such a distance behind the body of grain-stripping machines as will permit the stripped stalks to recover from the pressure of the machine and spring to an upright position before reaching such knife or cutter bar.

Second—The special combination and arrangement of parts shown in our drawings illustrating our said invention, with the knife and finger-bars removable or hinged, and either with or without the beaters.

In witness whereof, we, the said James Morrow and William Henry Nicholson, have hereto set our hands and seals, this sixth day of February, one thousand eight hundred and eighty-two.

Witness—W. S. BAYSTON,
Clerk to Edward Waters,
Patent Agent, Melbourne.

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 thirteenth day of May, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

We do ourselves the honor to report, in reply to your blank cover communication of the 13th instant, No. 2,180, transmitting Messrs. James Morrow and William Henry Nicholson's application for the registration of an invention entitled "Improvements in the construction of Grain-stripping Machines," that we are of opinion the prayer of the petitioners may be granted, in terms of their specification, drawings, and claim.

The Under Secretary of Justice.

Sydney, 20 February, 1882.

We have, &c.,
GOTHER K. MANN.
JAMES BARNET.

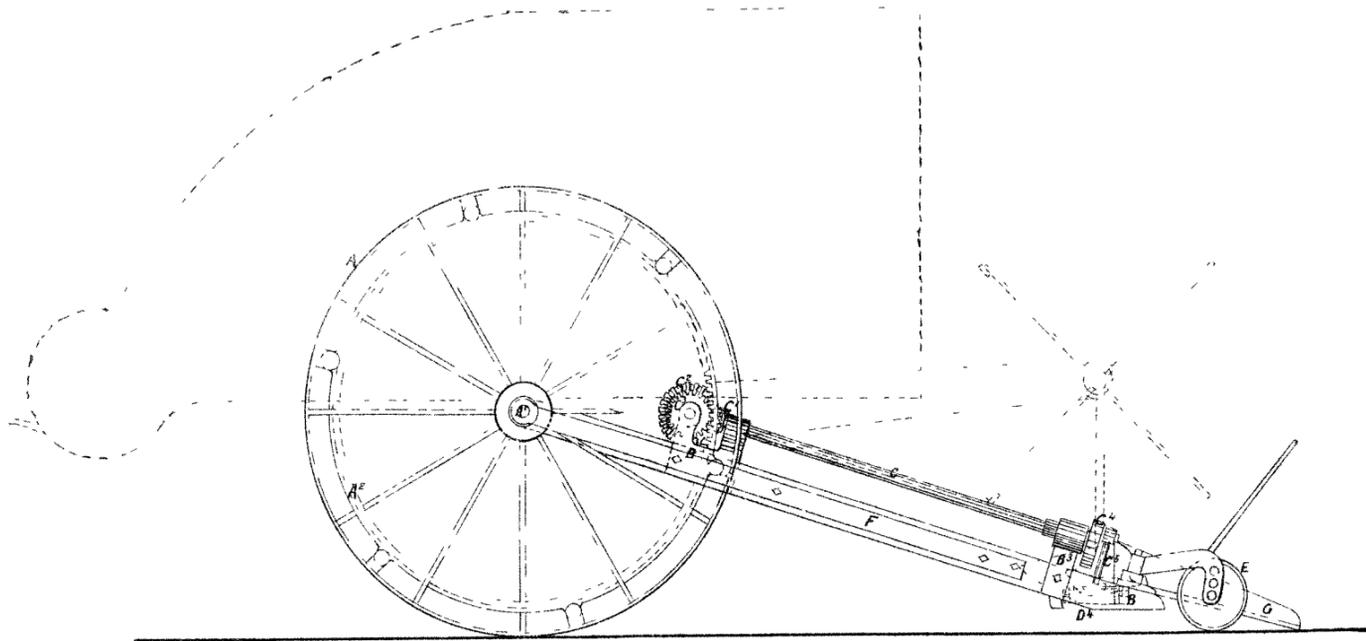


FIG. 2.

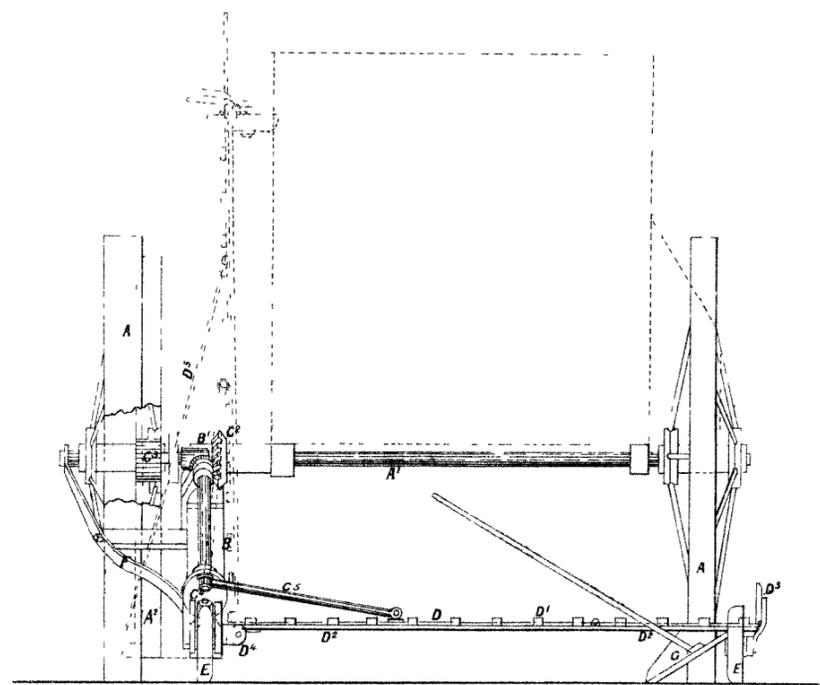


FIG. 3.

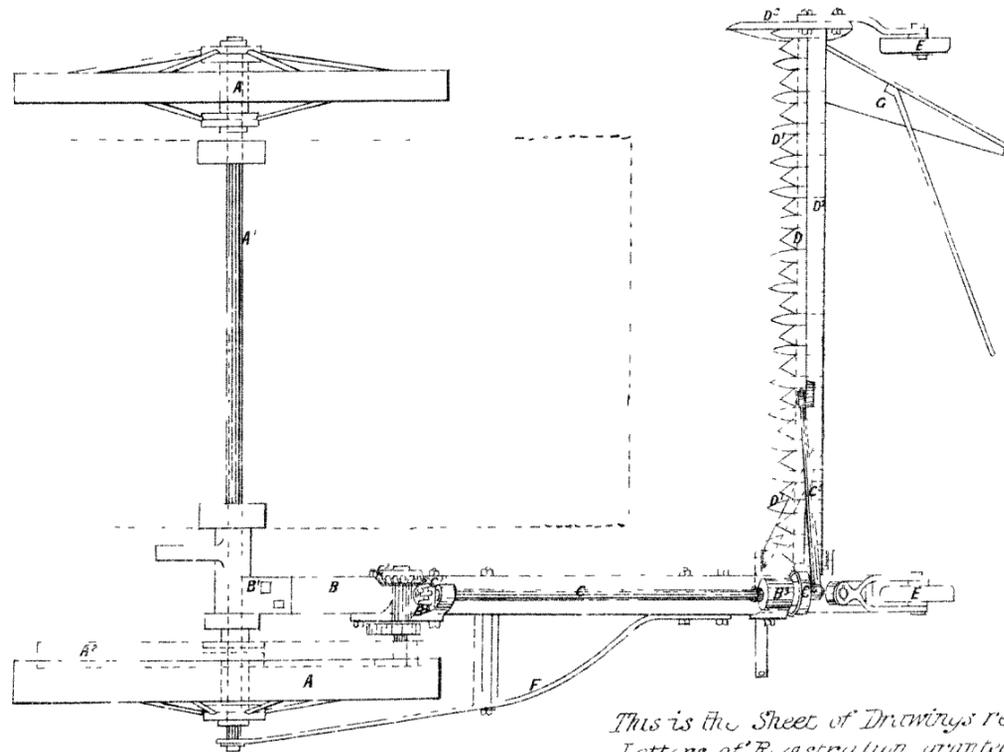


FIG. 1.

*This is the Sheet of Drawings referred to in the annexed
 Letters of Registration granted to James Morrow and
 William Henry Nicholson, this thirteenth day of May, A.D. 1882.
 Augustus Loftus.*

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

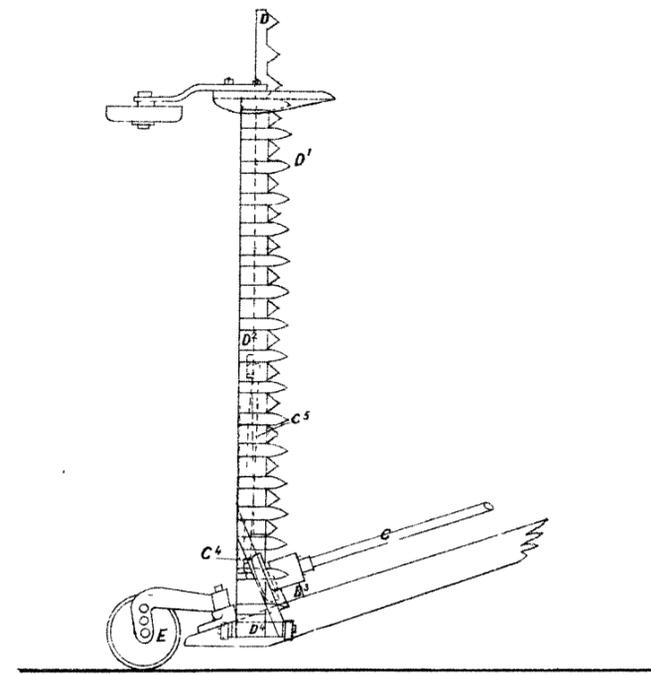


FIG. 4.



A.D. 1882, 13th May. No. 1068.

INVENTION FOR PREPARING TAN-BARK FOR TRANSPORTATION.

LETTERS OF REGISTRATION to Jonathan Sherman, jun., James L. Hill, and Emily S. Coursen, for an invention for preparing Tan-bark for transportation.

[Registered on the 13th day of May, 1882, 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 JONATHAN SHERMAN, junior, of Chicago, United States of America, manufacturer, JAMES L. HILL, of New York, United States of America, manufacturer, and EMILY S. COURSEN, of Chicago aforesaid, artist, have by their Petition humbly represented to me that the said Jonathan Sherman is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Preparing Tan-bark for transportation," which is more particularly described in the specification which is hereunto annexed ; and that they, the said Jonathan Sherman and the said James L. Hill and Emily S. Coursen, are the assignees of the said Jonathan Sherman and in the said invention, 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 Jonathan Sherman, James L. Hill, and Emily S. Coursen, 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 Jonathan Sherman, James Hill, and Emily S. Coursen, 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 Jonathan Sherman, James L. Hill, and Emily S. Coursen 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 May, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Invention for preparing Tan-bark for transportation.

SPECIFICATION of JONATHAN SHERMAN, junior, of Chicago, in the County of Cook and State of Illinois, United States of America, manufacturer, for an invention entitled "Preparing Tan-bark for transportation."

THIS invention relates to the preparation of tanning bark, so as to be ready for tanners' use, and yet will not be bulky or liable to waste by shipping; and it consists in drying, grinding, and compressing the bark into bricks of any desirable shape, on or near the spot where it is gathered.

Heretofore the bark was shipped to the tanner in its natural shape, as it was scaled off of the oak and hemlock trees, either single or compressed in layers, which, by their irregularity and spongy property, are very bulky for shipment, and quite a percentage had to be allowed for waste in loading and unloading, all which I prevent by drying, grinding, and pressing the bark into suitable cakes of brick or prismatic shapes.

Such compressed ground bark the tanner will break into pieces, which, in steeping in water, will swell and easily come apart, and will save to him the trouble of grinding or cutting the same himself, and by the means of such compression the cells of the bark containing the tannin are extended and broken, which admits the water to come more freely in contact with it; thus the tanner will save a large percentage of the strength of the barks over the ordinary mode of now doing it.

Having thus described my invention, what I claim as new and desire to secure by letters patent is—

The process for the preparation of bark for tanning, consisting in drying and grinding, and then compressing the bark sufficiently to crush the cells containing tannin, and at the same time to form small cakes of the ground material convenient for transportation.

In witness whereof, I, the said Jonathan Sherman, junior, have hereto set my hand and seal, this 22nd day of June, A.D. 1881.

JONATHAN SHERMAN, JUNIOR.

Witness—

JNO. C. MACGREGOR.

This is the specification referred to in the annexed Letters of Registration granted to Jonathan Sherman, junior, James L. Hill, and Emily S. Coursen, this thirteenth day of May, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

The application of Ashel Darwin*, James L. Hill, and Emily S. Coursen, for Letters of Registration for an invention for "preparing Tan-bark for exportation," having been referred to us, we have examined the 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.

The Under Secretary of Justice.

* The name Jonathan Sherman, junior, was afterwards substituted for that of Ashel Darwin.



A.D. 1882, 15th May. No. 1069.

IMPROVEMENTS IN PRESSES FOR PRESSING BRICKS AND CONCRETE BLOCKS.

LETTERS OF REGISTRATION to Augustus F. Nagle, for Improvements in Presses for pressing Bricks and Concrete Blocks.

[Registered on the 16th day of May, 1882, 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 AUGUSTUS F. NAGLE, of Providence, in the State of Rhode Island, 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 Presses for pressing Bricks and Concrete Blocks," 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 Augustus F. Nagle, 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 Augustus F. Nagle, 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 Augustus F. Nagle 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 May, in the year of our Lord one thousand eight hundred and eighty-two

[L.S.]

AUGUSTUS LOFTUS,

Improvements in Presses for pressing Bricks and Concrete Blocks.

A.

SPECIFICATION.

UNITED STATES Patent Office.—AUGUSTUS F. NAGLE, of Providence, R.I., assignor to CHARLES E. WHITIN, Trustee, of Whitinsville, Mass., "Improvement in Presses for pressing Bricks and Concrete Blocks." Specification forming part of Letters Patent No. 205,569, dated July 2, 1878; application filed April 12, 1878.

TO ALL WHOM IT MAY CONCERN: Be it known that I, AUGUSTUS F. NAGLE, of the city and county of Providence, in the State of Rhode Island, have invented certain new and useful improvements in presses; and I do hereby declare that the following specification, taken in connection with the drawings furnished, and forming part of the same, is a clear, true, and complete description of my invention, and of a press embodying the several features thereof.

My improvements relate to that class of presses which contain dies or moulds with which a plunger co-operates for subjecting matter to heavy compression, either for the purpose of solidification, or for imparting to said matter a form corresponding to that of the die or mould. For the accomplishment of both purposes, I have embodied the several features of my invention in a press particularly designed to mould and compress asphaltic concrete paving blocks. My improvements are in part applicable however to presses for other purposes, as for instance the bending or forming of sheet metal, useful in the manufacture of metallic goods of various kinds, and they are equally useful in many other connections where rapidity in execution, high pressure, and economy in operation are of special importance. In the manufacture of compressed concrete paving blocks, it is more important that the blocks be practically uniform in density than of the same exact dimensions. The moulds in all cases arbitrarily secure uniform length and breadth to blocks formed therein, but it is obvious that if the thickness be uniform, the density will vary in proportion as the mould is wholly or partially filled with concrete prior to compression. It is also obvious, in a press which has its plunger operated for compression by a cam or other positive mechanical device, that uniformity in density of the compressed material is only possible when the mould is filled each time with accuracy, and this is practically impossible, owing to the semi-plastic condition of the concrete. The prime object of my invention is to secure uniform compression, regardless of the quantity of material in the mould.

To that end, my invention consists mainly in the combination with a suitable die or mould, of a piston rod, a piston, a steam cylinder, a valve for admitting steam to and exhausting it from one end of the cylinder, and a plunger, which is mounted upon the piston rod, and is forced into the mould by the pressure of steam upon the piston. In a press embodying these elements in combination, the plunger will compress with a power equal to the aggregate steam pressure on the piston, less the power requisite to overcome the weight of the parts moved, and their friction and the pressure are the same on the contents of a mould whether it be properly filled or not. Somewhat similar combinations have heretofore been embodied in brick-making machines, but instead of having a plunger forced into the die or mould by steam pressure, the latter has heretofore been relied upon for lifting a heavy drop hammer, which is then permitted to fall into the mould or upon the matter contained therein, and therefore the degree of compression therewith attainable is limited to the weight of the hammer and the height from which it is permitted to fall.

In cotton-presses, steam cylinders and pistons have also been heretofore employed for operating platens, but, so far as my knowledge extends, intermediate power-multiplying mechanism has been used, such for instance as segmental gear, levers, and rack bars. In some cases hydraulic platens have been used, with which hydraulic pressure is attained by steam pressure on a piston in a steam cylinder acting through its piston rod upon a smaller piston within an hydraulic cylinder, which communicates with the chamber containing the stem of the hydraulic platen.

The employment of intermediate power-multiplying mechanism, and the hydraulic features referred to, whether singly or combined, are fatal to the attainment of that rapid operation which is a matter of great importance in the service for which my press is intended. The hammering action described is impracticable with asphaltic mixtures which require a gradual and heavy compression.

For properly controlling the piston and plunger while under steam pressure, my invention further consists in the combination with the mould, the plunger, the piston, and its rod, of a steam cylinder, provided with a steam and exhaust port at one end thereof, and a port or passage at the opposite end for the escape and admission of air (or exhausting steam, as the case may be) from and to the cylinder in front of the piston, and a valve or valves which admit and exhaust steam to and from one end of the cylinder, and control the passages at the opposite end for cushioning the piston against the initial force of the live steam.

The valve or valves referred to are so operated and so constructed and arranged with reference to the cylinder ports, that when live steam is first admitted to the cylinder at the rear of the piston, the passage or port at the front end is wholly closed, thus cushioning the piston and obviating such undue shock as would otherwise be incident to its movement.

After the cushioning of the piston, the front port is partially uncovered, permitting the air to escape and thereby allowing the piston to fully advance and exert its full power through the plunger upon the material in the mould, after which the rear port is closed to steam and opened to exhaust, the front port remaining open to allow the admission of air or exhaust steam in front of the piston, which is then with the plunger free to move to its normal position.

I prefer that the press be upright, in order that the return of the piston and the withdrawal of the plunger in the mould may be effected by gravity. In the hammer-press brick machines, such as are hereinbefore referred to, provision has been made for cushioning the piston in its dropping movement with the hammer, and this has been attained by having a series of ports which, when operating as exhaust ports, are successively covered by the piston in its descent. In my press the cushioning is provided for at the end of the cylinder opposite to that at which live steam is admitted and exhausted, instead of at the same end, as in the hammer press, as well as in steam forging hammers.

In steam-pumps a cushioning of the piston is effected in various ways alternately at the ends of the cylinder, at the terminal portion of the stroke, but this feature is distinct from the important and novel one of controlling the piston during its initial and subsequent movement under pressure, by which the plunger, regardless of heavy steam pressure, is controlled during its movement into the mould, and ultimately made to compress to the fullest extent possible with the head of steam employed.

The

Improvements in Presses for pressing Bricks and Concrete Blocks.

The mould employed by me is one which has a movable top or head block, and is therefore open at both ends, the top or upper end of the plunger serving as the bottom of the mould. During the movement of the head block in opening the mould, it is obvious that the pressure on the contents of the mould should not be continued, and therefore the steam pressure is wholly removed from the piston and the plunger allowed to drop, thus freeing itself from the concrete block, which is thereafter ejected from the mould by a second forward movement of the plunger.

For accomplishing this end, my invention further consists in the combination with a mould, a sliding head block, a plunger, piston rod, piston, steam cylinder and valve, of a continuously driven lifting device, which at proper intervals forces up the plunger for ejecting the contents of the mould. I prefer a cam on a continuously driven shaft, and a piston rod which carries the plunger on its upper end, and extends downwards through the lower head of the cylinder for contact with the cam, but other well-known mechanical devices may be successfully employed.

In brick-making machines as heretofore constructed, sliding head blocks and open moulds have been employed in connection with the plunger, which is forced through the mould by actuating machinery similar to that used by me, but I know of none in which the compression is effected by steam pressure acting through a piston and plunger, and the mould then freed from its block by means of cams or other equivalent mechanical devices acting upon the plunger after the steam pressure is removed therefrom.

The more or less plastic character of asphaltic concrete renders it difficult to properly charge a mould, but this is greatly facilitated by another feature of my invention, which consists in the combination of a mould of a vertical hopper or chute, which is smaller at its upper end than at the lower end, so that concrete supplied thereto passes in mass readily downward into the mould without clogging or wedging.

It is desirable that the lower end of the chute or hopper be somewhat smaller than the mould, so that the concrete will have no corner or edges to engage with in its downwards movement. I prefer also, for lessening the liability of wedging, that the corners of the chute be rounded instead of rectangular.

In order to secure a complete closure of the mould by a sliding head block, my invention further consists in the combination with a mould provided with a hardened cutting edge on one side at its top, of a sliding head block provided with a similar cutting edge for shearing or cutting through particles of rock and asphalt, when interposed between the cutting edges during the closing movement of the head block.

For preventing the blocks from unduly adhering to the mould, and for keeping the latter smooth and clean, my invention further consists in the combination with the mould and plunger of an exterior reservoir, connected with the plunger by suitable ducts or pipes, whereby oil or other lubricating matter may, while the press is at work, be supplied to the plunger, and thence distributed upon the interior surfaces of the mould during the movements of the plunger therein.

Brick-presses have heretofore been provided with chambered plungers for lubricating the mould, but, so far as my knowledge extends, lubricating matter can only be supplied to such plungers while the press is not at work.

As the top or end of the plunger serves as the bottom of the mould, and as it is desirable that the press be capable of making blocks of various sizes, I employ a plunger which is adjustable with reference to the mould, so that it may be permitted to fall more or less, according to the thickness of the blocks required, but such adjustable plungers have been heretofore employed in brick-presses.

For relieving the shock otherwise incident to the fall of the plunger and piston, my invention further consists in the combination with the plunger rod and piston, of a head on the piston rod beneath the plunger, and a chamber, to which the head is accurately fitted, so that when the plunger falls, the head enters the chamber and is cushioned by the air therein.

To more particularly describe my invention, I will refer to the accompanying drawings, of which there are four sheets, and in which figure 1, sheet 1, is a side elevation of a press embodying the several features of my invention, as arranged for the manufacture of concrete paving blocks; fig. 2, sheet 2, represents the same press partly in lateral vertical section, and with the front main columns of the frame removed; figs. 3 and 4, sheet 3, represent respectively, in side elevation and central vertical section, the valve and valve chamber, and its connections; fig. 5, sheet 3, represents in lateral section the piston of the steam valve; fig. 6, sheet 3, illustrates the shape of the valve cam; fig. 7, sheet 4, represents in vertical section the sliding hopper, the head block, and mould filled with concrete, and closed ready to receive pressure; fig. 8, sheet 4, is a similar view showing the mould open, and the compressed block ready to be discharged; fig. 9, sheet 4, represents a portion of the mould and the plunger, partially in section, to illustrate the manner of lubricating the mould; fig. 10, sheet 4, is a side view of the several cams mounted on a shaft and revolved therewith; fig. 11, sheet 2, represents the plunger in horizontal section, for showing the arrangement of interior lubricating ducts.

A denotes the steam cylinder, which is incorporated into and forms a part of the frame of the press; it is supported on four columns, A¹, mounted on a base plate, a. The cap plate of A² of the press is above the cylinder, and is firmly connected thereto, and supported by four heavy iron rods or bolts, A³. The mould is centrally located in the cap plate, and may be of any desired form. For making asphaltic concrete paving blocks, it is desirable that the mould be lined with steel plates, A⁴, secured by bolts, as shown in fig. 2, but a steel-lined mould constitutes no portion of my invention.

The cap plate on each side is provided with two heavy upright flanges, one on each side, which are channelled from front to rear, as shown at A⁵, figs. 2, 7, and 8, for the reception of laterally projecting portions of the sliding hopper B and its head block b. The interior of the hopper is clearly shown in figs. 2, 7, and 8; it has interior rounded corners, is smaller at the top than at the bottom, and is somewhat smaller at its lower end than the area of the mould C, so that the more or less plastic mass of concrete will readily pass downward into and fill the mould. The head block b is clad on its lower face with a hardened steel plate, b¹, which is in sliding contact with the upper surface of the cap plate a². The head block plate has a sheer or cutting edge which co-operates with a corresponding hardened edge of the steel lining of the mould, in order that small fragments of the rock will not obstruct the movement of the sliding blocks in closing the mould, said fragments being readily disposed of by the cutting edges; a pair is mounted

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mounted on the hopper to serve as a receptacle for concrete, and from which the hopper and mould are supplied from time to time by an attendant, it being advisable that the hopper should at all times contain considerably more concrete than is requisite for filling the mould. The hopper is connected by a link, b^2 , to a vertical lever, b^3 , which is pivoted to the frame near the cylinder, and is furcated at its lower end. Each leg of the lever b^3 is connected by double links, b^4 , to rockers, b^5 , pivoted to the bed plate a . One of these rockers is located in front and the other in rear of the shaft D, and each is provided with a friction roller, b^6 , (clearly shown in figs. 1, 2, and 10). One of these double links b^4 is composed of oval counterparts, with the central portions thereof removed, to afford space for the shaft D, which carries the two cams d (shown in figs. 2 and 10); these cams are so shaped and so set on the shaft with reference to each other, that the lever b^3 is positively vibrated, and the sliding hopper moved to and fro at certain intervals, as hereinafter described. The shaft D also carries a cam, d^1 , which is located beneath and in line with the centre of the steam cylinder, and is the mechanical lifting device by means of which the compressed contents of the mould are ejected. At the outer end of shaft D is a valve cam, d^2 , which is relied upon to impart certain movements to the valves of the press. The cam is cut in the side of a circular plate, and is a continuous groove of a form which is illustrated on an enlarged scale in fig. 6, and also fully shown in fig. 10. The plunger E is fitted to the mould so that it may move freely and securely therein, with close contact with the sides thereof, for lubricating the interior of the mould, thus keeping it smooth and permitting the blocks to be easily ejected. An oil reservoir E is attached to the press, at a point above the mould, and connected with the plunger by a jointed or flexible pipe, E^1 , which communicates with a central vertical duct, C^2 , and other horizontal ducts, E^3 , within the plunger, through which oil or other lubricant is discharged, preferably into a mass of fibrous absorbent which is kept in place around the plunger in perforated springs E^4 , one of which is shown in fig. 9. The contact of these springs with the sides of the mould secures a proper distribution of the lubricant. The sectional view of the plunger, fig. 11, sheet 2, shows the arrangements of the ducts. The plunger is firmly mounted upon the end of the piston rod F, and it is preferably arranged so that when at its lowest position it will still be within the mould, in order that it may always be guided, and because, when so arranged, the plunger and mould may be more accurately fitted to each other than would be possible if the plunger at each stroke was permitted to leave the mould. The piston rod F is preferably extended downward through the lower or rear head of the cylinder, because its lower end can then be placed in direct communication with the ejecting cam d^1 , but instead of having the piston rod thus extended, it may terminate at the piston G, and the ejecting cam so arranged to co-operate with a lever connected by a link to an upper lever, in turn connected with the piston rod and plunger, but this latter arrangement would involve complication, with no more satisfactory results.

The piston G is strong and heavy, is secured to the rod F and properly packed with relation to the cylinder, and each head of the latter is provided with a stuffing-box for the piston rod.

H denotes a cylindrical valve chamber, which communicates by port f with the lower or rear end of the cylinder, and by port g with the upper or front end. The steam pipe h communicates with the lower end of the valve chamber, and the exhaust pipe i communicates with the central portion thereof; the valve is of peculiar construction, and is in fact two valves mounted on a valve rod, k , which is provided with a stuffing-box in each head of the chamber. This valve has two pistons. The lower one L controls the cylinder port f for admitting and exhausting steam. It is hollow and webbed, and has apertures, L^1 , which admit steam within, and thence by an annular space surrounding the valve rod, it passes to the upper portion of the chamber, thus balancing the valve against steam pressure. The upper valve piston m is solid, but has a wide flange supported by radial webs, m^1 . The flange is cut away at m^2 , beneath the upper valve piston head, for affording a communicating passage, *via* port g , between the front or upper end of the cylinder and the central portion of the valve chamber. It is to be understood that the upper valve piston is relied upon to properly guard the port g , so that the upward movement of the cylinder piston G under steam pressure may be properly controlled, and all undue shock obviated, by maintaining a cushion of air or exhaust steam above the piston as long as may be necessary, and then permitting the compressed air to slowly escape while the piston and plunger are completing their upward movement. The lower end of the rod k is provided with a slide, k^1 , and a friction roller, k^2 , mounted on a stud projecting from the slide, so that the roller occupies the cam groove in cam d^2 on the outer end of shaft D. Above the cylinder and mounted thereon is a yoke frame, n , with a threaded eye, which encloses the piston rod; a hand wheel, O, with a threaded neck is fitted to the yoke, so that by turning the wheel it may be raised or lowered on the thread. The upper surface of the wheel is centrally recessed as at O^1 , forming a chamber which is accurately fitted to receive the circular head or plate O^2 on the bottom of the plunger E, so that when the plunger falls an air cushion is afforded in the chamber, to obviate the undue shock which would otherwise be liable to occur when the plunger falls.

By turning the hand-wheel up or down, the drop of the plunger may be varied, thereby decreasing or increasing the cubic capacity of the mould.

A guide is afforded for the lower end of the piston rod by a yoke, p , which is secured to the lower head of the cylinder.

In discharging a block from the mould, an easy contact is afforded between cams d and the piston rod, because of a friction roller at the lower end of the rod.

The operation of my press is as follows:—It will be assumed that the plunger is at its lowest position, the interior of the hopper in line with the mould, and the shaft D in motion. An attendant secures the proper supply of concrete to the mould. The revolution of shaft D and cams d , operating through lever b^3 , moves the hopper rearward, placing the head block b over the mould, thus closing it and sheering off the mass of concrete; the concrete in the hopper then rests upon the cap plate a^2 . As soon as the mould is closed (see fig. 7), and the hopper and head block at rest, the valve cam d^2 lifts the valve rod and admits steam through port f into the cylinder beneath the piston, which is thereby moved upward against the confined air and exhaust steam in the upper end of the cylinder; but after this first movement of the piston, the upper port g is slightly uncovered by the valve, which allows the compressed air to escape, and permits the piston to move freely upward under full steam pressure, and to compress the contents of the mould to a degree equal to the aggregate steam pressure on the piston, minus the weight

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weight lifted and the friction of the parts. The continued rotation of the cam d^2 next moves the valve downward, uncovering both cylinder ports f and g , which permits the exhaust steam to escape from below the piston, and air and exhaust steam to enter above the piston, whereupon the piston and plunger fall without shock, because they are cushioned by the air beneath the plate O^2 when entered into the chamber above the cylinder. As soon as steam pressure is removed from the piston, the cams d move the hopper rearward and uncover the mould, after which the block is ejected by the cam d^1 ; the hopper then moves forward, sliding the block from the plunger to the surface of the cap plate, from which it may be delivered to an endless belt, as indicated in dotted lines in fig. 1.

It will be seen that in case the mould be entirely empty, the movement of the piston will be properly controlled, so that it will ascend gradually to its full height without shock, and also that in case the mould has much or little concrete therein, the blocks will be of practically the same density, because subjected to the same degree of compression. During the exhausting of the steam from the lower end of the cylinder, it will be seen that the upper port g being open, the exhaust steam may freely enter the upper end of the cylinder, to serve as a cushion during the succeeding movement of the piston.

Steam may be supplied to the press from a boiler exclusively provided therefor, or from the boiler which affords the motive power for driving the shaft. The action of the steam being prompt and efficient for inducing the desired pressure, it is practicable to operate the shaft at a speed which will deliver (say) ten to twenty blocks a minute, if the concrete be of a character which will enable the moulds to be rapidly filled; this latter operation being the one which practically controls the speed at which the press may be successfully operated.

I do not limit myself to the precise construction shown, for I am well aware that other well known mechanical devices may be employed for moving the hopper actuating the valve and discharging the block, without departing from the spirit of my invention or materially affecting its practical value; nor do I limit myself to a valve or valves of the precise construction shown, for while I now employ what is practically two valves on one rod, I am well aware that each port of the cylinder may be guarded by a separate valve of a different construction and separately actuated; and I am also aware that the lower end of the cylinder may be provided with two ports, one for steam and the other for exhaust, and that these may be guarded by separately actuated valves. I have, however, produced the desired results by simple and effective means, and have avoided as far as possible unnecessary complications.

Having thus described my invention, I claim as new, and desire to secure by Letters Patent—

- 1st—The combination with a die or mould of a piston rod, a steam cylinder, a valve for admitting and exhausting steam to and from one end of the cylinder, and a plunger which is mounted upon the piston rod, and is forced into the mould by the pressure of steam upon the piston, substantially as described.
- 2nd—The combination with a mould, a plunger, a piston, and a piston rod carrying the plunger of a steam cylinder for the piston, provided with a steam and exhaust port at one end, and a passage or port at its opposite end, and a valve or valves which admit and exhaust steam to and from one end of the cylinder and control the passage at the opposite end for cushioning the piston against the initial force of the live steam, substantially as described.
- 3rd—The combination with a mould, a movable head block which opens the mould, a plunger, a piston and its rod, and a steam cylinder and its valve, of a mechanical lifting device for forcing the plunger through the mould, substantially as described, whereby the compressed contents of the mould are ejected therefrom, as set forth.
- 4th—The combination with a mould of a hopper which is smaller at the top than at the bottom, substantially as described, whereby concrete may freely pass downward to the mould, as set forth.
- 5th—The combination with a mould having a hardened cutting edge at its top, of a sliding head block provided with a hardened cutting edge, substantially as described, whereby particles of rock and concrete will not obstruct the movement of the block enclosing the mould, as set forth.
- 6th—The combination with the mould and a plunger provided with ducts, of an exterior reservoir connected with the plunger, substantially as described, whereby lubricating matter is supplied to the plunger while at work, and thence distributed upon the surface of the mould, as set forth.
- 7th—The combination with the plunger, piston rod, and piston, of a head on the rod below the plunger, and a recess or chamber to which the head is accurately fitted, substantially as described, whereby the fall of the plunger rod and piston is relieved from shock by the cushioning of air in the chamber, as set forth.

AUGUSTUS F. NAGLE.

Witnesses—

GEORGE H. CULVER.
GEORGE FULLER.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to Augustus F. Nagle, this fifteenth day of May, A.D. 1882.

AUGUSTUS LOFTUS.

Improvements in Presses for pressing Bricks and Concrete Blocks.

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 A. F. Nagle, for an invention entitled "Press for pressing Bricks and Concrete Blocks," as shown in the drawings and described in the specification attached to his Petition.

The Under Secretary of Justice.

Sydney, 18 March, 1882.

We have, &c.,

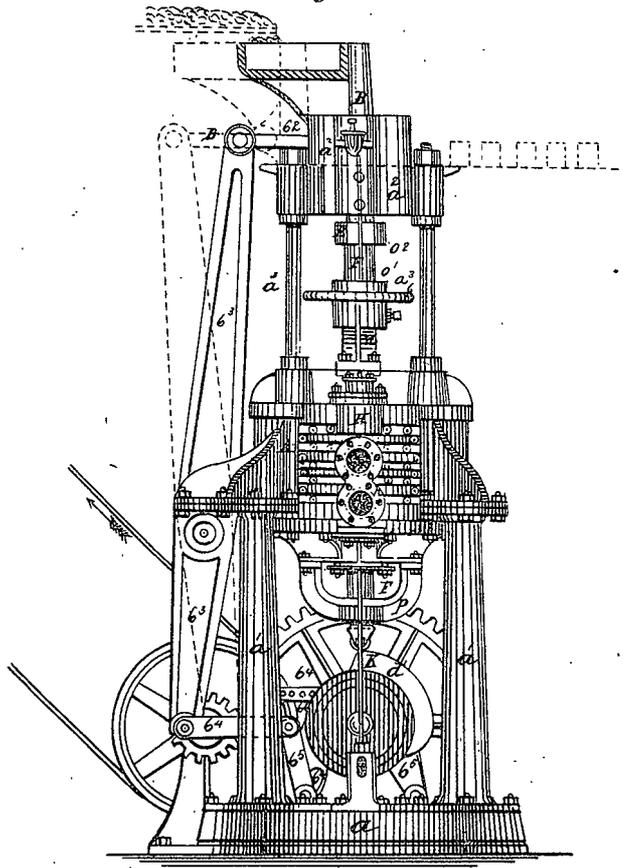
E. O. MORIARTY.
JOHN WHITTON.

[Drawings—four sheets.]

A. F. NACLE.

PRESS FOR PRESSING BRICK AND CONCRETE BLOCKS.

Fig. 1.



Thomas Waller & Brown
 Secy. H. Remington.

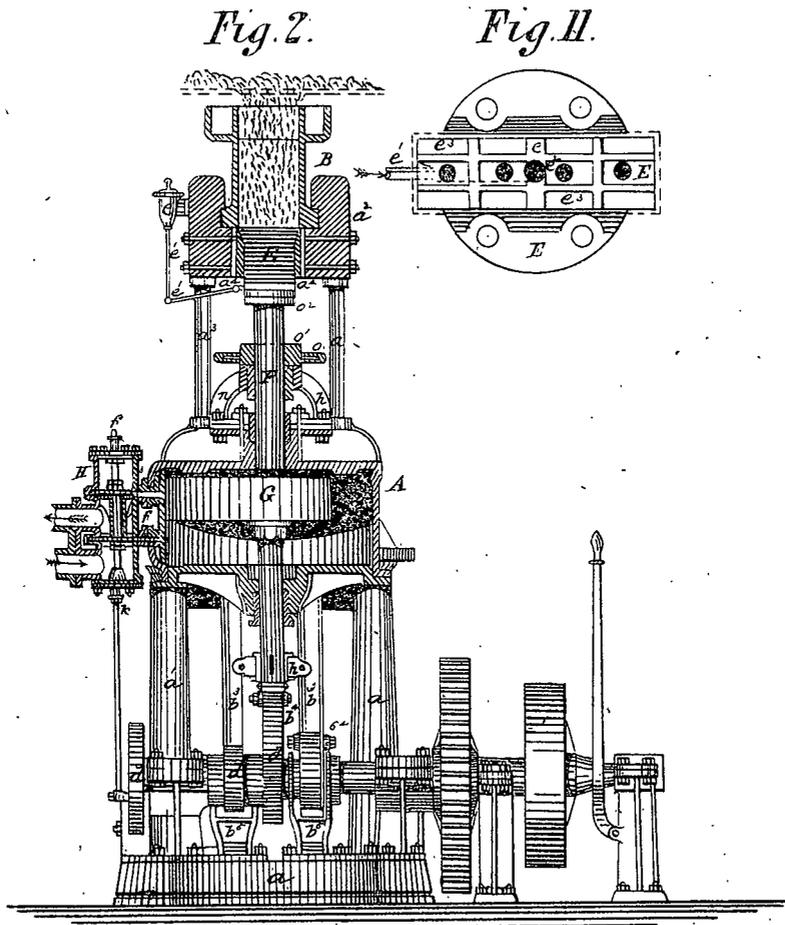
Inventor
 Augustus F. Nacle.

This is the Sheet of Drawings marked B. referred to in the
 annexed Letters of Registration granted to Augustus F.
 Nacle this fifteenth day of May, A. D. 1882.

Augustus Loftus.

A.F. NACLE.

PRESS FOR PRESSING BRICK AND CONCRETE BLOCKS.



Witnesses.

Walter F. Brown.
Geo. H. Remington.

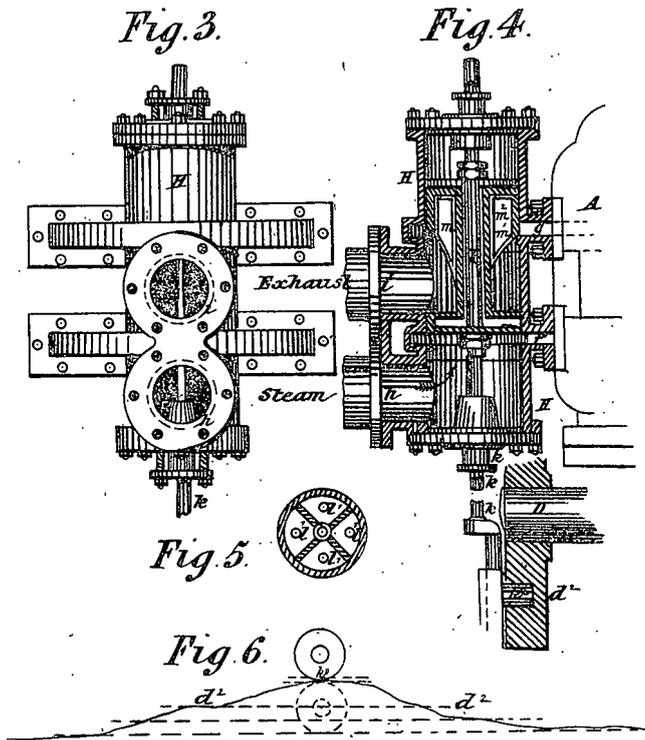
Inventor.
Augustus F. Nagle.

This is the Sheet of Drawings marked C. referred to in the annexed Letters of Registration granted to Augustus F. Nagle, this fifteenth day of May, A. D. 1882.

Augustus Loftus

A.F. NAGLE.

PRESS FOR PRESSING BRICK AND CONCRETE BLOCKS.



Witnesses.

Walter F. Brown.
Geo. H. Remington.

Inventor.
Augustus F. Nagle.

This is the Sheet of Drawings marked D referred to in the annexed Letters of Registration granted to Augustus F. Nagle this fifteenth day of May A.D. 1882

Augustus Loftus.

4 Sheets. Sheet 4.

A.F. NAGLE.

PRESS FOR PRESSING BRICK AND CONCRETE BLOCKS.

Fig. 7.

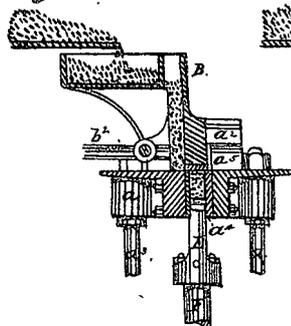


Fig. 8.

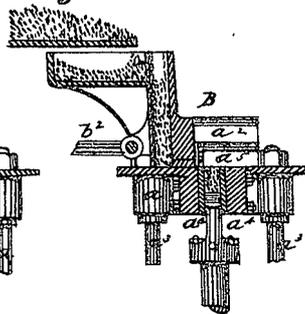


Fig. 9.

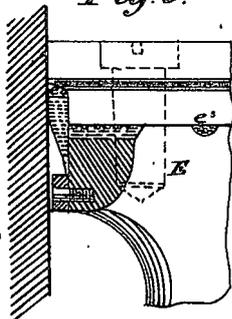
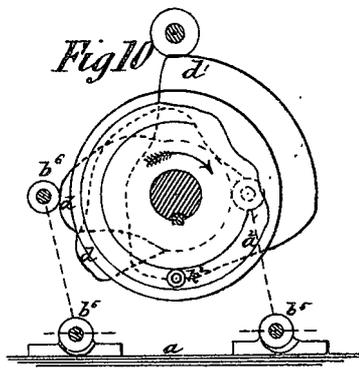


Fig. 10.



Witnesses.

Walter F. Brown
Geo. H. Remington.

Inventor

Augustus F. Nagle

This is the Sheet of Drawings marked E referred to in the annexed Letters of Registration granted to Augustus F. Nagle, this fifteenth day of May AD. 1882.

Augustus Loftus



A.D. 1882, 15th May. No. 1070,

IMPROVED APPARATUS FOR WORKING RAILWAY BRAKES BY FLUID PRESSURE.

LETTERS OF REGISTRATION to George Westinghouse, junior, for Improved Apparatus for working Railway Brakes by Fluid Pressure.

[Registered on the 17th day of May, 1882, 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, 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 working Railway Brakes by Fluid 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 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 fifteenth day of May, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improved Apparatus for working Railway Brakes by Fluid Pressure.

A.

SPECIFICATION of GEORGE WESTINGHOUSE, junior, of Pittsburg, Pennsylvania, United States of America, for an invention entitled "Improved Apparatus for working Railway Brakes by Fluid Pressure."

AIR is applied to work brakes on railway trains, either by employing it at a pressure above that of the atmosphere to act on pistons or their equivalents connected to the brake levers of the brake carriages, or by rarefying the air and so bringing the superior pressure of the external atmosphere to act on those pistons or their equivalents. Moreover, the apparatus employed for working the brakes by air pressure, whether in the plenum or in the vacuum way, is sometimes of the automatic kind, such that in case of a train separating, the brakes become put on of themselves; sometimes it is of the non-automatic kind, in which case braking power is destroyed in case of separation of the train.

As these several methods of operating are in use, it sometimes happens that a brake-carriage fitted for acting in the one way has to form part of a train the other brakes of which act in the other way. My invention relates to the construction of several parts of the brake apparatus in such a manner that when they are on a carriage fitted for having its brakes worked according to one method they do not interfere with the working of other brakes of a train according to others of the methods.

In pneumatic brakes to which my invention applies, there are several general features, which may be stated as follows:—On the locomotive or tender there is a pump for compressing air into a reservoir, or an ejector or pump for rarefying air, and the air thus treated is communicated throughout the train by pipes connected from carriage to carriage by suitable couplings. The communicating pipe is in some automatic brakes connected by branches on each carriage to an auxiliary reservoir or to a vacuum vessel constituting a local store of force, and to a brake cylinder having its piston connected to the brake levers, so that when the piston is subjected to excess of pressure on one of its sides it moves and puts on the brakes. Sometimes, instead of a cylinder and piston a vessel is employed divided by a flexible diaphragm, which acts like a piston, this forming an equivalent arrangement which is to be understood as being included in the following description when the brake cylinder and piston are referred to. The auxiliary reservoir or vacuum vessel is sometimes separate from the brake cylinder, communicating with it by a passage provided with special valves; sometimes it is arranged to be in constant communication with one end of the brake cylinder, and in such cases, instead of being made as a separate vessel, it is often merely a considerable enlargement of that end of the cylinder. The brakes, which are put on by the brake piston moving in obedience to excess of pressure on one of its sides, are generally taken off by weights or springs, when the pressure on the two sides of the piston are equalized. Sometimes the piston is made differential, exposing a greater area for pressure to act on one side than on the other, this difference of area serving as an equivalent for the weights or springs.

For non-automatic brakes no auxiliary reservoirs are employed, the brakes being put on and taken off simply by changing the pressure in the pipe which communicates throughout the train with the several brake cylinders or their equivalents. Such being the general character of the brake apparatus, I will describe the improved construction of some of its parts, which forms the object of my present invention, referring to the accompanying drawings.

Figure 1 is a longitudinal section, and figure 2 is a front view of the regulating valve by which the engine-driver can admit compressed air into the communicating pipe of the train, and can vary the pressure in the pipe or discharge compressed air from it. The valve-box has two nozzles, A, which is connected to the main reservoir or supply of fluid under pressure, and B, which is connected to the train pipe. These nozzles open from two compartments of the valve-box, separated by a partition having a valve C, which is pressed to its seat by a spring, c. Attached to the valve C is another valve, D, the attachment consisting of a cross-pin d, which has certain freedom in the hole of the stem of D through which it passes. The valve D seats on a hole in the centre of a piston, E, which may have in front of it a flexible diaphragm F, secured at its outer edge between the two parts of the valve-box, which are screwed together. The compartment of the valve-box on the other side of the piston E communicates with the outer air by passages, G, there being free passage to this compartment when the valve D is unseated by the hole through the piston and cross holes c. The stem of the piston E has a shoulder, against which butts one end of a spring H, whose other end butts against a plug, k, which is screwed into the lever handle K. The boss of this handle has on it a screw-thread, L, working in an internal thread of the valve-box. The handle K is provided with a spring catch lever, M, the lower end of which has teeth that can engage with teeth cut in the periphery of a ring, N, that is clamped between the two parts of the valve-box, the lever K being held in any desired position by the engagement of the spring catch with these teeth. When the driver desires to admit fluid under pressure into the train-pipe he turns the handle K so that its boss screws inward, pressing the piston E forwards. The valve D is thus firmly seated, but the valve C is forced from its seat, and fluid under pressure entering by the nozzle A, passes the valve C, and flows by the nozzle B to the train-pipe. When the driver desires to let fluid escape from the train-pipe and thereby reduce the pressure in the pipe, he turns the handle K in the opposite direction, unscrewing its boss and so relieving the pressure of the spring H on the piston E. The pressure of the fluid in the train-pipe acting on the piston E forces it back, and the valve C being seated, the pin d holds the valve D while the piston retreats from it, and thereupon fluid from the pipe flows by the nozzle B past the valve D, through the piston and the lateral apertures e, and escapes by the passages G. When the pressure in the pipe is so far reduced by escape of fluid that the force of the spring H overcomes the pressure on the piston E, the piston automatically advances so as to close the valve D and prevent further escape from the pipe. As the driver by turning the handle K more or less can more or less relieve the spring H, he can delicately regulate the pressure in the train-pipe, and can thus cause the brakes to be applied with greater or less rapidity and force as circumstances may require. The diaphragm F may obviously be dispensed with if the packing of the piston E be sufficiently tight to prevent leakage past the piston. The diaphragm is useful when compressed air is the fluid employed, but when steam or a liquid under pressure is used the diaphragm F should be dispensed with, and the passages G should be connected to a return pipe. The valves C and D are preferably loosely connected, as shown, to allow for slight inequalities of workmanship.

Figure

Improved Apparatus for working Railway Brakes by Fluid Pressure.

Figure 3 is a longitudinal section of a half-coupling for the communicating pipe, showing the modification which, according to my present invention, I introduce in order to render it available for connecting pipes, whether compressed or rarefied air be employed for working the brakes. The coupling is generally of the form described in the Specifications of Patents formerly granted to me—a form which is now largely in use, and which I will briefly explain. The coupling consists of two equal and symmetrical halves, which have lateral apertures provided with lips of caoutchouc or other elastic packing material. The halves being placed side by side so that their lateral apertures face each other, are turned partly round the common axis of these apertures so that a projecting segmental flange of each half engages in a hollow of the other half, holding the halves together, but not so firmly but that they can be drawn apart by a considerable strain such as might result from accidental separation of the carriages to which they respectively belong. In order to provide against leakage at the junction of such half-couplings, whether the pressure within them be greater or less than that of the outer air, I adopt the construction shown in figure 3. A is the nozzle, to which is attached the piece of flexible hose connecting the half-coupling to the pipe of its carriage. The passage from A turns at right angles to the lateral aperture B, which is as usual provided with the caoutchouc lip C. The segmental projecting flange D and the corresponding hollow E are made for engagement in the usual way. According to the modification which is the subject of my present invention, I provide within the body of the coupling a cylindrical cage, F, having lateral apertures, which cage, on screwing down the cap G, is made to press on the outer edge of the packing ring C and also on that of a flexible diaphragm, H, which is thus secured between the cap G and the cage F. Under the diaphragm H, and between it and the packing C, I introduce an inner cage, K which has also lateral apertures. The cap G has a hole, *g*, opening to the outer air, and in the enlarged lower part of this hole is placed a spring, L, pressing on the diaphragm H. When the coupling is used for connecting pipes for a vacuum brake when the pressure within the coupling is less than that of the external atmosphere, then the excess of the atmospheric pressure acting on the upper side of the diaphragm H conspires with the spring L to force down the inner cage K, and its lower curved edge *k* squeezes the packing C so as to press the packings of the two half-couplings firmly together and so prevent leakage of air between them into the pipes. When, on the other hand, the couplings are used for pipes conveying compressed air, then, though the diaphragm H is deflected upwards, and the packing C is relieved from the pressure of the cage K, yet the excess of the internal pressure of air acts on the packing C so as to force its lip outwards, and the packings of the two half-couplings are thus pressed firmly together, preventing leakage of air out of the pipes. The cage K is made with a central stem, which, by abutting against a valve in the other half-coupling (when such valve exists), opens that valve for free passage of air when the half-couplings are connected.

Figure 4 is a vertical section of the improved valve arrangement which I apply for bringing the brakes into action and taking them out of action, when rarefied air is employed for what is termed vacuum brake action. This valve arrangement is interposed between the pipe that communicates along the train and the brake cylinder, one end of which is always in communication with the auxiliary reservoir or vacuum vessel.

The valve-box is made in two parts, A and B, secured together by bolts passing through their flanges, which clamp between them the outer edge of a flexible diaphragm, D. The inner edge of this diaphragm is clamped between a flange, E, and a disc, F, secured on the stem G of the flange E. The stem G is bored up the middle about as far as the flange E, and from the end of the bore-holes *g* are bored diagonally so as to escape the upper part H of the stem. The lower end of the bore-hole in G is closed by a plug, *g*¹, and just above the plug a hole, *g*², is bored laterally into the central bore. The lower part of the stem G is reduced in diameter and fitted to slide in a bush K let into a recess in the body of the lower part A of the valve-box. A spring L butts on the bush K and against the shoulder of G. Holes, *a*, make communication between the lower nozzle M and the space under the diaphragm D. The space above the diaphragm communicates by a passage, *b*, with a side nozzle, N. The upper part *h* of the stem H is fitted to slide in a bush, O, from which there is a lateral passage to another side nozzle, P, and the stem H is partly cut away at the sides at *h* so as to give passage for air, while the parts not cut away serve as guides. The upper part of the bush O forms a seating for a valve Q, which is a disc faced with caoutchouc pressed down to its seat by a spring, R. The stem *q* of the valve Q projects down and terminates some distance above the top of the stem H. Above the valve *q* there is a nozzle S opening to the outer air, and preferably provided with a strainer of porous material, to prevent access of dust or dirt. This valve-box having its nozzle M connected to the train-pipe, its nozzle N to the auxiliary reservoir (which is always in communication with one end or back of the brake cylinder), and its nozzle P connected to the front of the brake cylinder, the operation is as follows:—The train-pipe M being exhausted, the diaphragm becomes deflected, as shown in figure 4, and air passes from the auxiliary reservoir and back of the brake cylinder by N and *b*, and from the front of the brake cylinder P past the ports *h* of the stem H, and through the holes *g* and *g*², and the valve Q being closed, the brake cylinder is thus equally exhausted at both ends, and the brake piston being in balance, the brakes are held off by suitable weights or springs. If now the pressure in the brake-pipe be increased, either purposely or by the accidental rupture of the pipe or separation of the train, then the diaphragm D is pressed upwards, closing the lateral passage *g*², closing also the passage by *h*, and thereafter, by the stem H bearing against *q*, opening the valve Q. Thereupon, while the vacuum is maintained on the one side of the brake-piston with which N communicates, air entering directly past the open valve Q flows by P so, as to press on the other side of the brake-piston, and the piston is thus urged so as to put on the brakes. On again exhausting the train-pipe the diaphragm becomes again deflected, valve Q closes, and the air is withdrawn from the front of the brake-cylinder, so that the brake-piston is again under equilibrium of pressure, and the brakes are taken off by their weights or springs. When the train-pipe is employed for working the brakes by compressed air, the pressure communicated through M raises the diaphragm till the upper face of G is pressed against the lower face of O. The passages *g* and *h* are thus closed, and the brake-cylinder and auxiliary reservoir are cut off from communication with the train-pipe, which is left available for working the other brakes of the train by compressed air.

In a former patent I described a system of pneumatic brake apparatus, in which the brakes could be applied from the engine either through an "automatic" or non-automatic system of train-pipes, by effecting the

Improved Apparatus for working Railway Brakes by Fluid Pressure.

the communication of the two systems of pipes with the brake cylinder through a valve apparatus so arranged that on actuating the brakes through the automatic system the said valve was automatically moved so as to cut off the communication between the brake cylinder and the non-automatic train-pipe, and establish the communication between the former and the automatic pipe—that is to say, with the triple-valve apparatus and auxiliary air reservoir of known arrangement in connection therewith, while on admitting air pressure to the non-automatic train-pipe the valve was moved so as to cut off the communication between the brake cylinder and the automatic train-pipe, and establish a direct communication between the former and the non-automatic pipe so as to admit the air-pressure from the latter.

Another of my present improvements relates to an improved construction of the said valve apparatus, having more particularly for its object the perfect separation of the automatic train-pipe, that is to say, of the auxiliary reservoir connected therewith from the non-automatic train-pipe, so that air pressure cannot possibly pass from the one to the other system of pipes.

The construction of the said apparatus is shown in longitudinal section at figure 5 of the drawings. A is a casing which is in communication at B with the triple-valve apparatus connected to the auxiliary reservoir and train-pipe of the automatic system, while at the other end C is connected to the non-automatic train-pipe, and at the middle it is connected by the branch D to the brake-cylinder. Within the casing an annular passage, F, is formed by the insertion of a cylinder, E, which passage communicates with the branch D and also with the interior of the cylinder, through a ring of small holes, G. Within the cylinder E is a piston-valve, H, having a packing, *h*, that fits the cylinder tightly, and that is somewhat greater in width than the diameter of the holes *g*, so that when the piston-valve is in the middle position the packing will effectually close the holes. The piston-valve has, furthermore, on both sides a facing, I I', of caoutchouc or other elastic material, of which I seats against the raised seat K when the piston is in the one end position, thus cutting off the communication between the non-automatic train-pipe and auxiliary reservoir and the cylinder E, while at the other end position of the piston-valve the face I' seats against the raised seating K', and thus cuts off the communication between the cylinder E and the non-automatic pipes. The piston-valve has also a stem, L, passing into the chamber A' of the casing A, where it carries a slide, M, pressed against the side of the chamber by a spring, and serving to open or close a passage, N, in the said chamber leading into the outer atmosphere.

The slide is so arranged relatively to the passage N and the piston-valve that, when this is in the one end position, closing the communication between the chamber A' and cylinder E, the slide leaves the passage N full open, while, when the valve moves over to the other side, the slide closes the passage before the packing G of the piston-valve opens the communication between the brake-cylinder and the chamber A'.

From the above arrangement it will be seen that while at all times the packing *h* effects a complete separation of the two end communications of the valve casing, this separation is rendered doubly secure at the end positions of the piston-valve by the faces I and I' seating against K and K'.

The action of the apparatus is as follows :—

First—For applying the brakes through the automatic train-pipe, air pressure being let off from this pipe, the triple-valve apparatus in connection therewith and with the auxiliary reservoir is actuated so as to admit air pressure from the latter to the chamber A' of the valve-casing A. The piston-valve H being moved by this pressure away from the seat K, the slide M first closes the passage N so as to prevent any escape of air pressure through it, after which the packing *h* uncovers the holes G, so that the air pressure can flow from the auxiliary reservoir into the brake-cylinder, and lastly, the face I' seats against the seating K'. On admitting air pressure to the automatic train-pipe again, the triple-valve is actuated in the known manner so as to close the communication with the auxiliary reservoir and open a passage to the open air so that the air pressure can escape back from the brake-cylinder through the chamber A', thus releasing the brakes, the piston-valve H remaining during this time in the position last described.

Second—For applying the brakes through the non-automatic pipe, air pressure being admitted from the latter to the valve-casing, the piston is moved over so as to uncover the holes G, so that the air pressure can flow from C into the brake-cylinder, the release of the brakes being effected by letting off the pressure from the non-automatic train-pipe, while the piston-valve H remains on its seating at K.

Thirdly—Assuming that the air-pressure has accidentally been admitted to the brake-cylinder from the auxiliary reservoir so as to apply the brakes, owing to the leakage or rupture of the automatic train-pipe, then, in order to release the brakes without having to go to each separate carriage for that purpose, if air pressure be applied through the non-automatic train-pipe, the piston-valve H, in being moved over to the position shown in the drawing (as the pressure admitted direct from the main reservoir through C would be greater than that admitted from the auxiliary reservoir through B), would cause the slide M to open the passage N, and the communication between the auxiliary reservoir and the chamber A' being open, the air pressure from the latter would escape through N. The air pressure being afterwards discharged from the non-automatic pipe, that in the brake-cylinder would also escape and the brakes would thus be released.

It is evident that a valve apparatus and a non-automatic train-pipe operating as above described might be used for simply releasing the brakes when applied by the automatic train-pipe, as last described, without providing the described communication between the non-automatic pipe and the cylinder, that is to say, the piston-valve H being of such a depth that it does not uncover the openings G when moved over to the seating K. But as it requires no additional appliances to connect the non-automatic pipe with the brake-cylinder, this arrangement is preferred.

Figure 6 of the drawings shows the section of a form of the apparatus adapted to operate as last described, that is to say, where the non-automatic train-pipe is not connected to the brake-cylinder of the automatic system, in which apparatus the movable piston-valve H of the first-described arrangement being replaced by a movable diaphragm. In the arrangement shown the non-automatic pipe B is assumed to be worked by vacuum instead of by air pressure, but it is equally applicable for working with the air pressure in the non-automatic pipe, as in the former arrangement, by simply reversing the action of the spring, as will be presently described.

In this case there is fixed on the non-automatic pipe B a casing, A, having a flexible diaphragm, C, pressed upwards by a spring, D. The stem E connected to the diaphragm is connected to the lever of a cock,

Improved Apparatus for working Railway Brakes by Fluid Pressure.

cock, F, that serves to open or close an aperture in the brake cylinder G of the automatic brake apparatus leading to the open air, the cock being turned so as to close the aperture when the diaphragm is in the position indicated, while, when the diaphragm is forced inwards, the cock is turned so as to open the aperture. Instead of actuating a cock by the diaphragm, any suitable form of valve may be opened or closed thereby. Thus, if the brakes have been applied accidentally by the automatic gear, as previously described, then, by producing a partial vacuum in the pipe B (by an ejector apparatus on the engine, or other known device such as is used in connection with vacuum brakes), the atmospheric pressure in forcing the diaphragm C inwards will cause the stem E to open the cock F, and thus allow the air pressure to escape from the brake-cylinder so as to release the brakes. On again admitting atmospheric pressure into the pipe B the diaphragm will be moved up again by the spring so as to close the cock.

It will be evident that the diaphragm C and cock may also be made to operate in the described manner by admitting air pressure into the pipe B, for which purpose it is only necessary to arrange the spring D so that it draws or pushes the diaphragm C inwards instead of outwards, the connection thereof with the cock or valve on the brake-cylinder being in that case such that the cock or valve is closed when the diaphragm is in the inward position, but that when it is forced outwards by the introduction of air pressure into B the cock is opened.

I prefer, however, to arrange the non-automatic pipe B and diaphragm to be operated by vacuum, as first described, as I am thereby enabled, by the addition of a second brake-cylinder or equivalent apparatus such as is used for vacuum brakes connected to the pipe B to enable the brake-carriage to be operated either by vacuum, should it happen to be coupled to a train that is provided with vacuum brakes, or to be worked by the automatic air-pressure apparatus when the train to which it happens to be connected is provided therewith, or the apparatus may be worked by both air pressure and vacuum combined when the engine is provided with both systems.

For this purpose both the vacuum brake-cylinder and the automatic brake-cylinder G are connected to one and the same set of brake levers and rods, the connections being slotted so that the brakes can be effectually operated by the one brake-cylinder while the other cylinder is out of action.

The parts being thus arranged the brakes may be operated thereby in several different ways. First—They may be worked non-automatically, by changing the pressure in the non-automatic pipe B. In this case, although when the pipe B is exhausted the diaphragm C may be deflected so as to open the cock or valve of the automatic cylinder, yet, as the automatic apparatus is inactive, this has no effect. Secondly—The brakes may be worked automatically, and as in this case the non-automatic pipe B is not affected, the diaphragm C remains stationary, and the valve or cock of the automatic cylinder remains closed. Thirdly—The brakes may be put on automatically, and may be kept on by bringing the non-automatic pipe into action. In this case the non-automatic pipe being exhausted, the diaphragm C becomes deflected inwards by the superior pressure of the atmosphere. The cock or valve of the automatic cylinder is thus opened, throwing the automatic apparatus out of action, but not till the non-automatic apparatus has been brought into action.

It will be evident that both brake-cylinders might be made to work with air pressure, the one automatically and the other non-automatically, instead of by air-pressure and vacuum.

Having thus described the nature of my invention, and in what manner the same is to be performed, I claim—

First—The construction of the regulating valve herein described, with reference to figures 1 and 2 of the accompanying drawings.

Second—The modification of the coupling by the addition of the cage K and diaphragm H, as therein described with reference to figure 3.

Third—The arrangement of valves for effecting the putting on and taking off of the brakes, as described with reference to figure 4.

Fourth—In brake apparatus whereby the brakes can be operated both by an automatic and a non-automatic train-pipe, the use of a control-valve apparatus having a packed piston-valve for preventing the passage of air pressure from the one system of pipes to the other, and a slide for opening and closing a passage for discharging the air pressure from the auxiliary reservoir of the automatic apparatus, substantially as herein described with reference to figure 5 of the drawings.

Fifth—In combination with automatic brake apparatus the use of a non-automatic train-pipe, operated either by vacuum or by air-pressure, and having a diaphragm connected to a cock or valve on the automatic brake-cylinder, and so arranged that by varying the air pressure within the non-automatic train-pipe the said cock or valve is opened or closed, substantially as and for the purposes herein described with reference to figure 6 of the drawings.

Sixth—For working the brakes, either automatically or non-automatically, the combination on one and the same brake-carriage of an automatic brake apparatus with a non-automatic brake apparatus and the diaphragm apparatus, described with reference to figure 6 of the drawings.

In witness whereof I, the said George Westinghouse, junior, have hereunto set my hand and seal, this twenty-second day of December, in the year of our Lord one thousand eight hundred and eighty-one.

GEO. WESTINGHOUSE, JUNR.

Witness—HAROLD IMRAY.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to George Westinghouse, junior, this fifteenth day of May, A.D. 1882.

AUGUSTUS LOFTUS.

Improved Apparatus for working Railway Brakes by Fluid Pressure.

REPORT.

Sir,

Having examined the specification and plans accompanying the petition of Mr. George Westinghouse, junior, for an invention entitled "Improved Apparatus for working Railway Brakes by Fluid Pressure," we have the honor to report that we see no objection to Letters of Registration being issued as prayed for.

The Under Secretary of Justice.

Sydney, 29 March, 1882.

We have, &c.,

JOHN WHITTON.

WILLIAM BENNETT.

[Drawings—three sheets.]

Fig: 1.

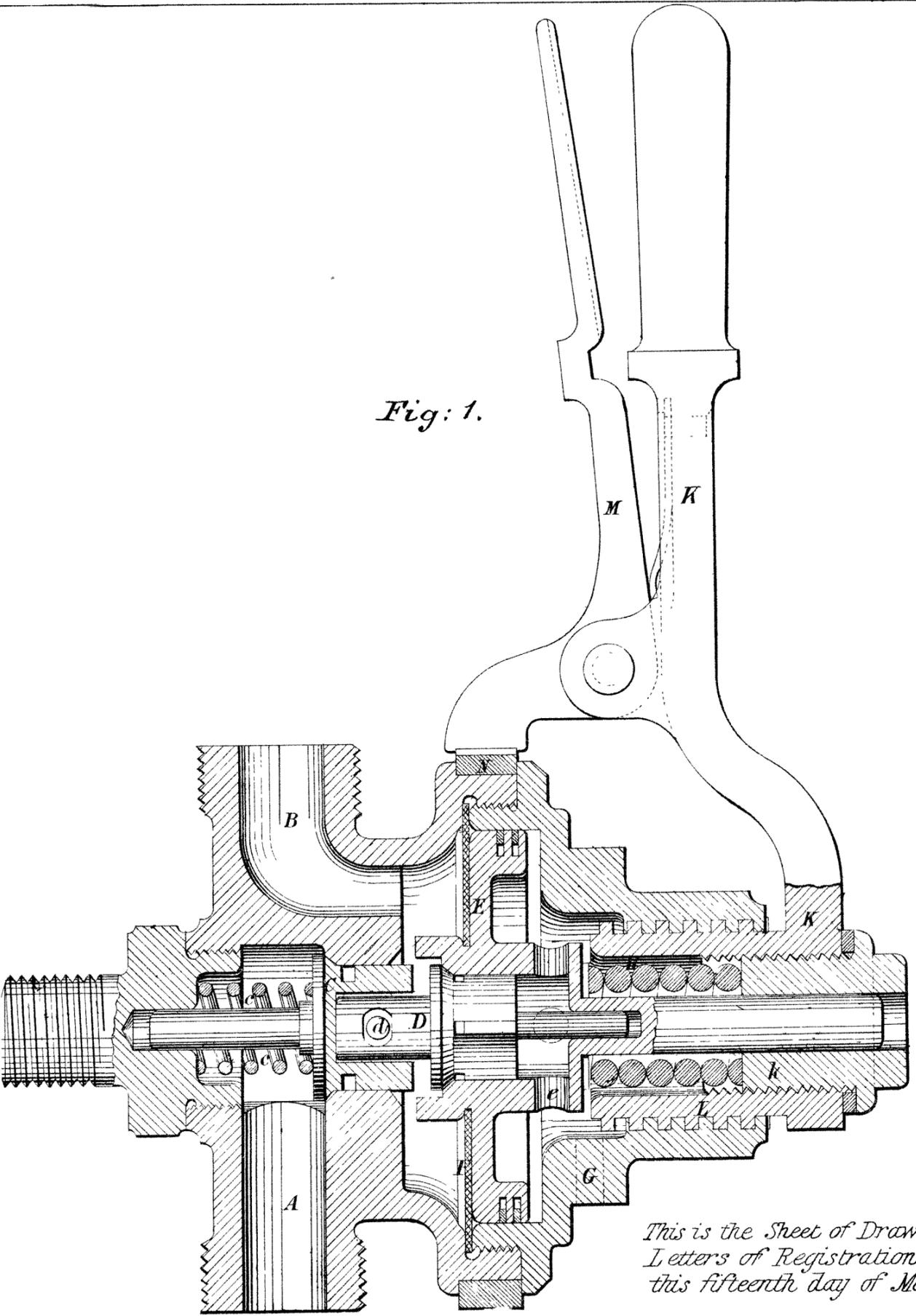
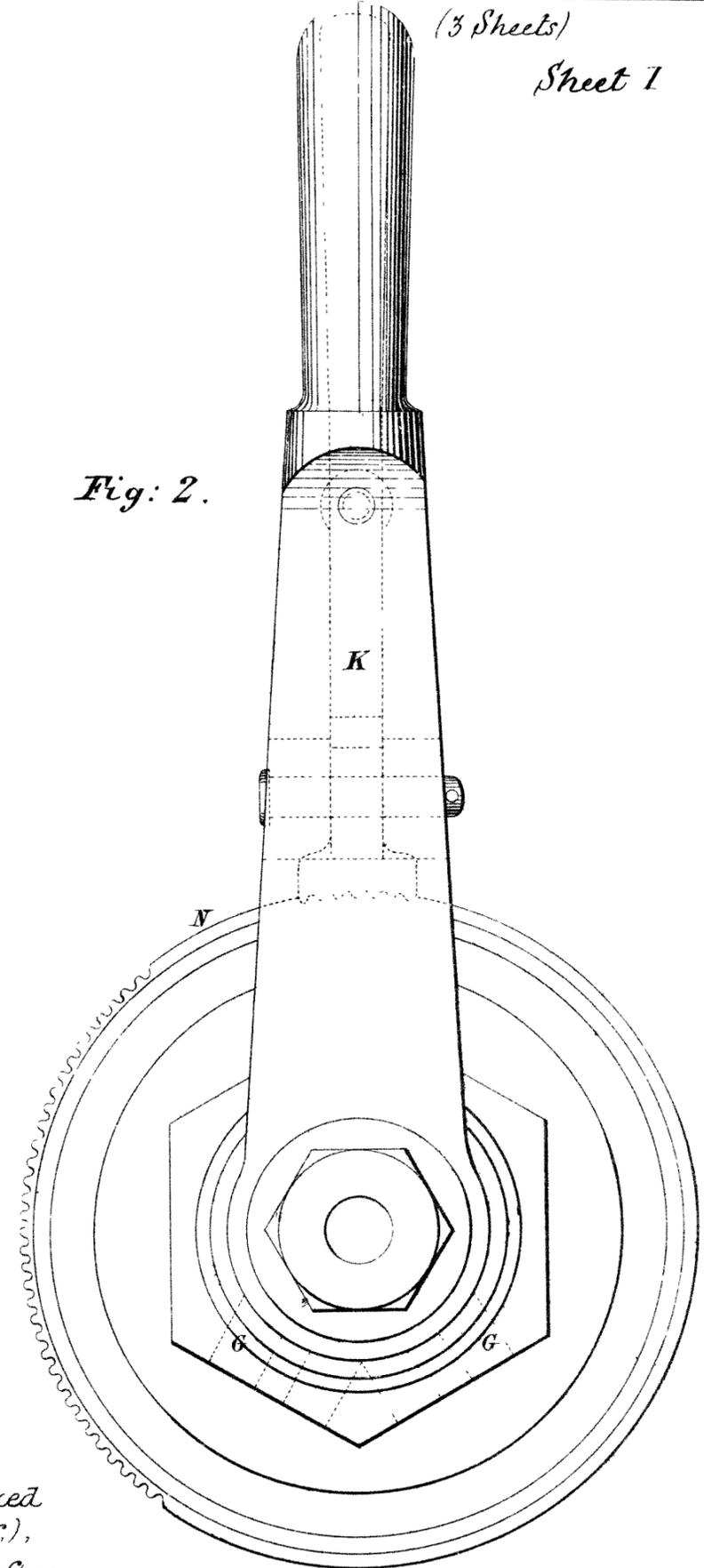


Fig: 2.



*This is the Sheet of Drawings marked B referred to in the annexed
Letters of Registration granted to George Westinghouse, (Junior),
this fifteenth day of May, A.D. 1882.*

Augustus Loftus.

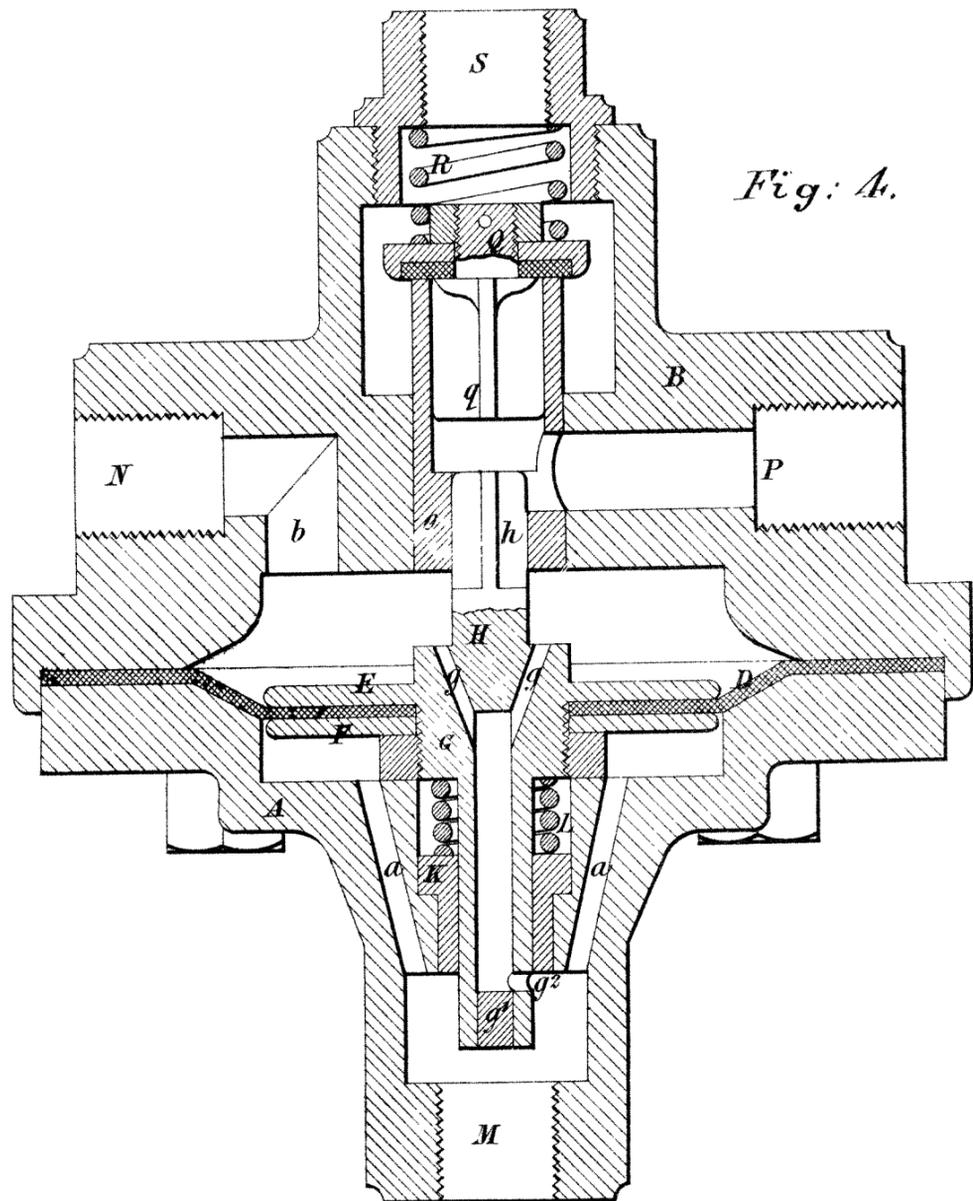


Fig: 4.

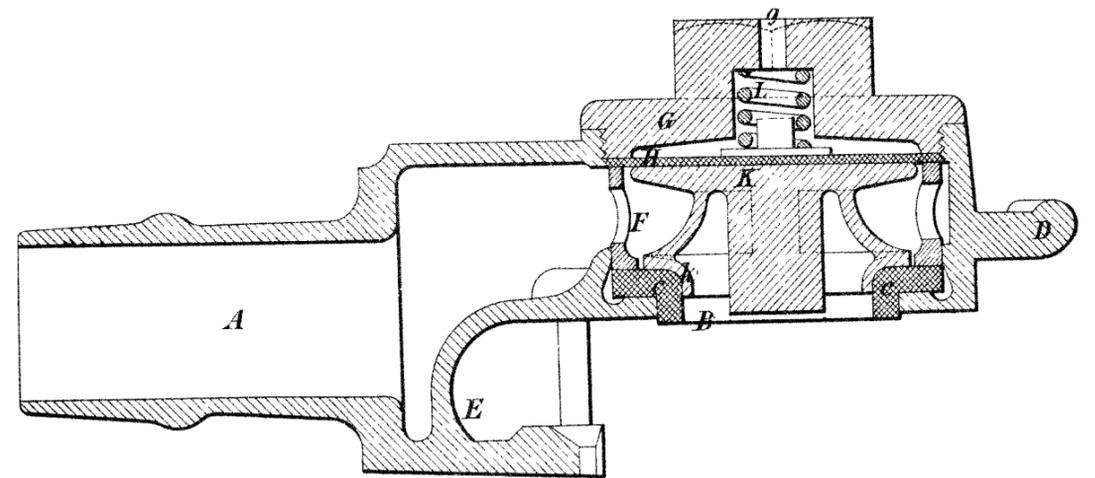


Fig: 3.

*This is the Sheet of Drawings marked C referred to in the annexed
 Letters of Registration granted to George Westinghouse (Junior),
 this fifteenth day of May. A.D. 1882 Augustus I. of Wis.*

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

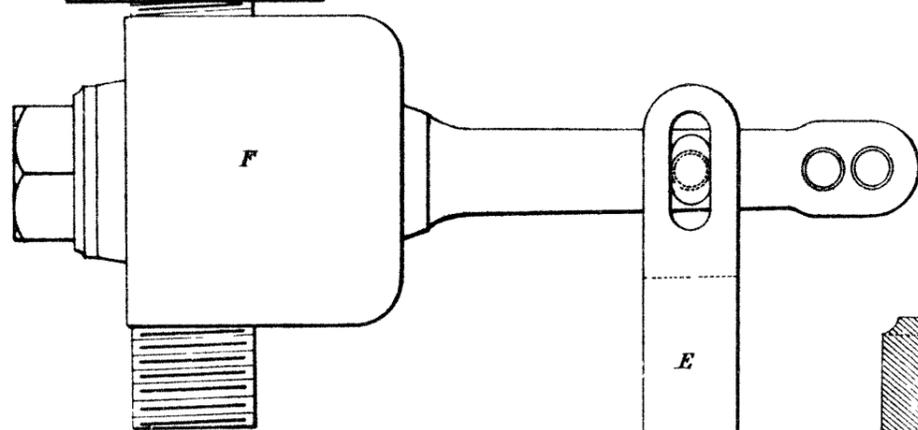
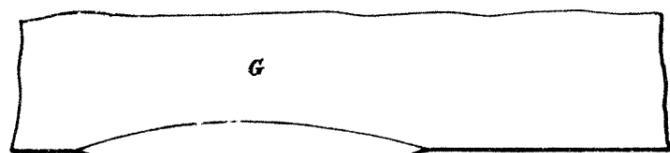


Fig: 5.

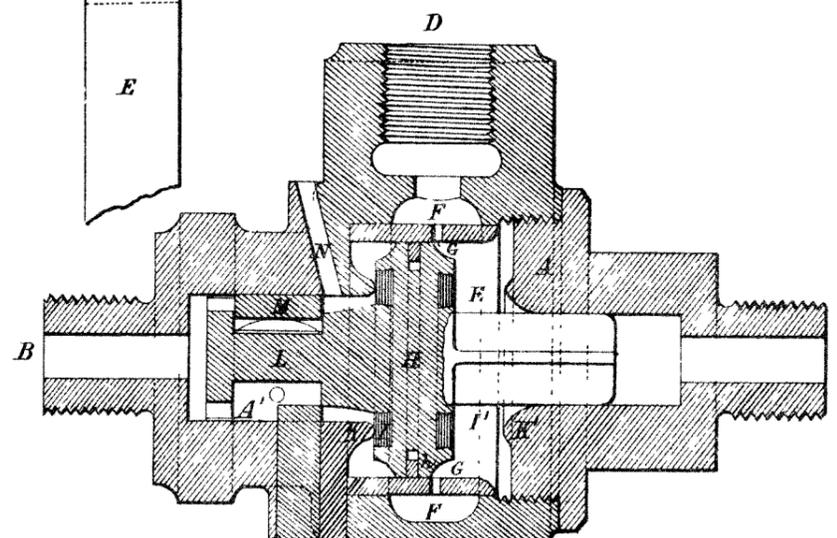
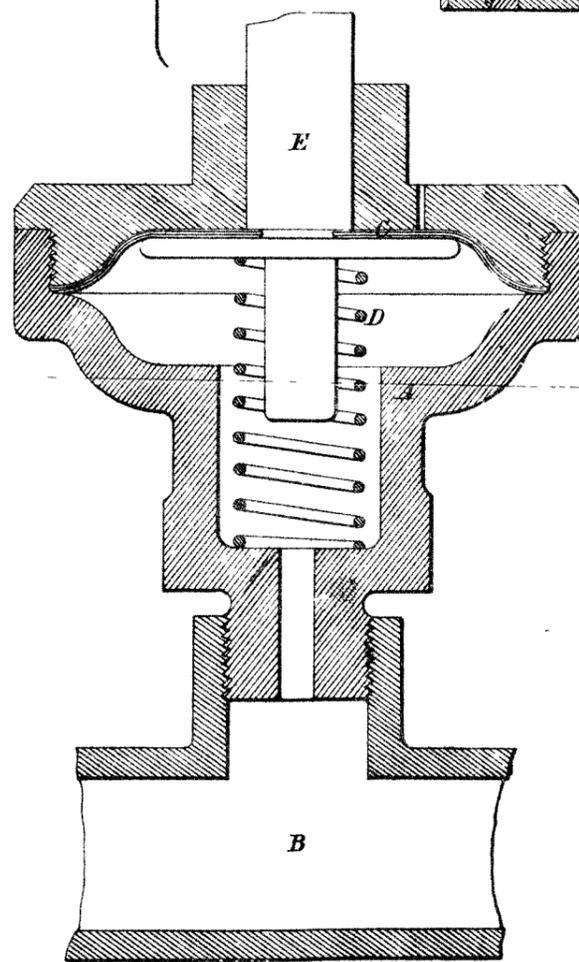


Fig: 6



*This is the Sheet of Drawings marked D referred to in
 the annexed Letters of Registration granted to
 George Westinghouse, this fifteenth day of May, A.D. 1882.
 Augustus Loftus.*



A.D. 1882, 22nd May. No. 1071.

IMPROVEMENTS IN ROLLING STOCK, &c.

LETTERS OF REGISTRATION to William Robert Rowan, for Improvements in Rolling Stock adapted for Railways and Tramways.

[Registered on the 23rd day of May, 1882, 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 Randers, in the Kingdom of Denmark, 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 Rolling Stock adapted for Railways and Tramways," 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 May, in the year of our Lord one thousand eight hundred and eighty-two.

[L.s.]

AUGUSTUS LOFTUS.

Improvements in Rolling Stock, &c.

SPECIFICATION of WILLIAM ROBERT ROWAN, of Randers, in the Kingdom of Denmark, engineer, for an invention entitled "Improvements in Rolling Stock adapted for Railways and Tramways."

My invention relates to certain improvements in the arrangement and combination of rolling stock adapted for railways and tramways, which permits of the combination of a locomotive with existing tramway-cars, or with railway carriages or trucks, such combination forming an automotive car, capable of working on tramways with very sharp curves and steep gradients, whilst allowing what was originally the railway carriage or car itself (as the case may be), when not in combination with the engine, to be employed in ordinary railway trains, thus permitting the transfer of traffic from railways on to road tramways, and *vice versa*, without breaking load.

In order that my said invention may be fully understood, I shall now proceed more particularly to describe the same, and for that purpose I shall now refer to the drawings hereto annexed, the same letters of reference indicating corresponding parts in all the figures. Figure 1 represents a side elevation of the locomotive engine that I prefer, combined according to my invention with a truck or waggon, so as to run on a light railway or tramway; figure 2 is an end elevation, partly in section, of the same, and figure 3 a plan thereof, showing a portion of the under-frame of the waggon; figure 4 shows the mode of combining an ordinary railway waggon, mounted upon two pair of wheels, with a locomotive engine by the alternative means of an auxiliary frame, which is shown by figure 5, which is a plan of such frame detached; figure 6 shows a locomotive and passenger-car combined together on the same principle; figures 7 and 8 show respectively elevation and plan of a permanently combined automotive car for passengers.

According to one mode of carrying out my said invention, I use any ordinary railway carriage or waggon, A (figure 4), but I prefer to employ the form of waggon mounted upon two bogies (as shown at figures 1, 2, and 3, with one bogie removed), and having the side soles prolonged at one end at A¹, so as to form fixed buffers, the opposite end being provided with spring buffers, A², as usual. These carriages or waggons would have the couplings in ordinary use, and be in every respect suitable for running in the usual trains on common railways. When it is desired to transfer the said carriages or waggons (with or without load) from an ordinary railway to a light railway or feeder, or to a road tramway, a locomotive engine, B, fitted with my improvements, as hereinafter described, is employed, it being specially adapted for being readily connected at will with a railway carriage or waggon in such a manner as to form, when combined therewith, an automotive car. The adhesion to the rails which is required for ascending steep gradients is derived from the weight of the car and its load, which is partly thrown on the driving-wheels. The automotive car thus obtained is specially adapted, as hereinafter described, for passing with facility round curves of extraordinarily small radius.

The boiler of the locomotive to be used may be of any type preferred, single or double, vertically or horizontally placed, although I prefer that it should be of the vertical or upright class, as affording an increased floor area, and thus providing room for its speciality, namely, a movable horizontal ring, C, resting upon double or single coned wheels or rollers, C¹, which work on an annular rail, D (or on segments of one), flanged or otherwise, and secured to the floor of the engine, the ring C being retained in position by the horizontal roller C² (figures 2 and 3).

When it is required to shift the car from a common railway to a road tramway or light railway, I raise the car at one end, remove one bogie (or one pair of wheels on an ordinary carriage or waggon), and place the protruding ends, A¹A¹, of the side soles of the car upon the movable ring C, to which they are secured by means of bolts or pins at C³, the car and engine thus combined forming an automotive car (figures 1, 2, and 3).

The tractive strain may be transmitted directly through the coned rollers C¹, working on the annular or segmental fixed rail D, without the necessity of using a draw-bar or other connecting device, as I have found the load and weight of the car acting upon the coned rollers on their annular or segmental rail alone suffices to afford sufficient resistance for the traction of the car when three (3) or more of such rollers are disposed at suitable intervals over the fixed rail; but as an extra precaution, I prefer to employ the coupling arrangement shown in figures 9 and 10, which consists of an iron band, J, slightly curved, fixed underneath the car H, and projecting vertically downwards between two plane vertical guide rollers, Z Z, fixed at the end of the engine framing B. The car must follow the movements of the engine, but is not interfered with, either vertically or laterally, in its own oscillation or movements.

The same system of applying the traction through coned wheels or rollers, working on an annular or segmental rail, is equally applicable to the class of carriage described in the specification of my invention for which Letters of Registration were granted to me, bearing date the twenty-seventh day of May, one thousand eight hundred and seventy-eight, and illustrated on sheet 1 of the drawings annexed thereto, as by this means I am enabled to simplify the construction by dispensing with the friction-rollers in the hoop which surrounds the bogie-pin.

In existing railway carriages or trucks, and tramway cars, where the side soles are not long enough for my purpose, I combine therewith a removable auxiliary frame, E (see figures 4, 5, and 6), for the purpose of coupling the vehicle A to the tramway engine B; and this arrangement may be varied by attaching the before-mentioned movable ring C, or segments of it, with its coned rollers C¹, to the said auxiliary-frame, as shown clearly in detail plan, figure 5, so as to be ready for immediate use when required.

When the vehicle is combined permanently, as is represented in figure 7, the coned rollers, arranged circularly instead of being fixed on a circular support, may be fixed to the fore part or the side soles of the vehicle itself, as shown in figure 8. The trailing end of the vehicle may rest on a bogie with two axles, as is shown in figures 3 and 5, or a bogie with a single axle may be made use of; in which case the framing of the bogie may be connected with the two-axled engine bogie by cross-stays, as is shown in figures 7 and 8; or finally, in making use of the auxiliary framework E, an axle of ordinary construction may be made use of, as shown in figures 4 and 6.

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 I do not claim generally

Improvements in Rolling Stock, &c.

generally the supporting of one end of the framing of a railway vehicle upon the framing of a locomotive engine, as I am aware that such has already been proposed; but what I consider to be novel and original, and therefore claim as my improvements in rolling stock adapted for railways and tramways, is—

First—The movable horizontal frame or circular crown support, furnished with rollers resting upon an annular rail or segments of an annular rail, secured to the floor of an engine, or upon such floor itself, by which means it is rendered possible to combine such engine with an ordinary railway car, and to convert them into an automotive car, substantially as described and explained, and illustrated in my drawings.

Second—The combination and arrangement of the auxiliary frame, with or without coned wheels or rollers attached thereto, with ordinary railway and tramway rolling stock, substantially in the manner and for the purposes herein described and explained, and illustrated in my drawings.

Third—The combination of a locomotive engine provided with a movable horizontal frame, or its alternative the auxiliary frame, as set forth in my first and second claims, with a tram-car or a railway vehicle, without the necessity of a draw-bar or other coupling device, so as to form a combined motor-car, substantially as herein described and explained, and as illustrated in my drawings.

Fourth—The coupling arrangement between the engine and the car, consisting of the curved iron band J fixed to the car, and guided between the rollers ZZ on the engine-framing, substantially as herein described, and as illustrated in figures 9 and 10 of my drawings.

In witness whereof I, the said William Robert Rowan, have hereto set my hand and seal, this twenty-second day of March, one thousand eight hundred and eighty-two.

WILLIAM ROBERT ROWAN,
By his Agent, H. ROWAN.

Witness—

EDWD. WATERS,
Melbourne, Patent Agent.

This is the specification referred to in the annexed Letters of Registration granted to William Robert Rowan, this twenty-second day of May, A.D. 1882.

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 Mr. William Robert Rowan, for an invention entitled "Improvements in Rolling Stock adapted for Railways and Tramways," 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.]

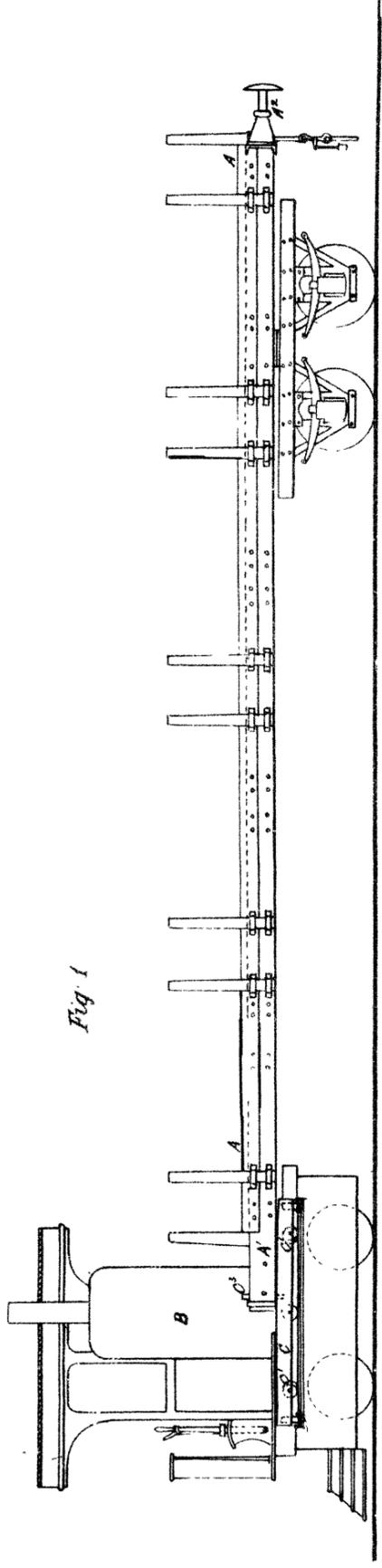


Fig. 1

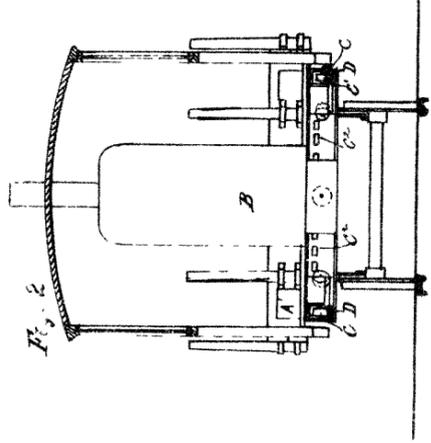


Fig. 2

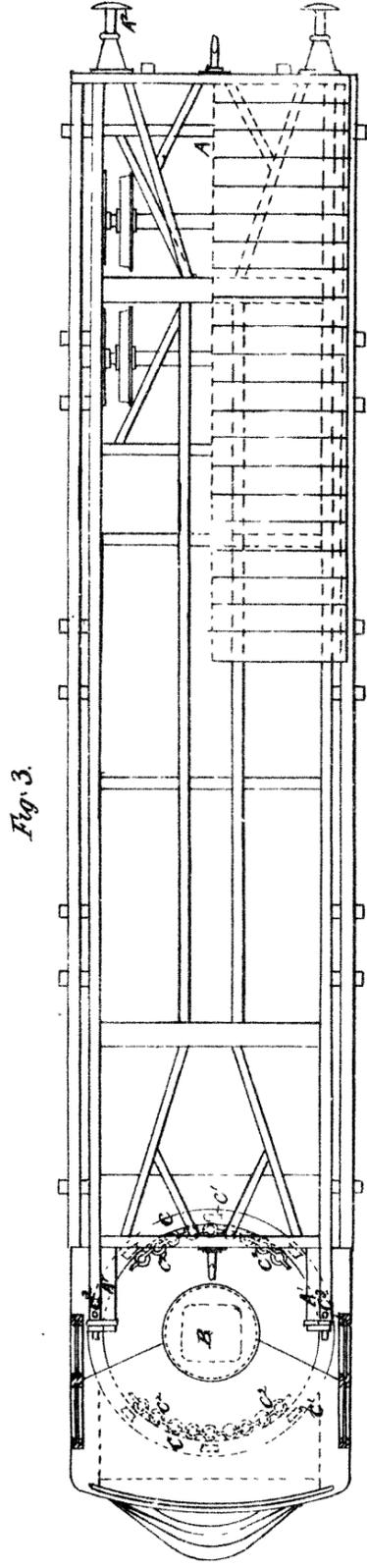


Fig. 3

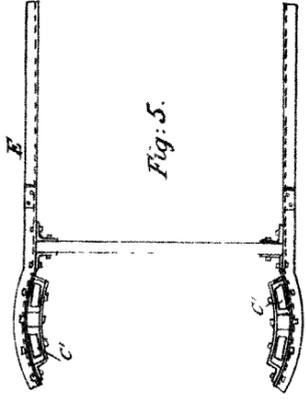


Fig. 5

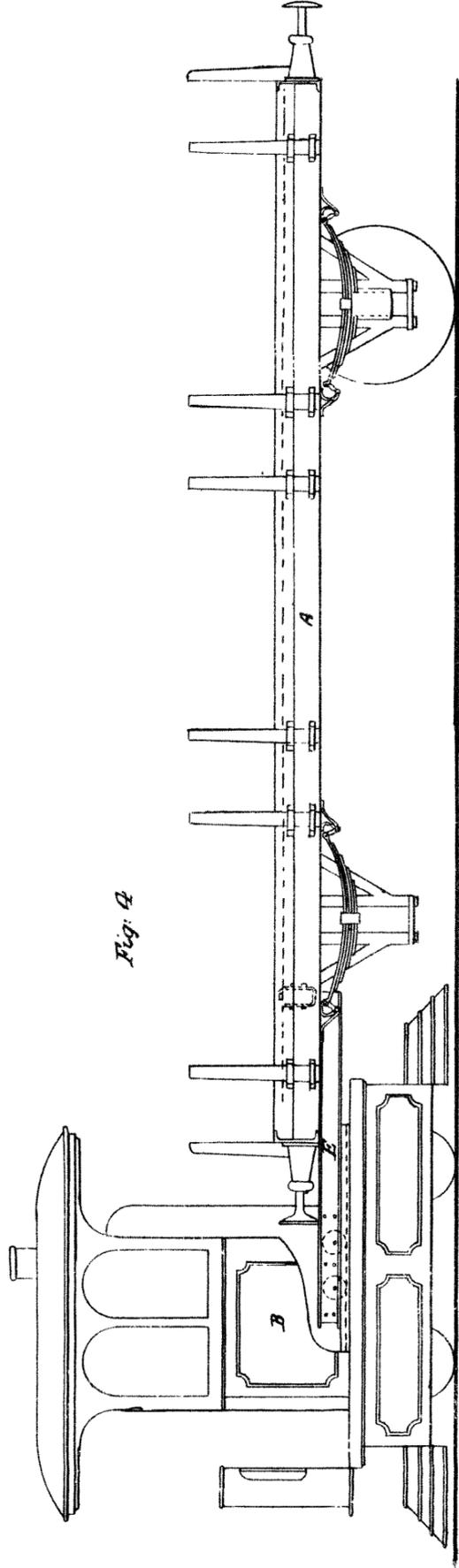


Fig. 4

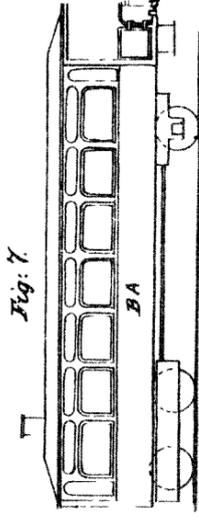


Fig. 7

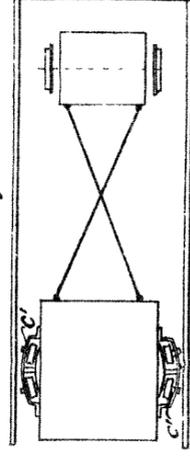


Fig. 8

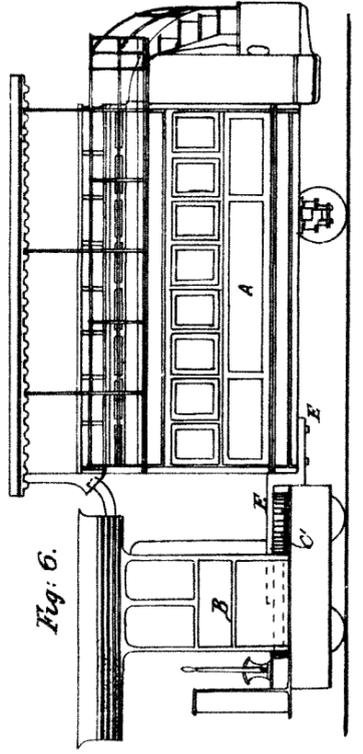


Fig. 6

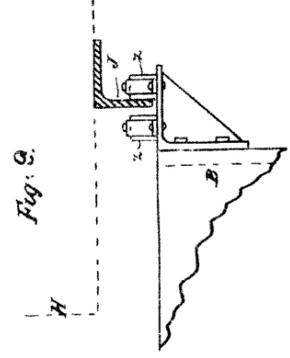


Fig. 9

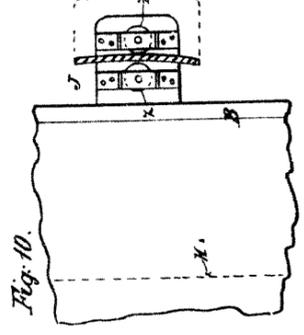


Fig. 10

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 May, A.D.
1882
Augustus Loftus.*



A.D. 1882, 22nd May. No. 1072.

AN IMPROVED BARBED FENCING-WIRE, AND AN IMPROVED MACHINE FOR MAKING IT.

LETTERS OF REGISTRATION to James Lees, John William Rock, and Charles Gifford Moore, for an Improved Barbed Fencing-wire, and an Improved Machine for making it.

[Registered on the 23rd day of May, 1882, 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 LEES, sheep farmer, JOHN WILLIAM ROCK, mechanical engineer, and CHARLES GIFFORD MOORE, civil engineer, all of Oamaru, in the Provincial District of Otago and Colony of New Zealand 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 Barbed Fencing-wire, and an improved Machine for making it," 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 Lees, John William Rock, and Charles Gifford Moore, 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 Lees, John William Rock, and Charles Gifford Moore, 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 Lees, John William Rock, and Charles Gifford Moore, 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 May, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improved Barbed Fencing-wire, and an Improved Machine for making it.

SPECIFICATION of JAMES LEES, sheep farmer, JOHN WILLIAM ROCK, mechanical engineer, and CHARLES GIFFORD MOORE, civil engineer, all of Oamaru, in the Provincial District of Otago and Colony of New Zealand, for an invention entitled "An improved Barbed Fencing-wire, and an improved Machine for making it."

THE object of this invention is to produce an efficient barbed fencing-wire at a lower cost than heretofore: We do not claim to be the inventors of barbed fencing-wire generally, but only of a certain peculiar make of such wire, in which barbs of three or five spikes, punched out of sheet or strip metal, and suitably twisted, are enwrapped by three wires twisted into a rope.

In order to make this peculiar kind of barbed fencing-wire, we have invented an improved machine, in which the reels carrying the separate wire strands (which together form the body of the complete fencing-wire) are supported by arms or brackets projecting from a boss fixed upon a hollow shaft, with which or upon which the whole revolve. These wire strands are each conducted over a guide-pulley, round a twisting pulley, into and down the centre of said hollow shaft, and thence over the straining-wheel, and on to the final winding-drum. As these reels revolve, the separate wire strands are twisted by the pulleys, and form an open cone at the mouth of the hollow shaft, into the apex of which cone the barbs are automatically projected at regular intervals, and are thus woven into and form part of the complete barbed fencing-wire.

In order, however, that our invention may be clearly understood, we will now proceed to describe the drawings hereto attached, in which it is clearly illustrated. At 45 the three-strand barbed wire is shown complete with three-pointed barbs, this being the form we prefer, although five-pointed barbs may be used; 47 and 49 show the shape of the three and five-pointed barbs respectively, as they are first punched from the sheet or strip metal; while 46 and 48 show a section of the same barbs, and of the wires enwrapping them; figure 1 shows a side elevation of the machine, figure 2 a plan, and figure 3 an end view of the same, with the feeding-gear removed.

The machine consists of a hollow iron shaft, marked A in the accompanying drawing, which is supported by the two plummer-blocks B and C, and being turned to a true surface in a lathe, can revolve easily in the said plummer-blocks, motion being imparted to it by means of the pulley D; upon the hollow shaft A is fastened the boss E, which is provided with three pairs of arms, marked respectively F F', G G', H H', each pair of arms holds, by means of a spindle, J, a reel, K, which is filled with the wire to be afterwards twisted into a rope; adjustable breaks, L, are provided for the purpose of regulating the tension on the wire as it leaves the reels; the wire passes over the pulleys M, which are held by the brackets N, bolted to the arms that support the reels, and thence over the little pulleys O, which are held in position by bearings fastened to the plate P, the same being secured to the brackets N. When the machine is set in motion the three wires unite into a single rope at Q, and this is led through the hollow shaft and round the drawing-wheel R, and thence to a reel, to be wound into a coil. The drawing-wheel R is fixed upon an upright shaft, S, which turns in bearings contained in the iron pillar T; upon the shaft is keyed the worm-wheel U, acted upon by the worm V, upon the shaft W. This shaft runs in bearings X X', and has at the end the toothed wheel Y. This gears with a similar wheel Z on the hollow shaft A, and thus motion is imparted to the wheel R, which revolves at a regular and proportionate speed to that of the reels of wire, whereby the strands of wire are made to form a rope of any desired pitch. The wheel R has wrapped round it some soft material, or is recessed so that the barbs may receive no damage. Round the wheel R are placed levers or grippers, one of which is shown at 2; any number of these may be used, but eight is the number preferred. They are held in position by the brackets 3 3, bolted to the rim of the wheel R, and on the outer end of each is fixed a circular weight, 4, capable of revolving upon the end of the lever. The inner ends of the levers are naturally pressed against the rim of the wheel R, and grip the barbed wire firmly to it. At a certain part of the revolution of the wheel R the grippers need to release the wire, and this is accomplished by allowing the round weights 4 to come in contact with a platform, 5, along which they run, and the outer ends of the levers being thus raised the grip on the wire is released. This platform is continued round until the place comes where the contact with the wire is to be renewed, and it there terminates, thus allowing the weight to again force the inner end of the lever against the wheel R. These grippers may be dispensed with if the friction of the barbed wire round the rim of the wheel R is found sufficient to draw the wires from the reels without them.

The apparatus for feeding the barbs into the twisting wires, consists of a thin plate of metal, 6, the periphery of which is provided with slots placed at regular distances, and which turns accurately on a spindle, 7. This plate is made to revolve slowly, by means of the worm 8 and worm-wheel 9. At the end of the worm-shaft 10 is fixed the grooved pulley 11, over which runs a strap, 12, and as the strap passes also over the grooved wheel 13, which is constantly revolving, the tendency of the plate 6 is also to revolve; but it is prevented from so turning by the spring-catch 14 which holds it, and the strap consequently slips round the pulley 11. This catch 14 is so fixed that it enters the slot opposite to it exactly as another slot is in position opposite to the cone of the twisting wires, and the said catch is provided with adjusting-screws, 15, to secure accuracy in the position of the slots. Whenever the catch is pulled back the strap 12 turns the pulley 11, and the plate 6 revolves until the next slot comes round, when the plate is again fixed by the catch holding it. The catch is pulled back and the plate 6 released by means of a pin, 16, upon the disc 17, at the end of the revolving shaft 18; this pin comes in contact at every revolution of the disc with the lever 19, and by raising it pulls a string that is fastened to it at one end and to the catch 14 at the other. In this manner the slots in the plate 6 are presented in succession in front of the cone of the twisting wires. The above-mentioned slots are filled with barbs by an attendant, and the barbs are thus presented regularly to the feeding-rod, which inserts them into the twist of the wires, and which is to be more fully described.

This feeding-rod consists of a spindle, 20, running in bearings, 21 22. A large view of the end of this feeding-rod is shown in figure 4, and it will be seen that it is hollow, and that a smaller part 23 slides within it, being kept extended by the spiral spring 24. A balance-weight, 25, is fixed beneath the sliding-rod 23, and thus the forked end 26 always resumes its position on leaving the twisting wires, should the wires catch the fork and turn it round with them. The spiral spring 24 allows the sliding-rod to yield when it carries the barb into the twist and exercises a slight pressure, thereby ensuring the correct placing of the barb. Motion is given to the feeding-spindle 20 by means of the lever 27 and connecting-rods 28. The roller 29

Improved Barbed Fencing-wire, and an Improved Machine for making it.

runs upon a cam, 30, fastened upon the revolving shaft 18, and thus a reciprocating action is imparted to the fork 26. A slot in the plate 6 being filled with a barb and brought into position, the cam turns and the fork carries off the barb and inserts it into the twisting wires; on the return of the fork the catch 14 releases the plate 6 until the next slot is presented, and the next barb being thus brought into position is ready for insertion by the fork. A balance-weight, 31, is used for keeping the roller upon the cam.

The revolving shaft 18 which gives motion to all the feed-gearing has upon it a mitre wheel, 32. This gears into a similar wheel, 33, on the shaft 34. This shaft runs in bearings 35, 36, and on the other end is keyed a bevel wheel, 37. An upright shaft, 38, runs in the footstep 39 and bearing 40, and on the top of it is keyed the mitre wheel 41 geared into the mitre wheel 42 on the hollow shaft A. At the other end is the pinion 43 gearing into 36, and thus the whole revolves in due proportion to the reels of wire K.

The barbs are cut or punched out of sheets or strips of steel, iron, or other metal, of the form marked 47 and 49. The tool used for the said cutting or punching should have a shearing motion, in order to ensure the desired sharpness of the spikes. They are bent into the shapes shown at 46 and 48, either at the time of cutting or punching, or by subsequent operation. They are enwrapped in the twist of the wires, as shown in section at 46 and 48. A small portion of the completed wire with a three-spike barb is shown at 45.

We claim the following as the special novelties of our invention:—

- First—The improved form of barbed fencing-wire substantially as described, having three wire strands twisted into a rope, and enwrapping barbs of three or five spikes.
- Second—The combination of the hollow shaft A with the revolving reels K, the spring brake, the driving-pulleys N, and the groove-twisting pulleys O, so as to form an open cone of twisting wires, thus enabling barbs to be inserted with ease and certainty.
- Third—The combination of the hollow feed-rod 20 with the sliding part 23, the forked end 26, the spring 24, and the balance weight 25, as shown, for the purpose described.
- Fourth—The combination of the feed-rod 20, the connecting-rod 28, the lever 27, the pulley 29, the cam 30, and the balance weight 31, for the purpose described.
- Fifth—The combination of the slotted-plate 6 with the feed-rod 20 and fork 26, for the purpose set forth.
- Sixth—The combination of the revolving-plate 6, the worm 8, the worm-wheel 9, the strap 10, the groove pulleys 11 and 13, and the slip-belt 12, with the spring-catch 14, the revolving-disc 17, the pin 16, and the lever 19, for the purpose set forth.
- Seventh—The combination of the adjustable gear YZ with the worm V, the worm-wheel-U, and the drawing-wheel R, for the purpose of regulating the pitch of the twist upon the wires.
- Eighth—The combination of the wheel R with the soft material enwrapping its rim, with the gripping-levers 2, for the purpose described.
- Ninth—The combination of the gripping-levers 2, the revolving weight 4, and the platform 5, for the purpose described.
- Tenth—The combination of a barb of three spikes with a wire rope of three strands substantially as described, so as to form a fencing-wire having barbs, each spike of which is held on each side by a strand.
- Eleventh—The combination of a wire rope of three strands with a barb of five spikes held by the wire, as shown in section at 48, to form a fencing-wire.
- Twelfth—The combination of mechanism substantially as described, for inserting between the strands of a rope of any number of wires, any barb without the necessity of any pause in the formation of the rope.
- Thirteenth—The forms of barbs as shown at 46, 47, 48, and 49.
- Fourteenth—The barbed wire formed as described by the insertion of spiked barbs, substantially as described, between three strands of wire, and retained by twisting the strands into a rope, the same to be used as a fencing-wire.
- Fifteenth—The mechanism substantially as described, by which the barbs are inserted into the wire rope by means of the feeder 20, disc 6, and stop-action 14.
- Sixteenth—The combination of the various parts of the manufacturing apparatus substantially as described.
- Seventeenth—The combination, substantially as described, of the revolving-reels with a hollow pillar bracket or shaft upon or with which the reels revolve, and through which the wire is led after being twisted, such combination enabling the barbs to be inserted with ease and certainty.

In witness whereof, we, the said James Lees, John William Rock, and Charles Gifford Moore, have hereto set our hands and seals, this twenty-fourth day of March, one thousand eight hundred and eighty-two.

JAMES LEES.
J. W. ROCK.
C. GIFFORD MOORE.

Witness—

W. S. BAYSTON,

Clerk to Edwd. Waters, Patent Agent, Melbourne.

By their duly authorized Attorney,

EDWD. WATERS.

This is the specification referred to in the annexed Letters of Registration granted to James Lees, John William Rock, and Charles Gifford Moore, this twenty-second day of May, A.D. 1882.

AUGUSTUS LOFTUS.

Improved Barbed Fencing-wire and an Improved Machine for making it.

REPORT.

Sir,

Sydney, 5 April, 1882.
Having examined the specification and plans accompanying the Petition, we have the honor to recommend that Letters of Registration should be issued to Messrs. Lees, Rock, and Moore, for an invention entitled "An improved Barbed Fencing-wire, and an improved Machine for making it," as shown in the drawing and described in the specification attached to his Petition.

The Under Secretary of Justice.

We have, &c.,

E. O. MORIARTY.
JAMES BARNET.

[Drawings—one sheet.]

LEES ROCK & MOORE'S PATENT.

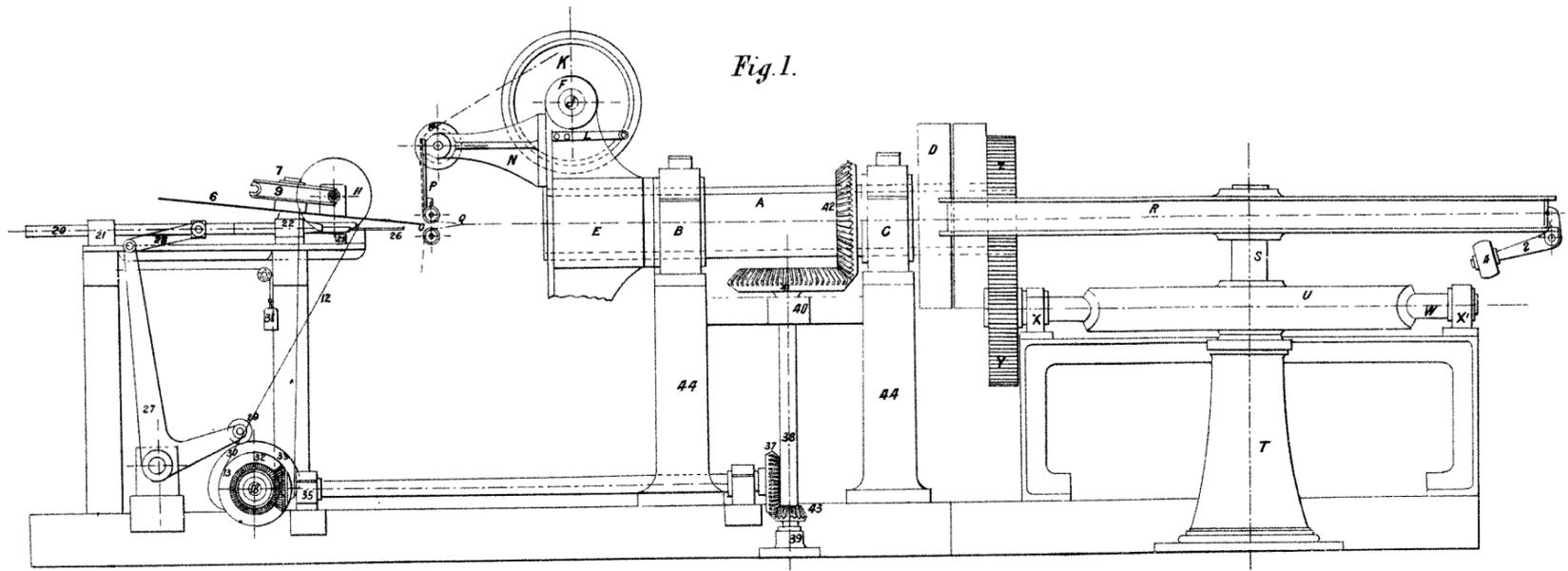


Fig. 1.

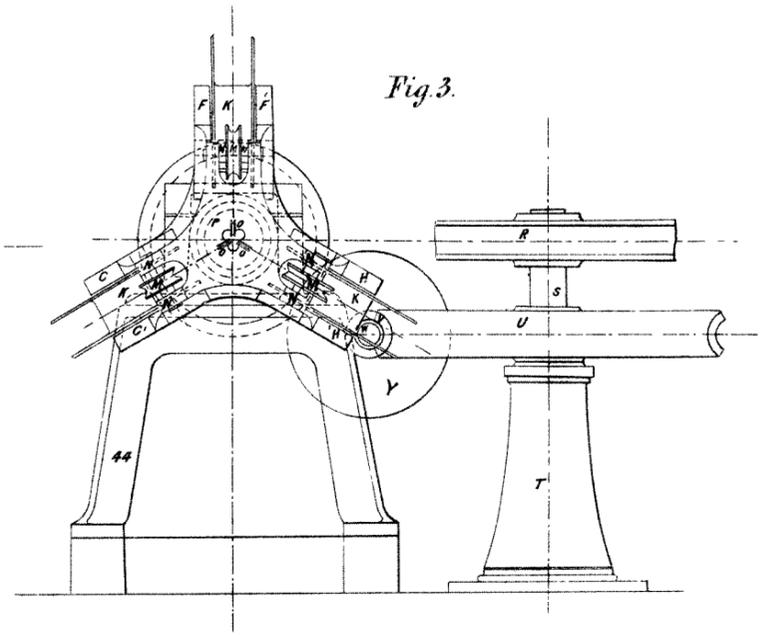


Fig. 3.

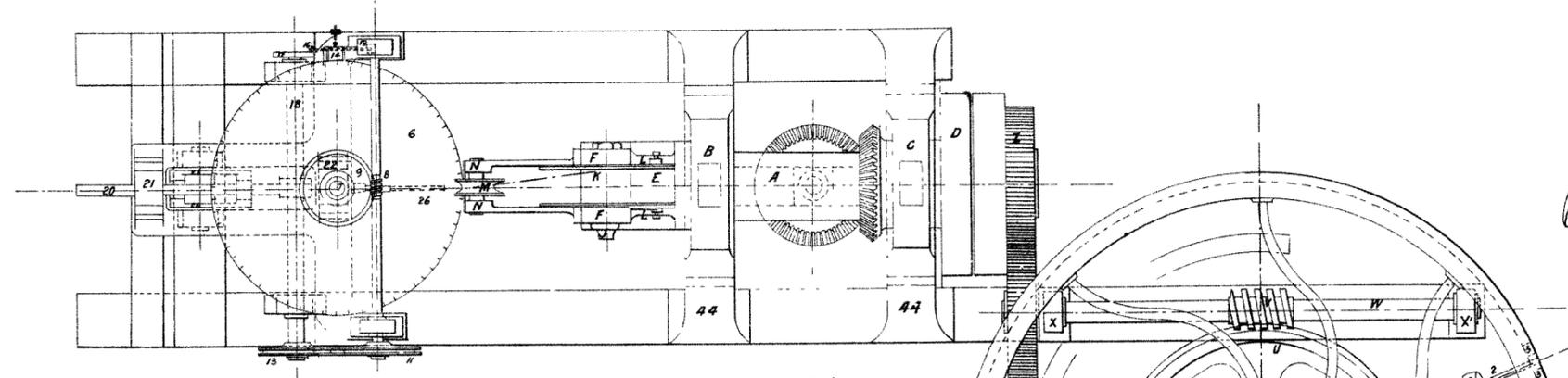


Fig. 2.

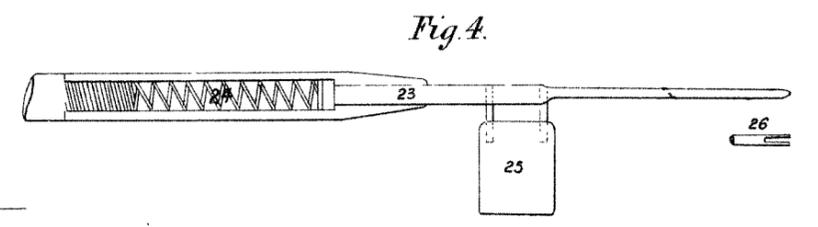
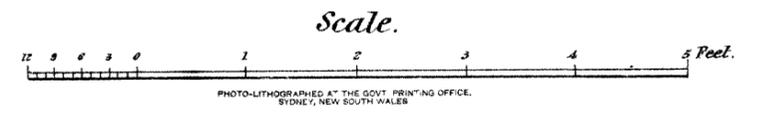
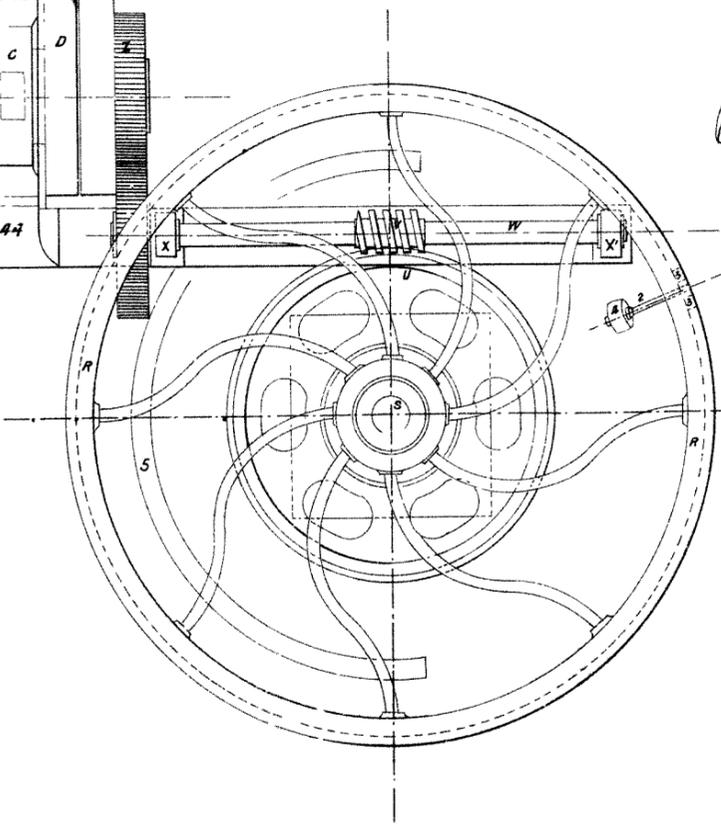
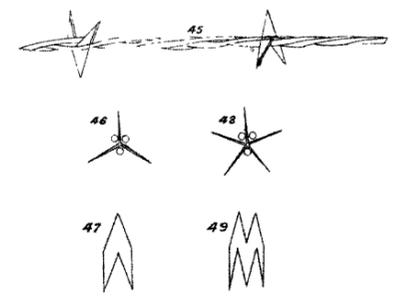


Fig. 4.



Scale.

This is the Sheet of Drawings referred to in the annexed Letters of Registration granted to James Lees, John William Rock, and Charles Griffith Moore, this twenty second day of May A. D. 1882.
Augustus Loftus.



A.D. 1882, 22nd May. No. 1073.

IMPROVEMENTS IN GALVANIC BATTERIES.

LETTERS OF REGISTRATION to Camille Alphonse Faure, for Improvements in Galvanic Batteries.

[Registered on the 23rd day of May, 1882, 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 CAMILLE ALPHONSE FAURE, of 22, Boulevard Voltaire, 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 Galvanic Batteries," 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 Camille Alphonse Faure, 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 Camille Alphonse Faure, 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 Camille Alphonse Faure 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 May, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Galvanic Batteries.

SPECIFICATION of CAMILLE ALPHONSE FAURE, of 22, Boulevard Voltaire, Paris, in the Republic of France, for an invention entitled "Improvements in Galvanic Batteries."

THIS invention has for its object improvements in galvanic batteries, and especially in what are known as polarization or secondary batteries. The polarization or secondary battery is capable when put into communication with a source of electricity of being charged from this source, and of storing up the electricity and of giving up again the electricity so stored. It is portable, and the electricity can be drawn from it at pleasure.

To render such secondary batteries practically useful I have introduced certain changes and improvements which I will presently describe, but I shall first refer shortly to a type of battery already known.

The batteries of Gaston Planté are polarization or secondary batteries. Each cell of these batteries contains two plates or elements of lead immersed in dilute sulphuric acid. They are formed in the following manner:—

By the term "formed" is meant the preparation necessary to render the battery fit for use.

The formation of Planté's battery is effected by charging the cells from an electric source and discharging them repeatedly. The process is one which requires a long time to effect properly. The object is to give certain qualities to the leaden plates; to render them in fact, as it may be termed, porous. By this process of formation the plates of lead acquire the property, under the influence of electric currents, of becoming strongly peroxidised on the one hand, and on the other of passing readily from the metallic state to that of oxide.

It will be observed that the elements of the Planté cell are composed of material which does not pass into solution in the surrounding liquid. My battery resembles the Planté in this respect.

The method of formation devised by Planté is very tedious and costly, and it gives but limited capacity. The capacity is limited first by the thickness of the leaden plates, and second by the disaggregation of the porous lead, which detaches itself from the plates, so that even with thick plates a perfect formation is unattainable.

I, on the other hand, obtain in a very short time a very great capacity for the accumulation of electricity; and I do this in the following manner:—

First—In place of disaggregating the plates which form the elements of the battery, in order to obtain a spongy surface in preparing the elements of my secondary batteries, I cover or put on to a foundation, which may most conveniently be a leaden plate, a somewhat thick coat of spongy or porous lead. The coating may be put on as a plaster or paste, or it may be deposited upon the foundation by electrical or chemical precipitation.

Second—I prevent this coating of porous lead from detaching itself from the foundation by affording it suitable mechanical support.

Third—I form the battery as Planté does, by connection with a source of electricity, preferably a dynamo-electric machine, but far less time and treatment suffices to bring the battery into a good working condition.

I will proceed to describe means for constructing my battery which I have found convenient in practice.

I use for the foundations leaden plates, plain or perforated, or gauze, or of any convenient form and dimensions. If the battery be required for electric lighting with incandescent lamps, plates of the thickness of stout cardboard and exposing a surface of 2 or 3 square feet will be suitable. Sometimes I use plates of larger dimensions and place them in cisterns.

I make a paste by moistening minium or oxide of lead, and with this I coat the foundations all over (excepting the strips to form the connections) to the thickness of about one quarter of an inch. To support this coating I envelop the coated plate in parchment paper, and then wrap felt around it and secure it by sewing or riveting.

The elements so prepared may be doubled or folded one on the other for convenience, so that elements of large surface may be contained in cells of moderate dimensions, but the battery may be made up in various forms. I commonly employ wooden cells, and charge them with dilute sulphuric acid.

The porosity of the coating may be augmented by incorporating inert matter, such as coke, with the mass of oxide.

In lieu of using a leaden foundation, a foundation of coke or carbon may be employed, or any suitable metal.

In some cases, as in batteries for telegraphs, the cells may be charged with a saline solution, such as sulphate of alumina.

Leaden rivets passed through the element from side to side may be used to attach the felt more closely, in order that it may afford a more effectual support.

The purpose served by the felt is to prevent the porous metallic coating from becoming disaggregated and falling off from the foundation. In place of felt, supports of other materials may be employed, as woollen threads passed through or across the spongy or porous coating or covering, or a supporting frame in the form of a trellis or wicker-work may be applied. The space in the cell between the two elements may be filled if desired, in order to render the battery more conveniently portable, with any readily permeable absorbent and inert material, such as animal fibre, which will hold the liquid and will give ready passage to any gases which may be generated during the formation and charging of the battery.

The elements having been prepared and arranged in pairs in the cells, the cells are coupled in series and connected with a source of electricity (the dynamo-electric machine is the most suitable), and things are so arranged that a copious current of electricity is caused to flow into the cells.

Care should be taken to avoid any considerable evolution of gas. The result of the process of formation by the electric current is in each cell to convert the coating or covering of one element into peroxide and that of the other into a reduced and porous lead.

When the battery has been charged and discharged a few times, it will have attained its proper capacity for the storage of electric energy.

Improvements in Galvanic Batteries.

Some other metallic materials may be employed in place of lead oxide to form the coverings or coatings of the elements of my battery, but not with the same advantage. Lead oxide is the material I prefer.

The elements may also be prepared by coating or covering the foundations with a peroxide previously prepared, or it may be with reduced lead, or one element may be prepared with the reduced lead and the other with the peroxide, or the sulphate of lead may be employed; but none of these variations are to be preferred to the preparation of the elements with minium or oxide of lead.

The felt envelopes which I have described and other like mechanical supports are very useful in polarization or secondary batteries constructed and formed in the manner practised by Planté and hereinbefore described.

In producing a Planté battery, the envelopes or supports should be applied to the bare leaden plates or elements before the process of forming is commenced.

My polarization or secondary batteries are useful for a variety of purposes; amongst others, for electric lighting, and for lighting railway carriages and steam-boats. For lighting railway carriages I cause a small dynamo-electric machine to be driven by a band from one of the axles of the carriage. The dynamo machine delivers its current to the secondary battery, and by suitable leads the current is taken from the battery to the lamps.

To avoid inconvenience from the discharge of the battery through the dynamo machine when the train is stopped or the speed reduced, I employ a governor, which then opens the circuit. This may readily be done by means of an ordinary centrifugal governor, or an arrangement operated by the electric current itself may be made use of: for instance, let an electro-magnet be wound with two wires, one of low and one of very high resistance, both being circulated by the principal current, and both causing a steel magnetised armature to be repelled, and thereby causing contact to be made completing the circuit. When current is reversed the said armature will be attracted, but in advancing will break contact and arrest the main current flowing on the large wire of the electro-magnet, but by proper arrangement the current in fine wire helix is kept on but reversed, so that the attraction continues with the expenditure of a very small current from the accumulators. When the current is reversed a second time, or comes back to its original course, a repelling action takes place and contact is again made for the large current to flow.

The electro-magnets of the dynamo-electric machine are included in a shunt or branch circuit, and the resistance in this circuit is varied. The resistance is increased as the speed becomes greater, in order to confine within convenient limits the variations of the current yielded by the dynamo-electric machine.

The regulation may be rendered automatic by applying a suitable governor or speed-indicator to shift a contact-maker, so as to include in the circuit a greater or lesser number of resistance coils.

In lighting steamships the apparatus will be similar to but on a much larger scale than that for lighting a railway carriage, or even for lighting a train. It can be driven by a belt from the propeller shaft.

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—The improved batteries adapted to store electric force or energy, substantially as described.

Second—The novel process for manufacturing polarization or secondary batteries, consisting in (1) preparing elements by applying and securing upon leaden plates or other foundations coatings or coverings of porous or spongy metal or metallic matter; (2) arranging such elements in pairs in battery cells; and (3) connecting them with a dynamo-electric machine or other source of electricity, substantially as described.

Third—In polarization or secondary batteries, the application of mechanical supports to maintain and hold up to or against a leaden plate or other foundation a coating or covering of porous or spongy metal or metallic matter, substantially as described.

In witness whereof, I the said Camille Alphonse Faure have hereunto set my hand and seal, this twenty-first day of January, 1882.

C. A. FAURE.

Witness—

DEANSTON CARPMAEL.

This is the specification referred to in the annexed Letters of Registration granted to Camille Alphonse Faure, this twenty-second day of May, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, April 6, 1882.

We do ourselves the honor to report, in reply to your blank cover communication of the 27th ultimo, No. 4233, transmitting Mr. Camille Alphonse Faure's Petition for the registration of "Improvements in Galvanic Batteries," that we are of opinion the prayer of the Petitioner may be granted, in terms of his specification and claim.

The Under Secretary of Justice.

We have, &c.,

E. C. CRACKNELL.
GOTHER K. MANN.



A.D. 1882, 22nd May. No. 1074.

**IMPROVEMENTS IN MACHINERY OR APPARATUS FOR CLASSIFYING,
DRESSING, AND CONCENTRATING ORES, &c.**

LETTERS OF REGISTRATION to Heinrich Wilhelm Ferdinand Kayser, for
Improvements in Machinery or Apparatus for classifying, dressing, and con-
centrating ores and other metalliferous material.

[Registered on the 23rd day of May, 1882, 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 HEINRICH WILHELM FERDINAND KAYSER, of Waratah, in the Colony of Tasmania, 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 classifying, dressing, and concentrating ores and other metalliferous material," 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 Heinrich Wilhelm Ferdinand Kayser, 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 Heinrich Wilhelm Ferdinand Kayser, 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 Heinrich Wilhelm Ferdinand Kayser 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 May, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Machinery or Apparatus for classifying and dressing Ores, &c.

A.

SPECIFICATION of HEINRICH WILHELM FERDINAND KAYSER, of Waratah, in the Colony of Tasmania, engineer, for an invention entitled "Improvements in Machinery or Apparatus for classifying, dressing, and concentrating Ores and other metalliferous material."

THIS invention consists of certain improvements in machinery or apparatus for classifying, dressing, and concentrating ores and other metalliferous material when in a finely divided state.

The first part of my invention relates to machinery or apparatus for classifying such ores and material according to their size and specific gravity, and consists, first, in a series of V-shaped channels of successively larger area and cubical measurement, filled with water, and through which the material to be treated is conveyed by means of a current of water, and is met at the apex of each V by a triangular sheet of water having an upward current which passes up the second leg of the V, the classified material passing down such triangular sheet of water into the pipe supplying such upward current, and from thence discharged into any suitable receptacle, and the rest passing up the second leg of the V to be thence carried into the first leg of the next V channel, to be there subjected to the same treatment, and so on throughout the whole series. The effect of this treatment is that the largest and heaviest particles deposit themselves in the first and smallest V where the current is strongest, the next in size and specific gravity in the second V, and so on, four V-shaped channels being the number I prefer to use, although of course there may be more or less as desired. This apparatus is clearly illustrated in sheet 1 of my drawings, where figure 1 shows plan thereof. Figure 2, longitudinal section; figures 3, 4, and 5 show on a larger scale plan, front elevation and section of the first V channel; and figures 6, 7, and 8, plan, elevation, and section of the triangular sheet of water at the bottom thereof.

The several channels are marked Nos. 1, 2, 3, and 4 respectively, and the directions of the currents are indicated by arrows. The vertical supply pipes are marked *b*, and have funnels, *x*, and the discharge pipes for the classified material are marked *e*. *a* and *a'* are the entering and exit channels respectively, the inner sides *g* of which are made adjustable by means of screws *k* and bars *m*. *C* is the triangular sheet of water having an upward pressure; *f* *f* are regulating taps; *h*, sliding groove; *i*, sliding tongue; *l*, screw frame; *n* and *o* are the inside walls of the V channels, and *p*, their apex; *q* and *r* are walls of the triangular sheet of water, and *s*, its door; *t*, are fastening cleats and bolts; *u*, wood plugs; *v*, supporting frame; *w*, connecting launders.

The first part of my invention consists, secondly, in a series of boxes of successively larger area and cubical measurement filled with water, through which the material to be treated is conveyed by means of a horizontal or nearly horizontal current of water, assisted when needed by an upward current proceeding from the bottom of such boxes. These boxes I make in the shape of inverted pyramids, from the apex of each of which the classified material is discharged. The effect of this treatment is that the largest and heaviest particles deposit themselves in the first and smallest box, where the current is strongest; the next in size and specific gravity in the second box, and so on, four boxes being the number I prefer to use, although of course there may be more or less as preferred. In the last box, where the finest material is deposited, I place current breakers consisting by preference of some perforated or open material, such as wire mesh, which will break the current and not absolutely stop it. This apparatus is clearly illustrated in sheet 2 of my drawings where figure 1 shows plan thereof; figure 2, longitudinal section; and figures 3, 4, and 5, plan, elevation, and section, on a larger scale, of the first box.

The several boxes are marked Nos. 1, 2, 3, and 4 respectively, the current flowing in the direction of the arrows. *a* is the launder for supplying the ore or material; *c*, connecting launders with distributors; *b*, thereon; *d*, the apex of the boxes with the discharge pipe *e* affixed; *f* are current breakers; *g*, regulating taps; *h*, waste water channel; *i*, supporting frame; *k*, wood plugs in pipes; *l* is a pressure supply-pipe to be used if desired.

It will be seen at once that the apparatus shown in sheet 2 is a substitute for and alternative to that shown on sheet 1 of my drawings. Of the two I prefer that shown on sheet 1, but I prefer most of all to combine the V-shaped channels 1 and 2 with the pyramidal boxes 3 and 4. The classified material from V channels 1, 2, and 3, or from boxes 1, 2, and 3 when they are used, I subject to further treatment in an ore-dresser or jigger now to be described, while the slimes from the largest V channels and boxes I treat on a conical table hereinafter described.

The second part of my invention consists in the peculiar construction and method of working this ore-dresser or jigger. In principle this is a jigger in which the pulsation is given to the water and the sieve is fixed. This sieve is of peculiar construction; being of woven wire fastened to an iron framing which when set in position is kept from warping or bending by an upper wooden framing which fastens it down on its ledges or shelving. In other respects this machine is like other jiggers, but I have a peculiar method of working it by which alone can it be made to work successfully. It consists in placing on the sieve a false bottom or layer of material of as nearly as possible the same specific gravity as that which it is intended to save, but of a size just too large to pass through the sieve. As the jiggling proceeds the dressed ore passes through the false bottom and the sieve into the chamber underneath, from whence it is discharged through the hole in the centre by lifting a plug. This machine is clearly illustrated on sheet 3 of my drawings, in which figure 1 is plan of a double jigger, which is the way I prefer to construct this ore-dresser. Figures 2 and 3 are sections on the lines N, O, and R, S, respectively in figure 1. Figure 4 is plan and section of the plunger; figure 5, plan and section of the sieve frame; figure 6, plan showing sieve frame, with sieve fastening bars and false bottom; figure 7, section of figure 6, showing also the lateral fastening bar; and figure 8 shows plan and section of the cover frame. *A* are the plunger boxes; and *B*, the sieve compartments with partitions *i*; *C*, the receptacle for the dressed material. The plunger *c* is worked by an eccentric, as shown; *e* is the sieve, with frame *l* and fastening bars *g*, *f* being the false bottom thereon; *h* is the material, and *h'* the water supply pipes; *n* is the outlet plug with rod *o*; *r* is connecting channel of double jigger; *s*, the cover frame, and *t*, a lining.

The third part of my invention consists, first, of an improved buddle for treating the tailings from the jigger. The improvements which I have made in the buddle relate first to the launder for distributing the

Improvements in Machinery or Apparatus for classifying and dressing Ores, &c.

the material to be treated, and secondly, to the arrangement of the knives or scrapers (known as Munday's scrapers). Hitherto the feed for buddles has been conducted directly into the distributing cup, but this produces an uneven distribution. Now I conduct the feed into a stationary central basin with a hole in its centre, directly over the centre of the distributing cup, so that the feed falls directly from the launder into this centre, from whence it is equally distributed through the distributing pipes. When so distributed it is also necessary that it should be equally treated by the scrapers, which by the old system it is not. The old system is to place about three scrapers in each carrying arm, all at about the same distance from the end, so that all follow in the same track; now I obtain much better results by placing these sets of scrapers at successively longer distances from the end of the carrying arms, commencing with those nearest the end, and then gradually placing them further and further back until they reach the furthest backward position, or that which is nearest the centre of the buddle, and in such a manner as that conjointly they travel over the whole of the working surface of the buddle.

This apparatus is clearly illustrated in sheet 4 of my drawings, where figures 1 and 2 show plan and cross section thereof; figure 3 plan and section of stationary feeding basin or launder; and figure 4 plan of one scraper carrier.

In figure 1 the relative proportion of area covered by each pair of scrapers is shown by the dotted lines 1, 2, 3, &c. *a* is the bottom of the buddle; *b*, ore scrapers on scraper-carriers *c*; *d*, staple hinge; *e*, spindle screws; *f*, radial arms; *g*, distributing pipes; *h*, feeding cup; *i*, ferrule on shaft *k*; *l*, stationary feeding basin; *m*, main supply pipe or launder; *n*, clean water pipe; *o*, suspending rods.

The third part of my invention also consists of a machine for treating slimes, such as that which is deposited in the fourth V-shaped channel on sheet No. 1, or in box No. 4 on sheet No. 2. This machine is illustrated on sheet 5 of my drawings, in which figure 1 is a plan and figure 2 a sectional elevation thereof. *A* is a circular plane resting on arms *B*, which have the same angle as the plane; the former is, if of wood, made of double boards and fastened to the arms. The periphery is the lowest part of the plane, thus forming a low cone. On the inner side of the plane the arms are fastened to a cast-iron rosette, *l*, which latter is affixed to a vertical shaft, *c*, which rests in a socket, *d*, said shaft is also held by a bearing, *e*, affixed to a frame on which also the motion gear rests. Below the plane and above the socket another rosette, *h*, is fixed on the shaft, to hold and receive centre *i*, for the support of the arms and plane. On the upper portion of the shaft *c* is worm-wheel *k*, in which worm *l* works, which latter is on the driving-shaft *m* at right angle to the table shaft. This shaft *m* is supplied with a pulley, *n*, to receive its motion from any desirable motor. In action the screw turns the toothed wheel, and thereby the table rotates. A supply-pipe for launder *o* leads the slime into a segment, *g*, of a circular serrated launder, *p*, whose outer circle is higher than its inner circle, and which latter is serrated, thereby allowing a number of small streams of ore matter to fall upon the table below this segment. The other three segments of the same launder serve to receive clean water through a pipe, *r*, for working purposes, and which is similarly distributed on the apex of the table. The washing-off pipe *s* is perforated diagonally downwards against the stream and motion of the table. The water in this pipe issues with some force out of the perforations, and washes off the ore into a part of an outer launder *u*, which encircles the whole table, and has as many outlets, *v*, as may be desirable for ore for waste and for middlings, if the latter is thought necessary; *w w*, are iron rods on which is canvas, sackcloth, or other textile fabric, so suspended that it partially rests upon the table; the one, *w'*, serves to prevent the splash of the jets from the wash-off pipe, and the others to prevent any lodgment taking place upon the table. The angle and the supply of water on the table having been determined, the particles move along the plane as above indicated, but as the table moves at right angles to the current, the particles make a tangential course, thereby remaining long under the influence at work before they arrive at their respective place of discharge. The action of the wash-off pipe provides a clean surface for the material under operation. I prefer this table to make about one revolution in three minutes for ordinary slimes, and one in two and a half minutes for the finest slimes.

The quantity of material treated will vary from two cubic feet for fine, to three cubic feet for coarse slimes per minute, containing from 15 lbs. to 50 lbs. of solid matter per cubic foot.

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 invention is—

First—The classifying apparatus, constructed and arranged in the manner and for the purpose substantially as herein described, and as illustrated in sheet 1 of my drawings.

Second—The classifying apparatus, constructed and arranged in the manner and for the purpose substantially as herein described, and as illustrated in sheet 2 of my drawings.

Third—The peculiar construction of sieve for ore-dressers or jiggers and the use therein of false bottoms, in the manner and for the purpose substantially as herein described, and as illustrated in sheet 3 of my drawings.

Fourth—The novel construction of feeding launder, and the novel arrangement of the scrapers in buddles, substantially as herein described and explained, and as illustrated in sheet 4 of my drawings.

Fifth—The concentrating apparatus constructed and arranged in the manner and for the purpose substantially as herein described, and as illustrated in sheet 5 of my drawings.

In witness whereof, I the said Heinrich Wilhelm Ferdinand Kayser have hereto set my hand and seal, this twentieth day of March, one thousand eight hundred and eighty-two.

Witness—

THOMAS DUNCANSOR, J.P.,
Waratah, storekeeper.

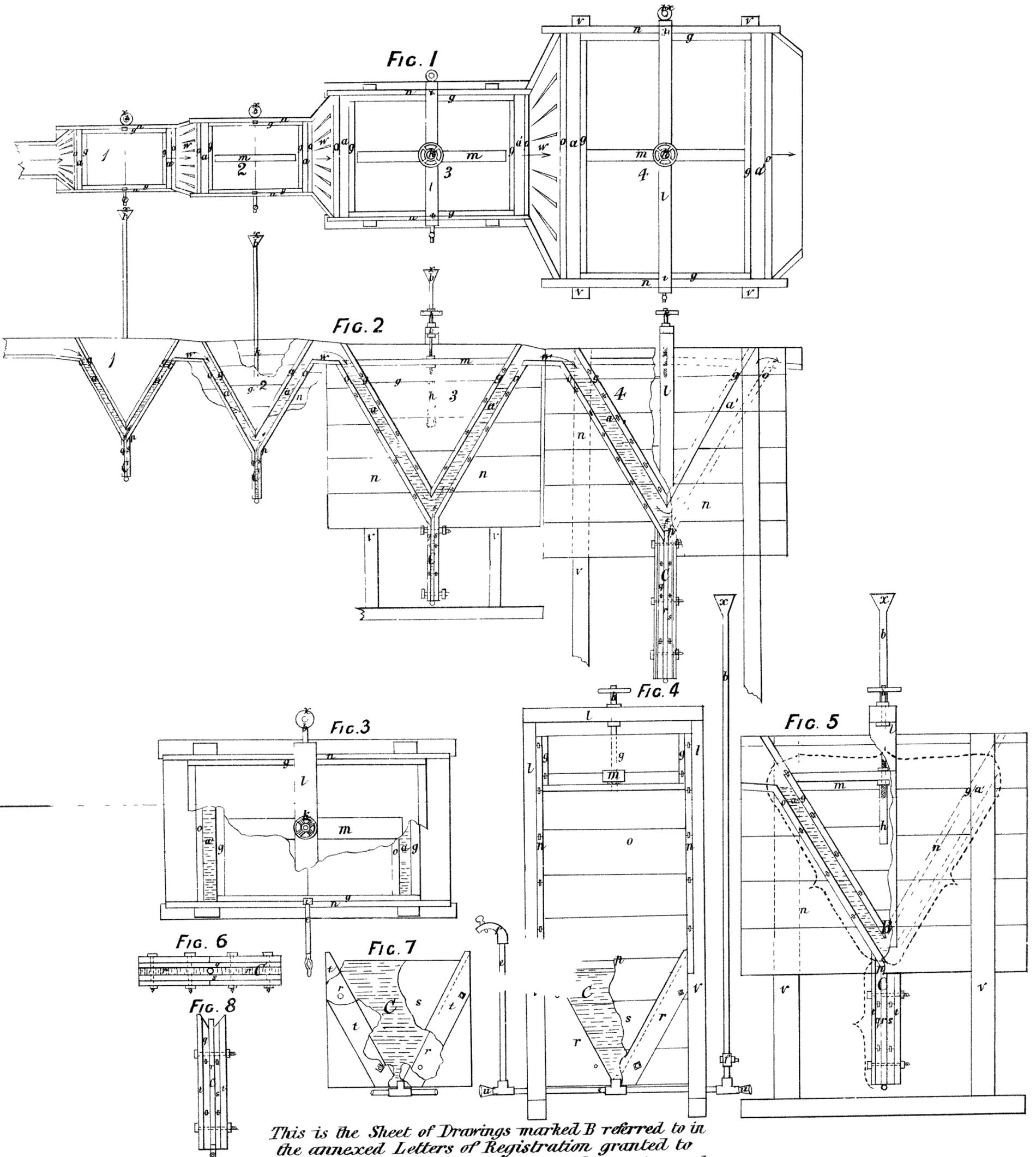
H. W. FERD. KAYSER.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to Heinrich Wilhelm Ferdinand Kayser, this twenty-second day of May, A.D. 1882.

AUGUSTUS LOFTUS.

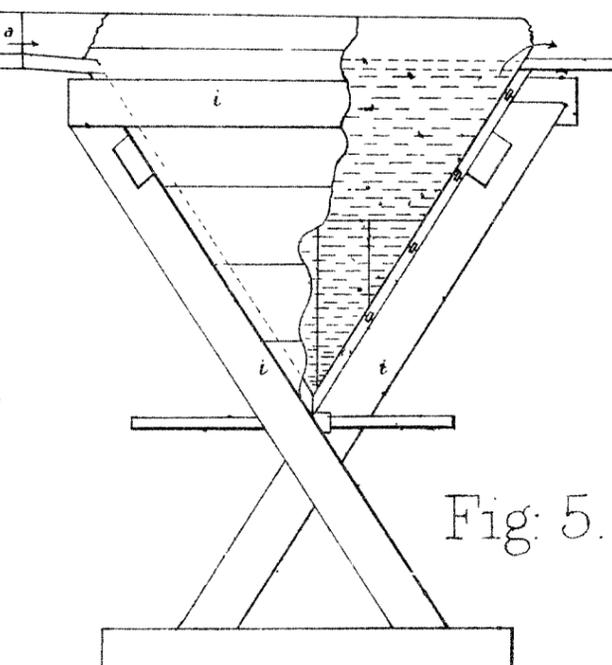
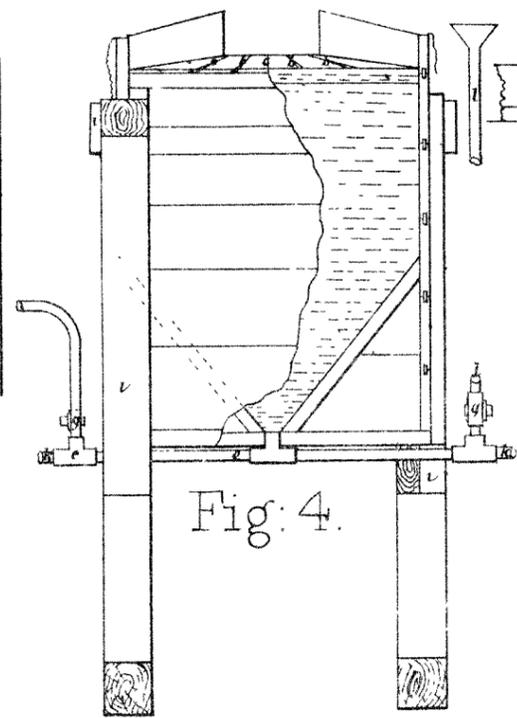
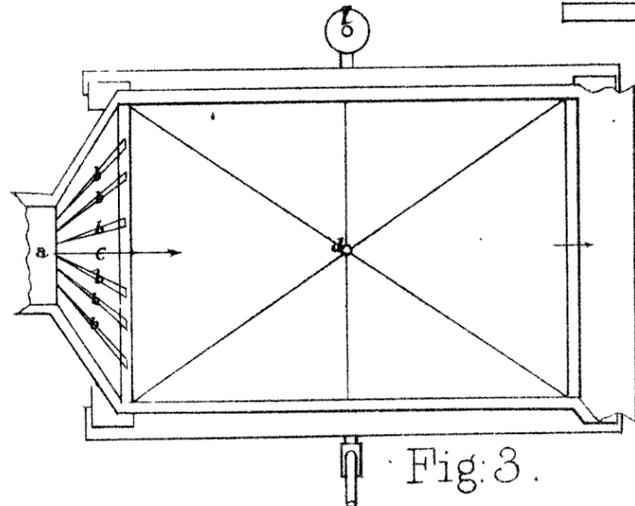
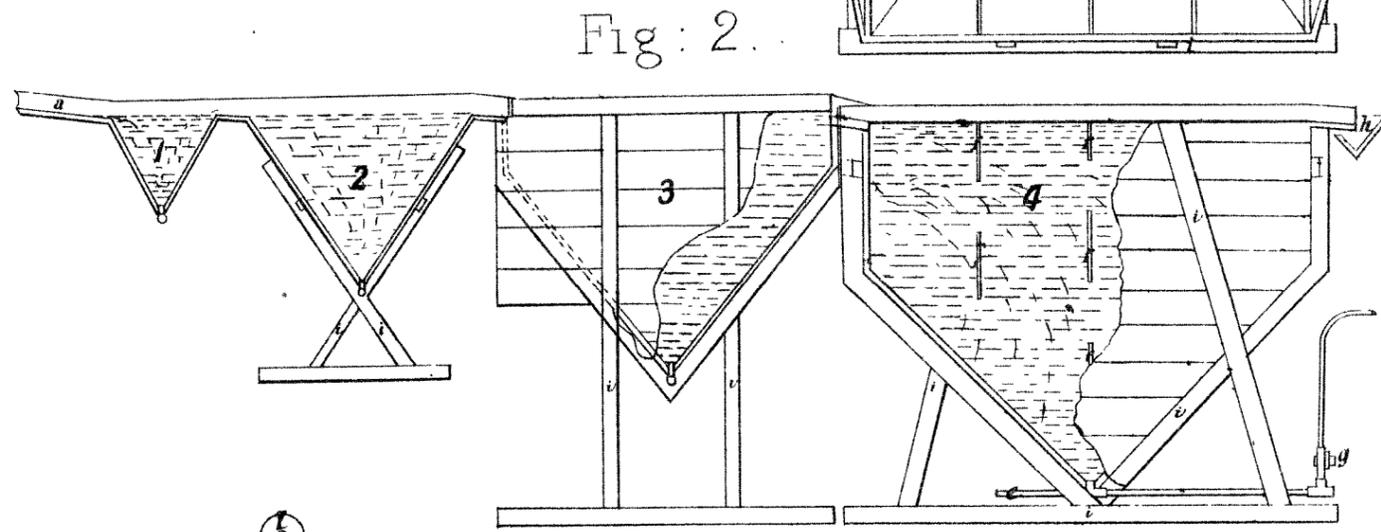
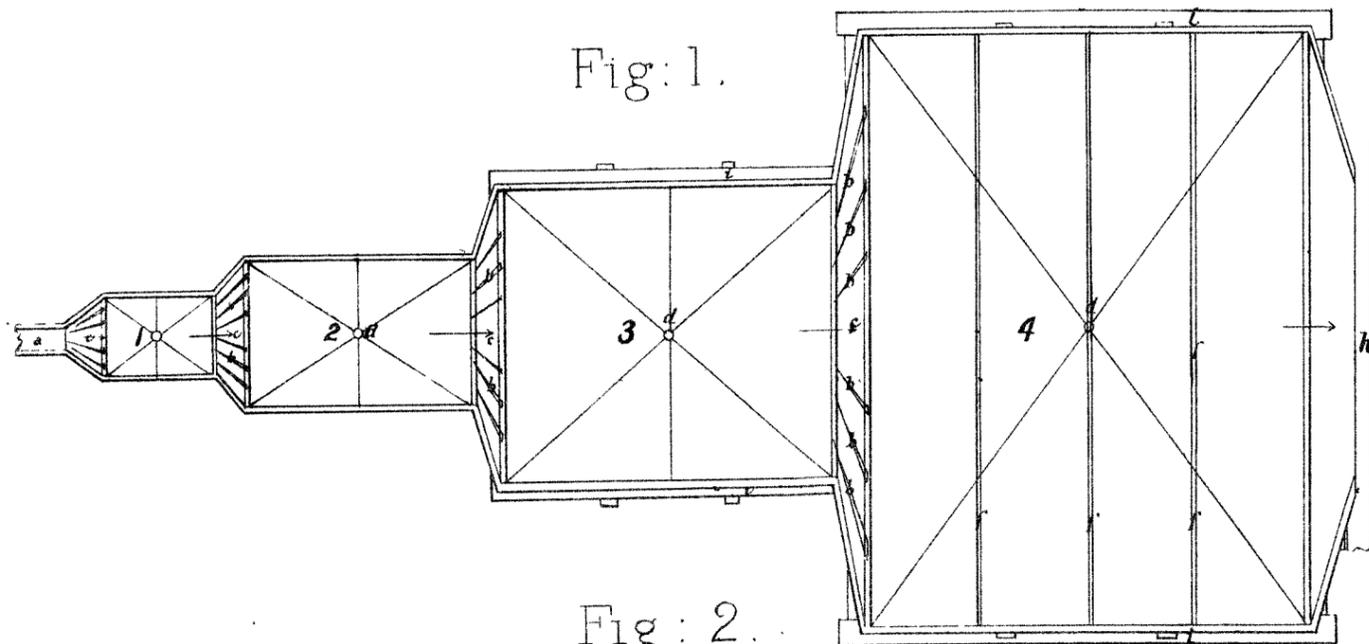
REPORT.

KAYSER'S PATENT



This is the Sheet of Drawings marked B referred to in the annexed Letters of Registration granted to Heinrich Wilhelm Ferdinand Kayser; this twenty-second day of May, A. D. 1882.
 Augustus Loftus.

KAYSER'S PATENT



This is the Sheet of Drawings marked C referred to in the annexed Letters of Registration granted to Heinrich Wilhelm Ferdinand Kayser, this twenty-second day of May, A.D. 1882. Augustus Loftus.

KAYSER'S PATENT

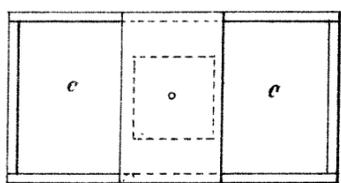
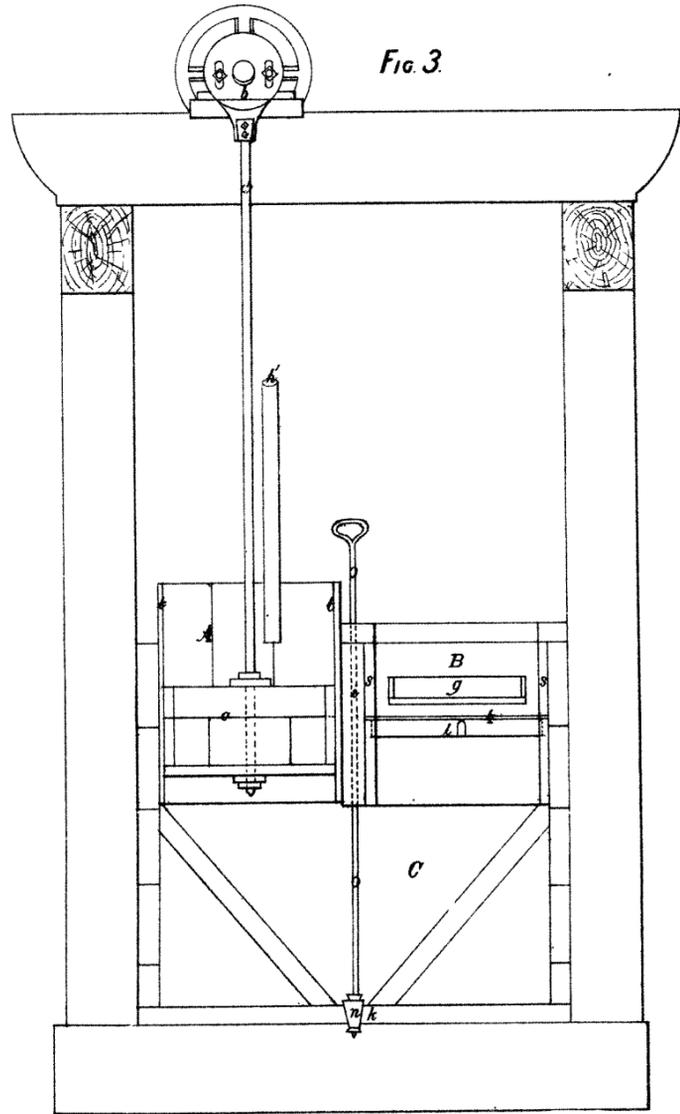
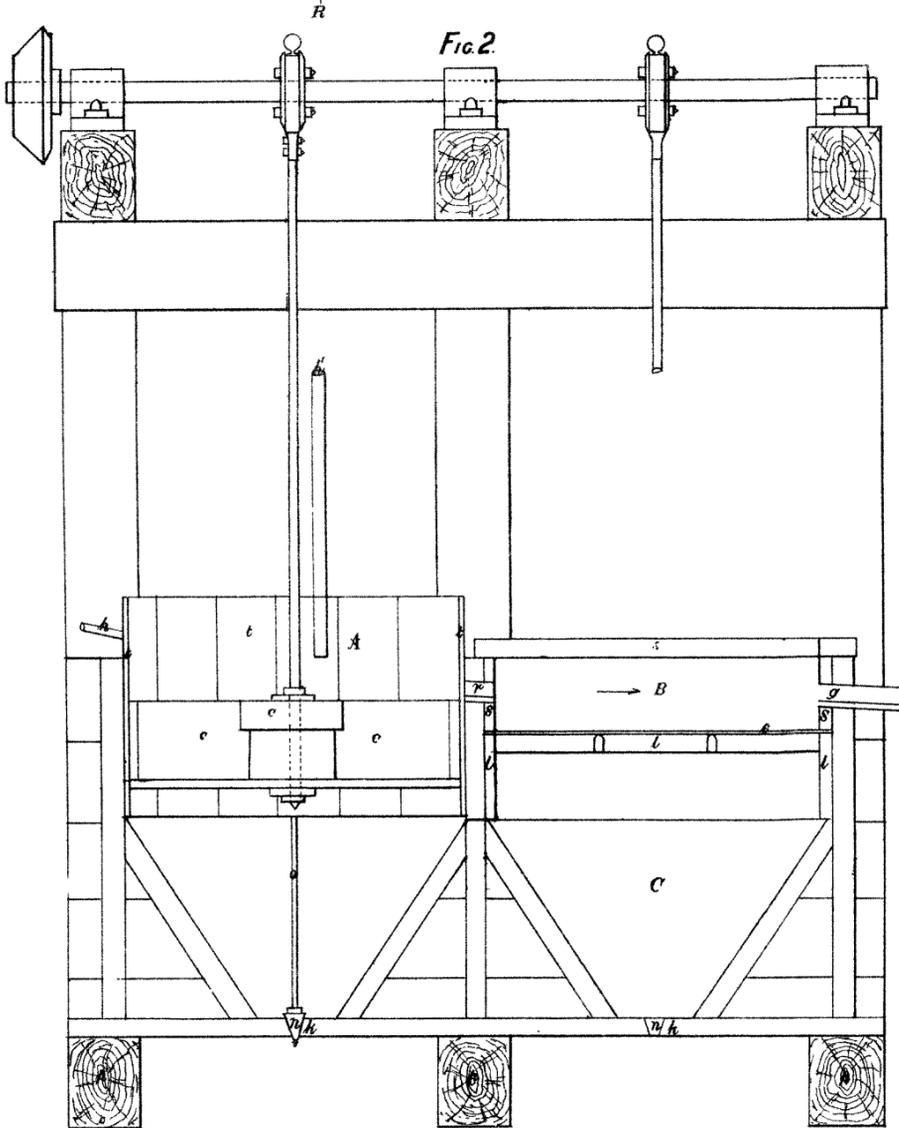
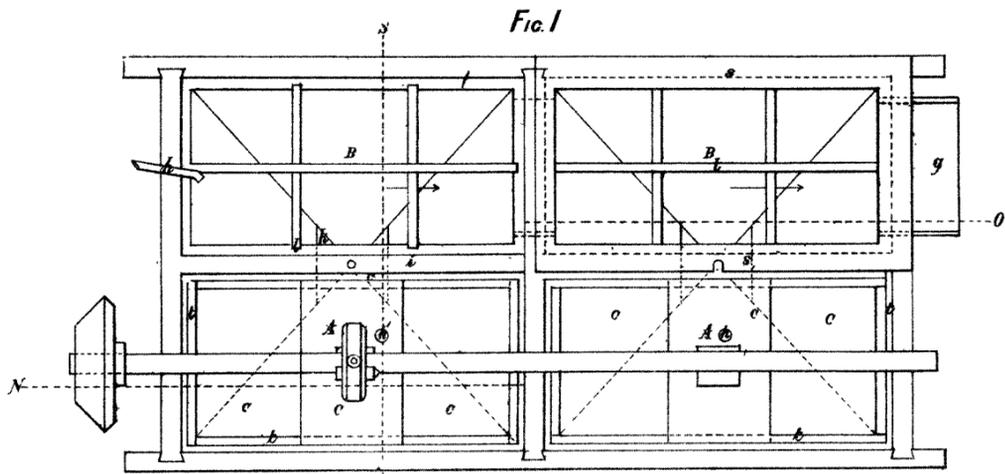


Fig. 4.

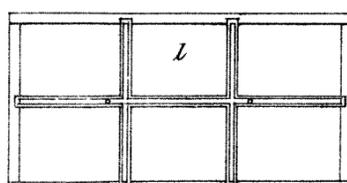


Fig. 5.

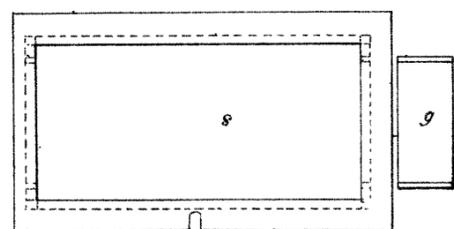


Fig. 6.

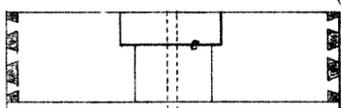


Fig. 7.

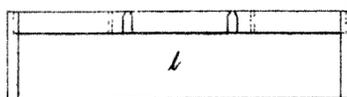


Fig. 8.

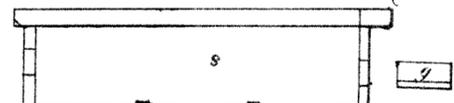


Fig. 9.

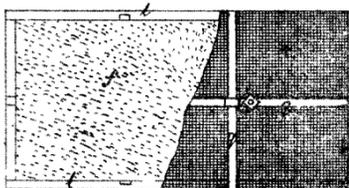


Fig. 10.

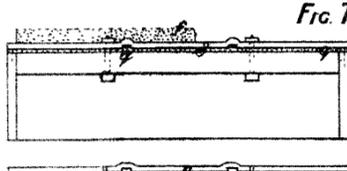
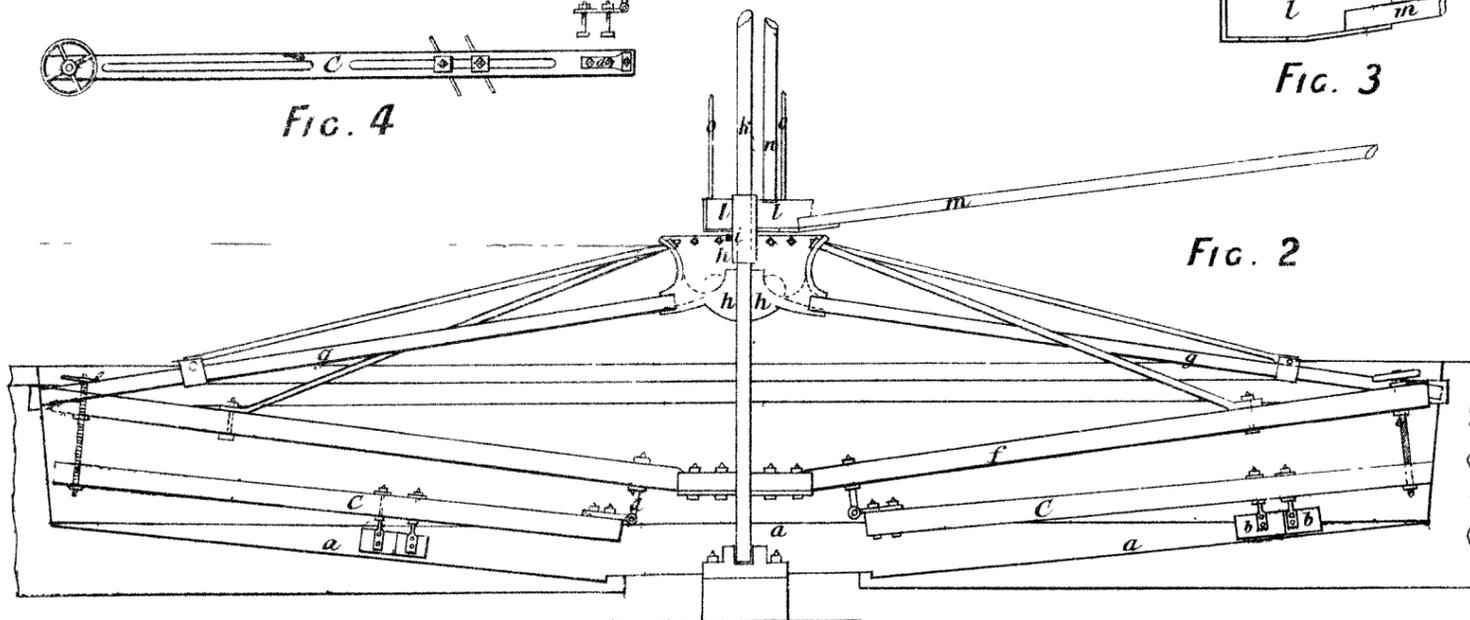
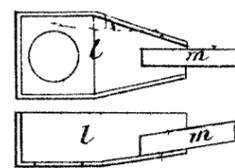
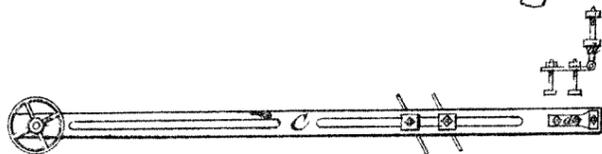
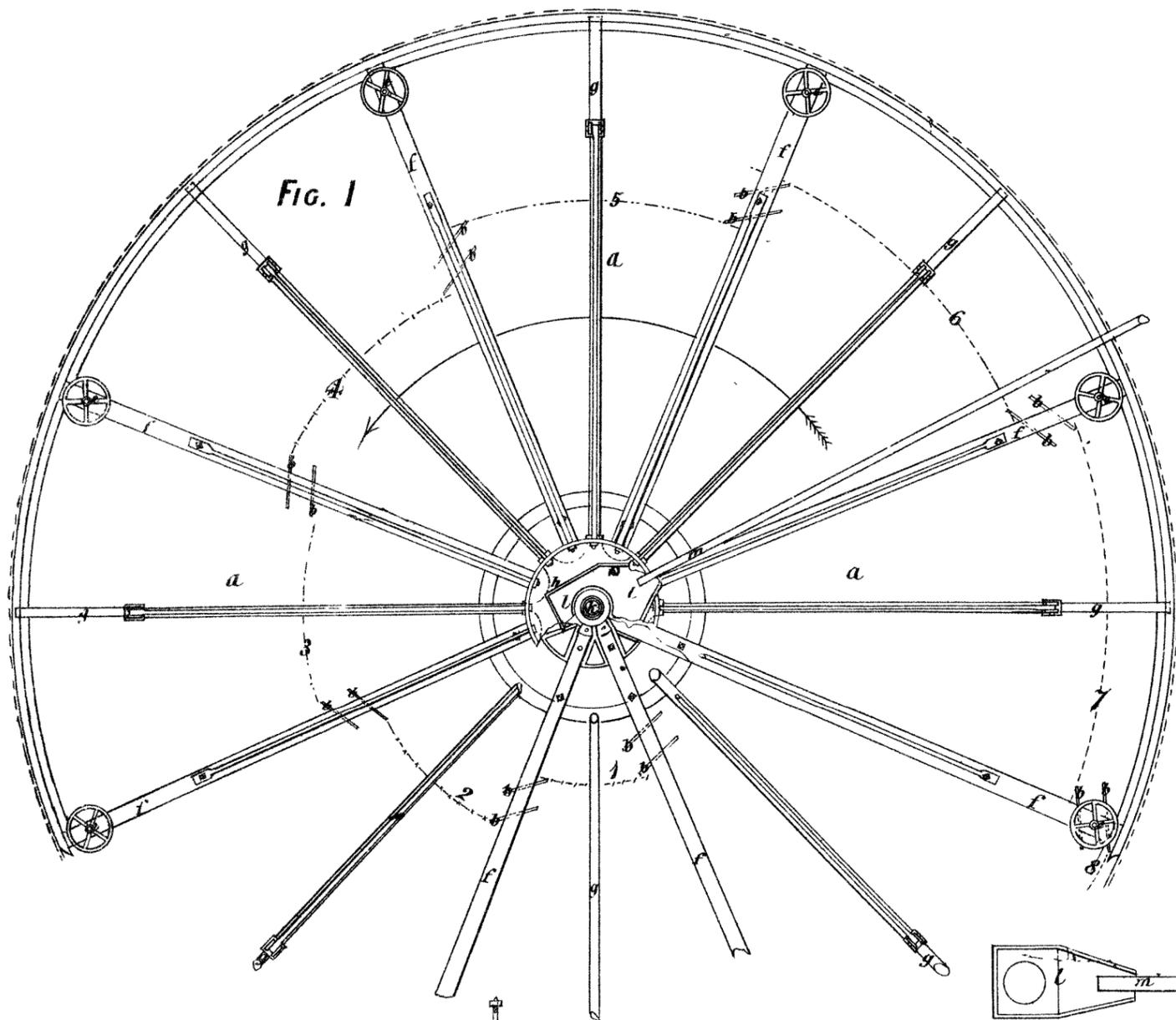


Fig. 11.

This is the Sheet of Drawings marked D referred to in the annexed Letters of Registration granted to Heinrich Wilhelm Ferdinand Kayser, this twenty second day of May, A.D. 1882.
Augustus Loftus.

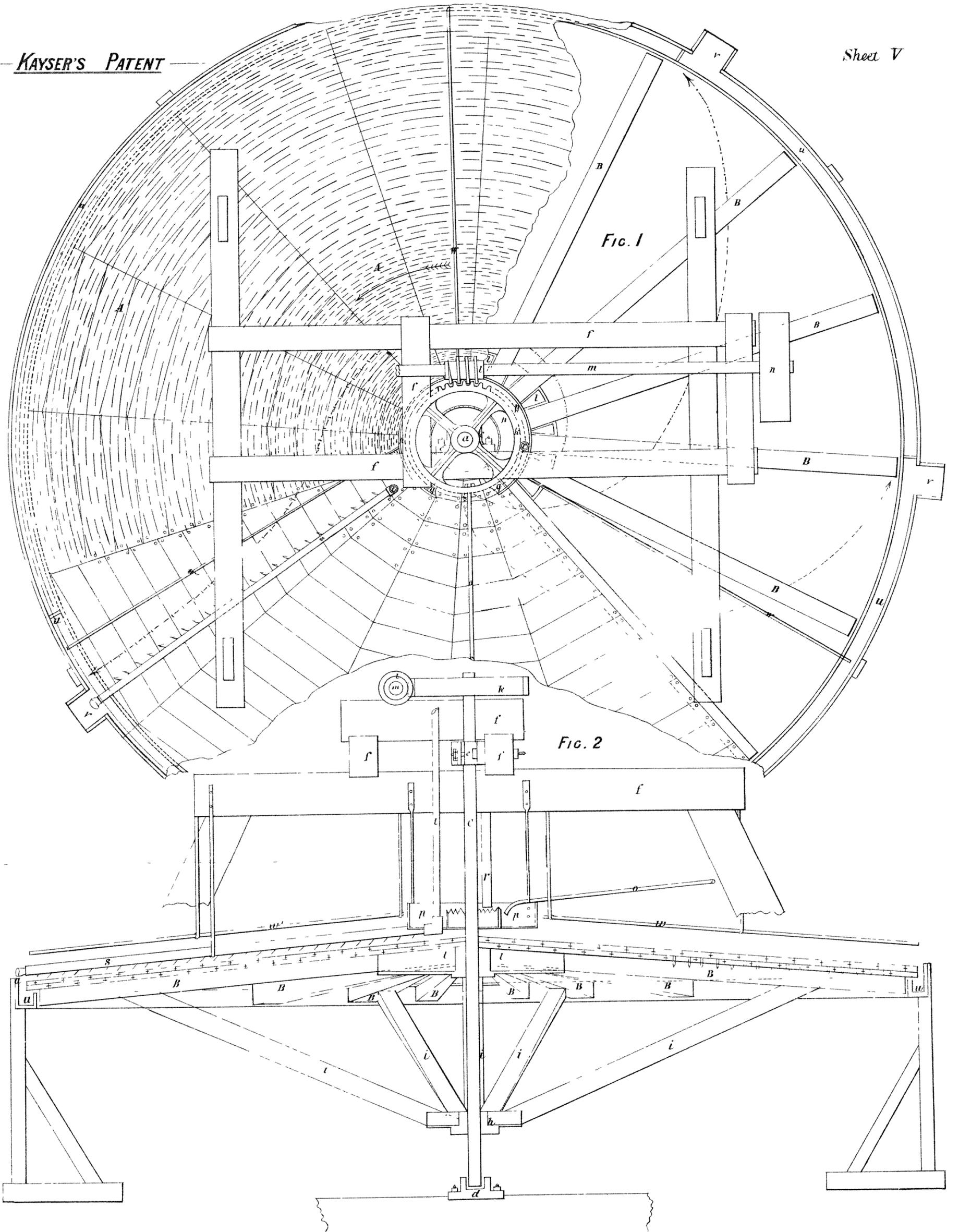
KAYSER'S PATENT



This is the Sheet of Drawings marked E referred to in the annexed Letters of Registration granted to Heinrich Wilhelm Ferdinand Kayser, this twenty-second day of May, A.D. 1882. Augustus Lotus.

KAYSER'S PATENT

Sheet V



This is the Sheet of Drawings marked F. referred to in the annexed
 Letters of Registration granted to Heinrich Wilhelm Ferdinand Kayser,
 this twenty-second day of May, A. D. 1882.

Augustus Loftus.



A.D. 1882, 22nd May. No. 1075.

A NEW OR IMPROVED METHOD OF PRODUCING ALUMINA.

LETTERS OF REGISTRATION to James Webster, for a new or improved method of producing Alumina suitable for the manufacture of Aluminium.

[Registered on the 23rd day of May, 1882, 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 WEBSTER, of Solihull, in the County of Warwick, Great Britain, 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 new or improved method of producing Alumina suitable for the manufacture of Aluminium," which is more particularly described in the copy 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 James Webster, 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 Webster, 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 Webster 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 May, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

A new or improved method of producing Alumina.

SPECIFICATION.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, JAMES WEBSTER, of Solihull, in the County of Warwick, engineer, send greeting :

WHEREAS Her Most Excellent Majesty Queen Victoria, by Her Letters Patent bearing date the fourteenth day of June, in the year of our Lord one thousand eight hundred and eighty-one, in the forty-fourth year of Her reign, did for Herself, Her Heirs and Successors, give and grant unto me, the said James Webster, Her special license that I, the said James Webster, my executors, administrators, and assigns, or such others as I, the said James Webster, my executors, administrators, and assigns, should at any time agree with, and no others, from time to time, and at all times thereafter, during the term therein expressed, should and lawfully might make, use, exercise, and vend within the United Kingdom of Great Britain and Ireland, the Channel Islands, and Isle of Man, an invention for "A new or improved method of producing Alumina, suitable for the manufacture of Aluminium," upon the condition (amongst others) that I, the said James Webster, my executors or administrators, by an instrument in writing under my or their or one of their hands and seals, should particularly describe and ascertain the nature of the said invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said Letters Patent : Now know ye that I, the said James Webster, do hereby declare the nature of the said invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement :—

The object of this invention is to produce alumina, to be used in the manufacture of aluminium, and for other useful purposes, at a less cost than heretofore.

In carrying my present invention into practice, I take the alum of commerce, or the sulphate of alumina, or other salts or compounds of alum ; for this description I will take the ordinary alum of commerce, and mix therewith about one-third its weight of carbonaceous matter, by preference gas pitch, which consists chiefly of carbon with a small portion of sulphur. This mixture is ground to a fine powder and then thrown into a flat-bottomed furnace, similar to those used in the manufacture of soda-ash, and is heated to about 400° to 500° of Fahrenheit's scale, care being taken not to raise the heat higher, thus driving off the water of crystallization, with a small portion of sulphuric acid, from the alum. At the said temperature the pitch and sulphur combine together with the alum thus dried. This temperature is maintained for about three hours, the compound being well stirred and mixed during such time, when it will have attained the consistence of a thick paste ; it is then removed from the furnace and placed upon a stone floor and, when cool, broken into pieces and moistened with a small quantity of hydrochloric acid and water, mixed in the proportion of one volume of acid to four similar volumes of water. This mixture is then thrown in a heap, eighteen inches thick or more, and occasionally turned, so that it may heat and give off sulphuretted hydrogen gas. When such gas ceases to rise from the mixture, about five per cent. thereof of wood charcoal or lamp-black is added thereto, with a small quantity of water, if required, for grinding the compound down to a thick paste, and well mix them ; the whole is then removed to a mill or other grinding apparatus and ground to a stiff paste. This paste is then removed from the mill and into balls about 1 lb. each, and pierced with some four to six holes, to allow the moisture therein to freely escape during the process of drying ; the said balls are then placed in a drying stove, previously heated to about 100° Fahrenheit for about two days, when they are transferred to an oven or stove, heated from 200° to 300° Fahrenheit, and thus remain until thoroughly dried. These dried balls are put into a vertical retort of fire-clay. Or, the mixture in the heap, when it ceases to give off sulphuretted hydrogen gas, may be conveyed direct to such fire-clay retort, which, in either case, is then heated to a dull red heat and maintained thereat for about thirty hours. During this time, when the mixture is thus heated, I pass through it a jet of steam and atmospheric air, mixed in the proportion of about two volumes of steam to one similar volume of air. By this process the sulphur and ferric sulphate, with a small quantity of potass and a trace of alumina, are carried over with the vapour, and condensed by being passed through earthenware tubes and condensers, similar to the process used in the condensing of nitrous or nitric acid. This condensed vapour or liquid is really hydrochloric acid, in a concentrated state, contaminated with free sulphuric acid, sulphate of potass, and iron. When the said vapour is all given off the dried mixture is removed from the retort and placed to cool ; when sufficiently cooled it is again taken to the mill and there ground to a fine powder, which powder is then placed in a vat or pan with about seven times its weight of water, and boiled by steam for about an hour, when the steam is turned off and the contents of the vat allowed to cool ; during this process of cooling, the alumina will fall to the bottom of the vessel as a thick precipitate, the sulphate of potass, which was left in the alumina, being held in solution by the water. I then draw this liquid off and boil it down dry, when the residue will be found to be the crude sulphate of potass.

The said thick precipitate (the alumina) is further washed with water, to free it from any little sulphate of potass that may remain therein, and is then placed in sacks or frames to drain and dry, which completes the production of the alumina.

This alumina can now be used for the manufacture of anhydrous chloride of aluminium, the metal aluminium, also for other purposes where a hydrate of alumina or oxide of alumina are now used.

The aforesaid liquid or hydrochloric acid may be drawn from the condensers, and be sold or used in the manufacture of colours in dyeing, printing, and for other similar purposes.

The sale of this bye product and the crude sulphate of potass will considerably reduce the cost of making the alumina. I estimate that I shall, by my improved process, reduce by nearly one-half the present cost of producing it.

Having thus fully described and ascertained the nature of my said invention and the method of performing the same, I hereby declare that I do not claim the mixture of carbonaceous matter with alum *per se*, being aware that, prior to my invention, such mixture has been used ; nor do I claim the jet of mixed steam and air *per se*, being aware that it has been applied to other uses, but never previously as *now applied*
to

A new or improved method of producing Alumina.

to vertical retorts for the production of alumina ; but what I do claim as my invention and desire to secure by the said Letters Patent is—

Firstly—Extracting the chief portion of the sulphur and ferric sulphate, and recovering the hydrochloric acid from the compound, while in a heated state, by means of a jet or jets of steam and atmospheric air combined, and the method of performing the same, substantially as described.

Secondly—The improved process, as a whole (except the parts disclaimed), of manufacturing alumina from alum or other sulphates of alumina or salts of alum, substantially as specified.

In witness whereof, I, the said James Webster, have hereunto set my hand and seal, this seventh day of December, in the year of our Lord one thousand eight hundred and eighty-one.

JAMES WEBSTER.

I hereby certify the preceding to be a correct copy of the specification No. 2,580, dated June 14th, 1881 ; also, of the accompanying copy thereof certified by Mr. C. J. Watts, Notary Public.

W. COOKE,

Patent Solicitor,

43, Southampton Buildings, London, W.C.,

13 December, 1881.

This is the copy specification referred to in the annexed Letters of Registration granted to James Webster, this twenty-second day of May, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 4 April, 1882.

The application of Mr. James Webster for Letters of Registration for "A new or improved method for producing Alumina suitable for the manufacture of Aluminium" 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.,

CHAS. WATTS.

A. LEIBIUS.

The Under Secretary of Justice.



A.D. 1882, 22nd May. No. 1076.

THE COMBINED WATER-JET VAPOUR EXHAUSTER AND CONDENSER.

LETTERS OF REGISTRATION to Louis Carnegy Auldjo, for an Invention entitled "The Combined Water-jet Vapour Exhauster and Condenser."

[Registered on the 23rd day of May, 1882, 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 CARNEGIE AULDJO, 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 "The Combined Water-jet Vapour Exhauster and Condenser," 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 Carnegy Auldjo, 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 Carnegy Auldjo, 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 Carnegy Auldjo 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 May, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

The Combined Water-jet Vapour Exhauster and Condenser.

SPECIFICATION.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, LOUIS CARNEGÝ AULDJO, of Sydney, New South Wales, 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 of, exercise, and vend, within the Colony of New South Wales and its Dependencies, an invention known as "The Combined Water-jet Vapour Exhauster and Condenser"; 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 hereafter 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:—

NATURE OF THE INVENTION.

My invention relates to Exhausters and Condensers applied to vacuum pans, stills, kettles, and other similar vessels from which vapour may be exhausted and condensed.

ARRANGEMENT OF THE INVENTION.

One arrangement of my invention (hereafter known as arrangement No. 1) consists in the application of a cylindrical vessel, in which are placed one or more hollow conical nozzles, to a vacuum pan or pans, or other similar vessels, to work in conjunction with a steam pump or pumps, either directly or indirectly, by the introduction of an intermediate reservoir or tank, a steam-engine or engines, or one or a number of both. I inject two or more jets of water into the cylindrical vessel, and I also exhaust the steam from the steam pump or pumps, steam-engine or engines, which may be used in conjunction with my invention, into the same cylindrical vessel, and condense the said steam, thereby more effectively exhausting and condensing the vapour generated in the vacuum pan or pans, or other similar vessels, as well as working more economically and effectively any steam pump or pumps, steam-engine or engines, which may be employed in conjunction with my invention. I discharge the water injected into the cylindrical vessel, also the steam and vapour condensed in the same, into a well or other receiver.

Another arrangement of my invention (hereafter known as arrangement No. 2) consists in the application of a cylindrical vessel, in which are placed one or more hollow conical nozzles, to a vacuum pan or pans, or other similar vessels. The principle of this arrangement is similar to that employed in arrangement No. 1, but with this difference, that is to say, I do not employ my invention in conjunction with a steam pump or pumps, steam-engine or engines, but simply inject a jet or jets of water, and this, by the use of any description of pump or pumps whatsoever, either directly or indirectly, by the introduction of an intermediate reservoir or tank, or by a natural head of water. The subsequent exhausting and condensing of the vapour in this arrangement is performed as in arrangement No. 1.

DESCRIPTION OF DRAWINGS.

Accompanying drawings (one sheet) more particularly refer to arrangement No. 1.

Figure 1 is a longitudinal elevation	} of my invention.
" 2 " " " section	
" 3 " " plan	
" 4 " " sectional plan	

The same letters are used for like parts throughout.

A, opening to vacuum pan or other similar vessels. B, opening to exhaust steam from steam pumps or engines. C and D, opening to water-jets. E, opening to well or other receiver. F¹ and F², condensing nozzles.

ACTION OF THE INVENTION.

The action of my invention will be understood by reference to figure 2, and is as follows:—

Two jets of water enter respectively at C and D, and are carried round the annular spaces G G and H H, which surround the nozzles F¹ and F², and then pass through the openings L L and M M. The exhaust steam from the steam pump or pumps, steam-engine or engines, enters at B and passes through the nozzle F¹, which being kept cool by the water surrounding it at G G, partially condenses the steam, forming a vacuum, which causes the water at G G to rush down through the opening at L L with increased speed into the contracting nozzle I. The remaining steam at the same time passes down into the hollow cone of water thus formed, and becomes completely condensed. This jet of water now rushes into the chamber X, into which also the vapour from the vacuum pan or other similar vessel is being exhausted through A. This vapour surrounding the nozzle I, which is kept comparatively cool by the water passing through it, becomes partially condensed and rushes down through the hollow cone F², along with the water discharged at I. This cone being kept cool by the water surrounding it at H H, further condenses the remaining steam or vapour. The water from H H rushing through the opening at M M to fill the vacuum thus formed, meets the vapour and water at J, through which they lead into the widening nozzle, and are finally discharged at E.

The action of my invention under arrangement No. 2 is precisely similar to the foregoing, excepting that the steam from a steam pump or pumps, steam-engine or engines, is not exhausted into the cylindrical vessel; the number of jets of water being determined according to the quantity of vapour to be exhausted and condensed from the vacuum pan or pans, or other similar vessels.

The nozzles F¹ and F², instead of being fixed as shown in figure 2, may be made movable, so as they can be operated on by a lever, screw, or other mechanical motion from the outside, for the purpose of regulating the flow of the water jets, and also for removing any sediment or other obstacle which may be deposited in the annular spaces G G and H H.

Having

The Combined Water-jet Vapour Exhauster and Condenser.

Having now particularly described and ascertained the nature of my invention, and in what manner the same is to be performed or carried out in practice, I hereby wish it to be distinctly understood that it is not necessary, for the successful working of my invention, that the openings A, B, C, D, and E should bear the same relative positions to each other that are shown in the accompanying drawings, nor is it necessary that any portion of my invention should be exactly in position, size, or shape to those shown in accompanying drawings, nor that any particular material be employed in the construction of my invention. I also hereby declare that I claim the invention of "The Combined Water-jet Vapour Exhauster and Condenser," for application to a vacuum pan or pans, or other similar vessels, substantially as hereinbefore set forth and described, wherein the following are important points or features, that is to say—

Firstly—The general arrangement of the exhauster and condenser, substantially as hereinbefore described, or any mere modification thereof.

Secondly—Its application to a vacuum pan or pans, or other similar vessels, for the purpose of exhausting and condensing the vapour which may be generated in said vessels, substantially as hereinbefore described, or any mere modification thereof.

Thirdly—The condensing of the exhaust steam from steam pump or pumps, steam-engine or engines—which may be in use in the same establishment as a vacuum pan or pans, or other similar vessels—by the aid of my combined exhauster and condenser, thereby working the said steam pump or pumps, steam-engine or engines, more efficiently and economically than were they exhausting into the atmosphere, and also effecting condensation much more cheaply than by a separate condenser and air-pump.

Fourthly—The successful exhausting and condensing of vapour generated in a vacuum pan or pans, or other similar vessels, without the assistance and employment of an air-pump.

Fifthly—The successful exhausting and condensing of vapour generated in a vacuum pan or pans, or other similar vessels, without the aid of steam taken directly from a steam boiler or boilers.

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 hereinbefore described to be a new invention, as to the public use and exercise thereof; and I do not know or believe that any other person or persons than myself is or are the true and first inventors of the said invention, and that I will not deposit these presents at the office of the Registrar-General with any such knowledge or believe as last aforesaid.

L. C. AULDJO.

This is the specification referred to in the annexed Letters of Registration granted to Louis Carnegy Auldjo, this twenty-second day of May, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

We do ourselves the honor to report, in reply to your blank cover communication of the 23rd ultimo, No. 4,091, transmitting Mr. Louis Carnegy Auldjo's application for the registration of "An invention of an apparatus for the exhausting and condensing of vapour generated in vacuum pans, &c." that we are of opinion the prayer of the Petitioner may be granted, in terms of Mr. L. C. Auldjo's specification, drawings, and claim.

The Under Secretary of Justice.

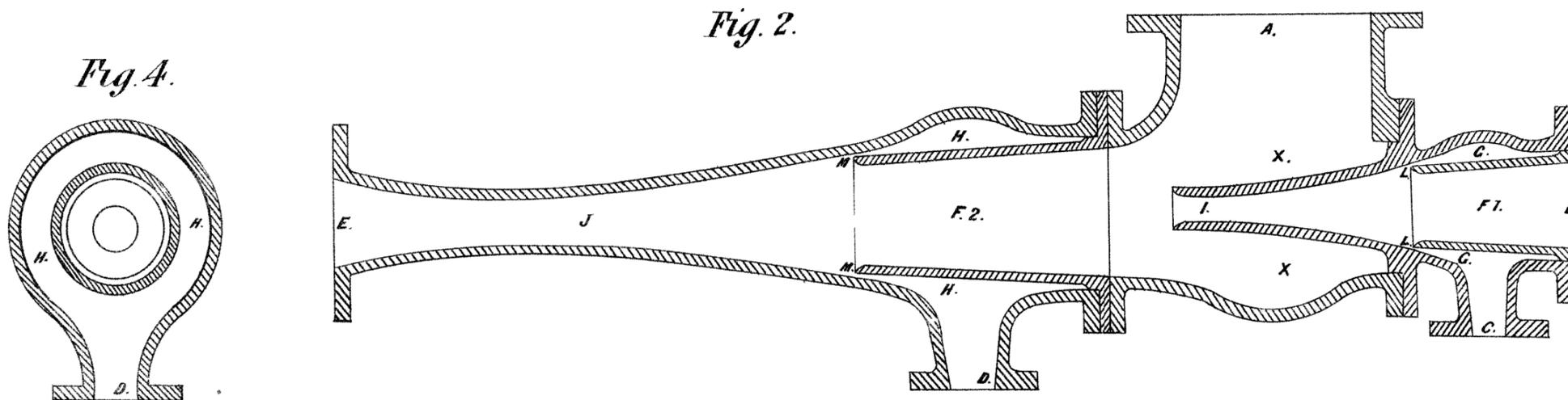
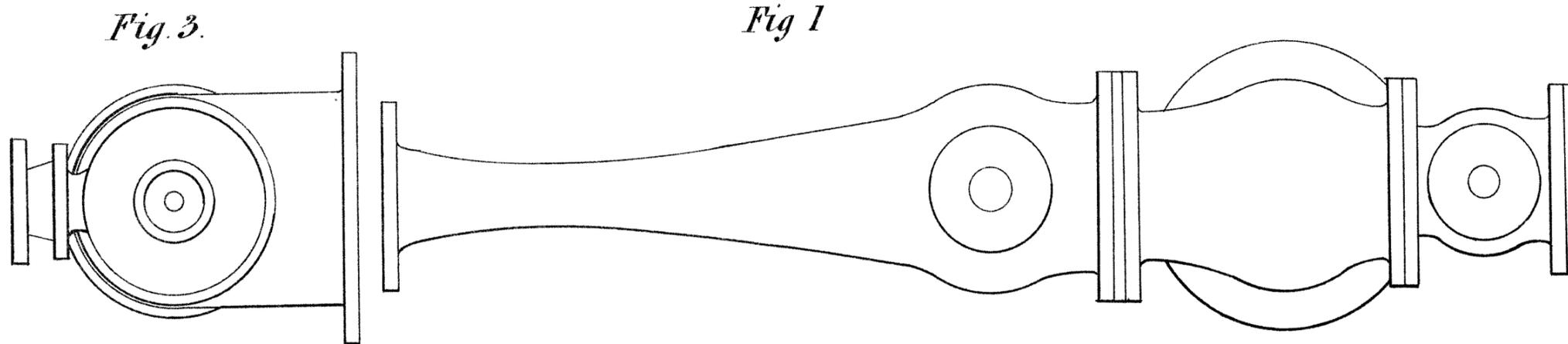
Sydney, 6th April, 1882.

We have, &c.,

E. C. CRACKNELL.
GOTHER K. MANN.

[Drawings—one sheet.]

THE COMBINED WATER-JET VAPOR EXHAUSTER & CONDENSER.



This is the Sheet of Drawings referred to in the annexed Letters of Registration granted to Louis Carnegy Auldjo, this twenty second day of May, AD 1882.

Augustus Loftus.



A.D. 1882, 22 *May*. No. 1077.

IMPROVEMENT IN THE MANUFACTURE OF CONCRETE MATERIALS, &c.

LETTERS OF REGISTRATION to James Sykes Wethered, for an Improvement in the manufacture of Concrete Materials, and in blocks made thereof, for paving, building, and similar purposes.

[Registered on the 23rd day of May, 1882, 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 SYKES WETHERED, of the city and State of New York, United States of America, 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 entitled "An Improvement in the manufacture of Concrete Materials, and in blocks made thereof, for paving, building, and similar purposes," 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 James Sykes Wethered, 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 Sykes Wethered, 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 Sykes Wethered 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 May, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvement in the manufacture of Concrete Materials, &c.

COMPLETE SPECIFICATION of Improvement in the manufacture of Concrete Materials, and in blocks made thereof, for paving, building, and similar purposes, invented by JAMES SYKES WETHERED, of the city and State of New York, America.

TO ALL TO WHOM IT MAY CONCERN: BE it known that I, James Sykes Wethered, of the city and State of New York, United States of America, have invented certain Improvements in the manufacture of Concrete Materials, and in blocks made thereof, for paving, building, and similar purposes; and I hereby declare the following to be a full, clear, and exact description thereof.

This invention relates to the manufacture of concrete materials, and to the formation and treatment of pressed or moulded blocks thereof, for road pavements, submarine or exposed walls for fortifications, and for other like purposes.

Concrete materials for paving purposes composed of limestone or calcareous matter and asphalt have long been known, and these substances have also been used in combination with various other substances for the same purpose.

Concrete mixtures of various kinds have also been formed into blocks in a mould under pressure, for the purpose of being afterwards laid as a road pavement.

This invention relates to improvements hereinafter described, in the process of which a concrete mixture composed wholly or partially of furnace slag, limestone, or other calcareous material, and asphalt, is prepared, and in the treatment of paving or other blocks made from such concrete after they have been moulded under pressure.

It is to be understood that the material of which this improved concrete is to be composed may comprise any ingredients in any preferred proportions, so long as furnace slag, limestone, or other calcareous substance and asphalt are employed in the composition.

An excellent concrete, for example, may be made of the following ingredients, namely:—Eighty parts of furnace slag or limestone, suitably crushed or granulated, and twenty parts of asphalt tempered with mineral oil. The proportion of the oil to the asphalt will depend upon the richness of the latter, but in general should be from 8 to 10 per cent.

In order that the furnace slag, limestone, or other calcareous matter and asphalt may combine completely, and the latter be absorbed by the former to the fullest extent practicable, it is necessary to heat the calcareous matter to a high degree after it has been suitably crushed or granulated, and before it is mixed with the heated asphalt; and the said invention partly consists in so heating the calcareous matter.

The degree of heat should be more than enough to merely effect the drying of the material; it should be sufficient not only to drive off all the moisture and carbonic acid which the material contains, but to open the pores, and so expand the material as to enable the heated asphalt to readily permeate the substance and become thoroughly incorporated with it.

By "heating the calcareous matter," in this specification, is meant applying to the crushed furnace slag, limestone, or other calcareous matter, before it is combined with the melted asphalt, a degree of heat above that which is sufficient to expel the moisture it contains, and within that which is sufficient to calcine limestone. For heating the calcareous matter, an oven of common and well-known construction, or either of the many varieties of furnaces for roasting ores, may be employed. After the crushed furnace slag, limestone, or other calcareous material has been heated as described, it is, while in its highly heated state, to be mixed with the heated asphalt and with the other ingredients which are to compose the concrete, in any suitable apparatus used for mixing concretes. A horizontal cylinder of iron, mounted in bearings, and made to revolve around a shaft furnished with radially projecting arms for mixing the mass, will furnish a simple and effective apparatus for the purpose; and it will be found advantageous to apply heat to said revolving cylinder while the process of tumbling and mixing the material is going on. The concrete having been so prepared, is now in proper condition to be spread as a side-walk pavement and rolled smooth. For paving road beds it is necessary that the concrete material prepared as above described should be condensed under heavy pressure, while in a mould, into the form of blocks. This operation should be performed while the concrete is still hot, as thereby the block is rendered more homogeneous and the particles composing it more thoroughly compact. When however the block, in a highly heated condition, is expelled from the mould by the discharging-plunger of the compressing machine it often happens that it will crumble, and to avoid this injury time must be allowed for the mass to become set before it is removed. This delay interferes with the economy of the manufacture, and therefore this part of the said improved process consists in subjecting the heated block, after it has been moulded and compressed, to the chilling effect of cold water applied to its surface. The treatment is best performed at the instant that the block is raised out of the mould, or as soon as possible after it has been deposited upon the endless apron or conveyer for removing it from the machine. The water may, however, be applied to the block while it still remains in the mould, or the mould itself may be chilled by means of a circulating stream of cold water. The effect of this chilling process is to harden the exterior surface of the moulded block, so that it will preserve its form and integrity during the subsequent handling of it. Compressed blocks, the material of which has been prepared, and which blocks have been moulded as above described, are not only valuable for paving road-beds; but possess great utility as an artificial material for the construction of submarine or exposed sea walls or for other building purposes. Experiments too have shown that compressed blocks of this character can be used for the walls of fortifications with great advantage in comparison with natural stone. They are enabled, from their great density, to sustain, without any greater injury than indentation to a limited extent, the impact of heavy projectiles, while their peculiar toughness and slight elasticity prevent injury from splintering or fracturing.

Having thus fully described the said invention and the manner of performing the same, I wish it understood that I claim—

First—The improvement in the manufacture of concrete, containing among its ingredients limestone or other calcareous matter and asphalt, which improvement consists in heating the calcareous substances to a high degree before mixing the same with the asphalt, and mixing these two ingredients while they are both highly heated, as above specified.

Second—

Improvement in the manufacture of Concrete Materials, &c.

Second—The improvement in the manufacture of compressed concrete blocks, which are moulded and condensed by pressure while hot, which improvement consists in chilling the surface of the compressed block, while it is in or as it comes from the mould, by the application of water to the block, as hereinbefore specified.

In witness whereof, I, the said James Sykes Wethered, have hereunto set my hand and seal, this twenty-third day of March, A.D. 1882.

JAMES SYKES WETHERED,
(By his lawful Attorney, W. B. M'CLURE).

This is the specification referred to in the annexed Letters of Registration granted to James Sykes Wethered, this 22nd day of May, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Having examined the specification accompanying the Petition, we have the honor to recommend that Letters of Registration should be issued to Mr. James Sykes Wethered, for an invention entitled "An Improvement in the manufacture of Concrete Materials, and in blocks made thereof, for paving, building, and similar purposes," as described in the specification attached to his Petition.

We have, &c.,

E. O. MORIARTY.
JOHN WHITTON.

The Under Secretary of Justice.



A.D. 1882, 22nd May. No. 1078.

**A MACHINE FOR MOULDING AND COMPRESSING ARTIFICIAL BLOCKS
OR BRICKS.**

LETTERS OF REGISTRATION to Alfred Walker, for a Machine for moulding
and compressing artificial Blocks or Bricks.

[Registered on the 23rd day of May, 1882, 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 WALKER, of Sing Sing, 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 improve-
ment in manufactures, that is to say, of an invention entitled "A Machine for moulding and compressing
artificial Blocks or Bricks," 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 Alfred Walker, 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 Alfred Walker, 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 Alfred Walker 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 twenty-second day of May, in the year of our
Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

A Machine for moulding and compressing artificial Blocks or Bricks.

A.

SPECIFICATION forming part of Letters Patent No. 226,256, dated April 6, 1880, ALFRED WALKER, of Sing Sing, assignor to JAMES P. ROBINSON, Trustee, of New York, "Machine for moulding and compressing artificial Blocks or Bricks."

TO ALL WHOM IT MAY CONCERN: Be it known that I, ALFRED WALKER, of Sing Sing, County of Westchester and State of New York, have invented certain new and useful improvements in machines for moulding and compressing artificial blocks or bricks, for pavements or building purposes, from granular material such as concrete, a mixture of sand or broken stone, and asphaltum, &c.; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the annexed drawings, in which figure 1, sheet 1, represents a side view of a machine embodying my improvements; figure 2, sheet 2, is a vertical central section of the same; figure 3, sheet 2, is a detail view, partly in section; figure 4, sheet 3, is a rear view of the machine; figure 5 is a detail view of the same. Similar letters of reference in the several figures indicate the same part.

This invention has for its object to improve the construction of machines for moulding and compressing artificial blocks or bricks for paving purposes, or for use in the construction of buildings; and it consists in certain novel details of construction and combinations of parts, which I will now proceed to particularly describe.

Referring to the drawings, H H are pillars supporting a plate, B, which is provided with an opening, C, the length and width of the latter being of the exact size of the block or brick to be manufactured, and admitting the passage of the plunger D. A head block, E, is placed on top of plate B, and is so arranged as to slide horizontally between two projecting pieces, *b b'*, of plate B. Said head block E is also provided with an opening, C', of the same dimensions as opening C.

By an oscillating movement of double-armed levers, F, the head block E may be shifted in such a manner as to occupy three different positions successively. In the first position its opening C' forms a continuation of C in plate B, to allow of the filling of opening C with the concrete or other material employed. In the second position its end (designated *p* in the drawings) covers the opening C, in order to interrupt communication between C and C', and to allow the material in opening C to be compressed by the plunger D; and in the third position its end *p* is entirely moved off of opening C, so as to permit the compressed block or brick to ascend to the upper level of plate B, and to be removed by the head block E as the latter slides to its first position, that is to say, into the position where its opening C' registers with opening C. In order to produce these three successive movements, the head block E is fastened to one end of the double-armed lever F. The lever F is made fast by means of the shaft *a* and the brackets *d d'* to a pair of pillars, AA. The other end of the lever F (see figs. 3 and 5) is provided with pins, *e e*, carrying friction rollers, *m*. Two brackets, *f f*, also fastened to AA, support the shaft *g*, which has gear wheels on its extremities. Fastened to the inner side of the wheel G is a cam, provided with three cam surfaces, *h, i, k*, arranged in such a manner as to produce eccentric motion whenever the wheels G G' are rotated. The friction-rollers *m m'* coming in contact with these cam surfaces *h i k*, and yielding to their different eccentric positions, will cause the sliding movements of head block E in the following manner:—As shown in figs. 2 and 3, the roller *e* encounters the outside of cam surface *h*; as soon as wheel G is rotated in the direction as indicated by the arrow, the roller *m* will follow the course of the cam surface; the cam surface *h* being eccentric toward the left, the upper arm of lever F will be thrown in the opposite direction and carry with it the head block E, by which motion the second position above described is attained. In further rotating the wheel G the roller *m* will meet the cam surface *i*, which being still more eccentric will carry the head block E further toward the right, leaving the opening C in plate B free from the end *p* of head block E, and placing the head block E in the third position. On meeting the third cam surface, *K*, the roller *m* will follow the under side of the same, and thereby nearing the centre will be carried toward the right, and consequently the head block E will be shifted toward the left and attain the first position, leaving openings C and C' communicating with each other, as indicated in fig. 3, sheet 2. The wheel G' is provided with a cam groove similar to the cam surfaces above described, and in this groove works the roller *m'* on the pin *e'*, carried by the other lever F. The time occupied in traversing the distance between the different cam surfaces, and while the block E is not in motion, is utilized in such manner that the distance between *K* and *h* will allow for the filling of opening C with concrete, &c., the distance between *h* and *i* will allow for compressing this material by the plunger D, and the distance between *i* and *K* will allow for the compressed block or brick to be raised to the level of plate B by the further movement of the plunger D.

The operation of compressing the material for the construction of bricks, paving blocks, &c., is performed by means of the plunger D within the opening C, operated upon by compound levers I and I', which latter follow the movements of a cam, J. Fastened to the centre of the shaft *g*, which carries wheels G G', is the cam J. The compound lever I and I' has a movable joint, O (see fig. 1, sheet 1), and having its fulcrum at *n*. Near its joint O it carries a friction-roller, *r*, which following the course of the cam J produces a vertical movement of the knob *q*, fastened to one end of lever I. The lower end of plunger D being so formed as to correspond in shape with the knob *q*, the plunger will be slowly pushed upward whenever the friction-roller *r* follows that course of the cam J which is indicated by S, S', S², fig. 2. This upward movement of plunger D acting on the material is sufficient to give to the latter the necessary density and shape required. When the most eccentric portion S² of the cam J in its revolution reaches the roller *r* the compound lever I I' is straightened to a vertical position, and then continued slightly beyond a vertical position, so as to relieve the pressure on head block E, as shown in fig. 1. As soon as said portion S² has passed said roller, the compound lever I I' is returned to its former bent position (see fig. 2) by means of a spring, *u*, the lower end of which is rigid, and the free end is curved so as to bear against the lever I', as shown. In the lower part of the brackets *d d'* is a shaft, *l*, which carries one end of a lever, K, and forms the fulcrum thereof. The other end of the lever K is connected by a rod, H, with the lower portion of the plunger D,

by

A Machine for moulding and compressing artificial Blocks or Bricks.

by means of a bolt and lugs, H^2 . Between the two ends of the lever K , and near the end to which the rod H is connected, are two friction-rollers, $L L^1$, which straddle the cam J , and engage with the two cam surfaces J^2 arranged on each side of the cam J . Before the cam J releases the compound lever $I I^1$, as just above described, the rollers $L L^1$ are engaged by the cams J^2 , by which means the lever K is raised, and through the connecting rod H elevates the plunger D until its upper surface is level with the upper surface of plate B . When the most eccentric portion, S^2 , of the cam J^2 has passed the rollers $L L^1$, the lever K , rod H , and plunger D drop of their own weight or some mechanical device, and leave the opening C free for the reception of another charge of the plastic material. In order to render the compressing action of the compound lever $I I^1$ slightly yielding, in case more material shall have been admitted into opening C than is necessary for the making of one brick or block, or in case the material is in such a state as to cause more resistance than usual in compressing it, or in order to overcome this increased resistance, the fulcrum n of lever I^1 is connected to and rests on a lever, M , near the fulcrum thereof, which fulcrum is at one end of said lever. The other end of said lever M rests upon a nest of springs, O , provided with a follower, P . The tension of the springs may be regulated by a set-screw, O^2 , passing through the lever M and bearing upon the follower P , and the upward play of the lever M may be regulated by a screw-bolt, P^2 , passing through the base-plate R and the lever M , and carrying a nut on the upper side of said lever. The upper end of the lever I is provided with two pins or studs extending from it in opposite directions, and working in guide slots, t , in the framework of the machine. The plunger D is also provided with similar projections working in said slots, for the purpose of guiding it in its vertical motion.

For regulating the quantity of material admitted into the opening C and the density of the mass after being compressed, I employ devices arranged and operating as follows:—On the plunger D on the side opposite the rod H is a lug, h^2 , through which passes a rod or bolt, T , having a head, t^2 , on its lower end, and a screw-thread on its upper portion, which screw-thread engages with a female thread in a tap hole in the under side of the plate B . The rod or bolt T has feathered to it a worm-wheel, t^3 , which is engaged by a worm, v , on a shaft, V , having its bearings in the frame of the machine, and is provided with a head or knob, v^2 , for turning it. When the plunger D descends, its lowest point is determined by the lug h^2 resting on the head t^2 . By turning the worm-shaft V , and thus through the worm v and worm-wheel t^3 imparting a rotary motion to rod or bolt T , said rod or bolt is screwed into or out of the tap hole in the plate B , and consequently the point occupied by the head t^2 is made higher or lower, so as to either diminish or increase the depth of the space between the top of the plunger and the top surface of the plate B , or in other words the depth of the opening C when the plunger is down. As the top of the plunger in its upward movement or stroke is always the same, the bricks or blocks will always be of the same size, but their density will vary according to the quantity of material, as a greater quantity will be more closely compressed than a lesser quantity. When the plunger D is at its lowest point, the opening C in the plate B , the opening C^1 in the head block E , and the tube or mouth of the hopper which supplies the material, are all in line with each other, and the material therein forms a continuous column.

In each case it is desirable to separate the material in the opening C from the material above it before the head block begins to move back to allow the material to be compressed into a block or brick, because it is desirable that the bricks or blocks should be not only of the same dimensions, but also of exactly the same density in all cases, and this result can only be accomplished by having the mould filled accurately each time, which has been found impossible heretofore. In my invention this result is positively insured by means of cut-off devices constructed and operating as follows:—In the two levers $F F^1$, just above their fulcra, a rock shaft, W , has its bearings. This rock shaft carries an arm, W^2 , projecting upward, and two arms, $W^3 W^4$, projecting downward, said arms being rigidly attached to said rock shaft. The upper arm W^2 carries at its upper end a ball, which engages with a socket, x , in the rear end of a knife, X , which is arranged to slide between the upper surface of the plate B and the lower surface of the block E . The lower arms, $W^3 W^4$, are provided with friction-rollers, and are attached near the ends of the shaft W , while the upper arm W^2 is about midway between them. The arm W^3 is engaged by a projection, g^3 , on the wheel G , and the arm W^4 engages with a projection, g^4 , on the wheel G .

When the plunger D is at its lowest point, and the opening C has received the material for a brick or block, as the wheel G revolves the projection g^3 strikes the lower end of the arm W^3 , and through the rock-shaft W^1 and arm W^2 forces the knife X forward so as to cut off the material on a level with the top surface of the plate B . The knife is held in its position by the engagement of the projection g^4 on the wheel G^1 until the head block E moves back so as to cover the opening C , and is then drawn further back so as to clear the opening C^1 , in which position it remains until ready for another forward movement. After the material has been compressed the head block E moves still further back, until the end p is clear of the opening C , whereupon the plunger D rises and elevates the compressed brick to the level of the plate B . The head block E then moves forward, and pushes the brick or block to the position illustrated in fig. 2. In machines heretofore constructed, the material in the mould has been separated from that above it simply by the horizontal movement of the head block, by which movement the material is scraped from the top of the mould in such manner as to leave its top surface rough and uneven, and by no means uniform in all cases. Such process simply tears or pulls one portion of the plastic mass away from the other portion. In some cases stones, pebbles, and other solid particles are pressed into the lower portion of the mass, and in other cases they are torn away from said portion; so that also the bricks or blocks may all be of the same length, breadth, and thickness, yet they will not be of the same density.

In my invention the knife X divides the mass into two portions before the head block begins to move at all. It works with a cutting movement instead of a scraping or tearing movement, making the divided surface smooth and even, and when the cut is completed the lower surface of the knife is exactly in line with the lower surface of the portion p of the head block E , so that when said head block and said knife move backward simultaneously as above-described a continuous smooth surface is presented to the top of the material in the mould or opening C .

Having

A Machine for moulding and compressing artificial Blocks or Bricks.

Having thus described my invention, what I claim and desire to secure by letters patent is—

1. In a machine for moulding and compressing artificial paving blocks or bricks, the combination with a mould-plate, a movable head block, and a compacting plunger, of the compound lever or toggle I I' and cam J, for moving forward the plunger to compress and compact the material into a block or brick, and the lever K, connecting rod H, and the said cam J, for further moving the plunger to eject the completed block or brick from the mould, substantially as described.
2. In a machine for moulding and compressing artificial paving blocks or bricks, the combination with the plunger D and compound lever or toggle I I' of the rotating cam J, so shaped as to force the said lever or toggle past its centre after completing the block or brick, and thus take off the pressure from the head block E and allow the latter to be readily moved aside without bending its guides, substantially as described.
3. The combination with the compound lever or toggle I I' and cam J of the spring *u* for throwing back the said lever or toggle to its original bent position after or while the completed block or brick is being ejected, substantially as described.
4. The combination with the plunger D, cam J, and compound lever or toggle I I' of the adjustable spring seated lever M, forming the bearing or support of the lower member of the compound lever or toggle, substantially as described for the purpose specified.
5. The combination with the sliding plunger D of the adjustable rod T, having the head *t* for limiting the backward movement of said plunger, and consequently determining the capacity of the mould and the amount of pressure to which the block or brick is to be subjected, substantially as described.
6. In a machine for moulding and compressing artificial paving blocks or bricks, the combination with a head block through which the material is fed to the opening in the mould plate, and against which the material is compressed and compacted, of an independent cut-off blade for severing the column of material flush with the top of the mould plate before the head block moves to cover the opening in the mould plate, substantially as described for the purpose specified.
7. The cut-off blade X, adapted to slide within a recess in the under side of the head block E, with its lower surface flush with the lower surface of the head block, so that when said cut-off blade and said block move back simultaneously a continuous smooth surface will be presented to the top of the material in the mould below, substantially as described for the purpose specified.
8. The combination with the cut-off blade X of the rock-shaft W, provided with arms, W² W³ W⁴, the wheel G having the projection *g*³, and the wheel G¹ having a similar projection, *g*⁴, and a rim or bearing for the arm, W⁴, substantially as described for the purpose specified.

ALFRED WALKER,
By his lawful Attorney,
W. B. M'CLURE.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to Alfred Walker, this twenty-second day of May, A.D. 1882.

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 Alfred Walker, for an invention entitled "A Machine for moulding or compressing artificial Blocks or Bricks," as shown in the drawing and described in the specification attached to his Petition.

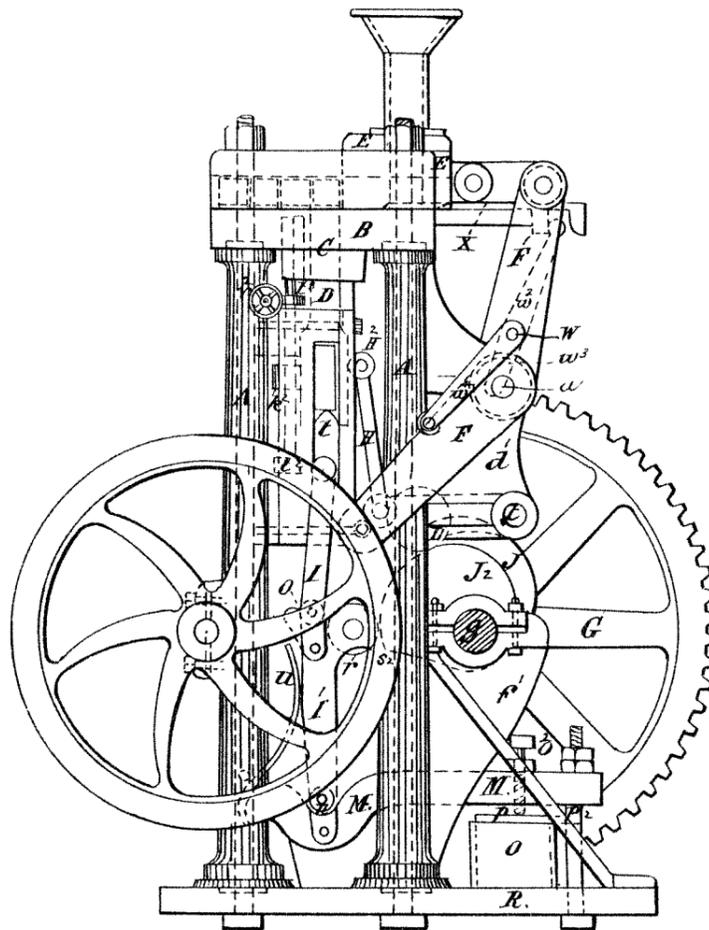
Sydney, 19/4/82.
We have, &c.,
E. O. MORIARTY.
JOHN WHITTON.

To The Under Secretary of Justice.

[Drawings—three sheets.]

A. WALKER.
MACHINE FOR MOULDING AND COMPRESSING ARTIFICIAL
BLOCKS OR BRICKS.

Fig. 1.



Witnesses

Henry Eschling
J. Robinson

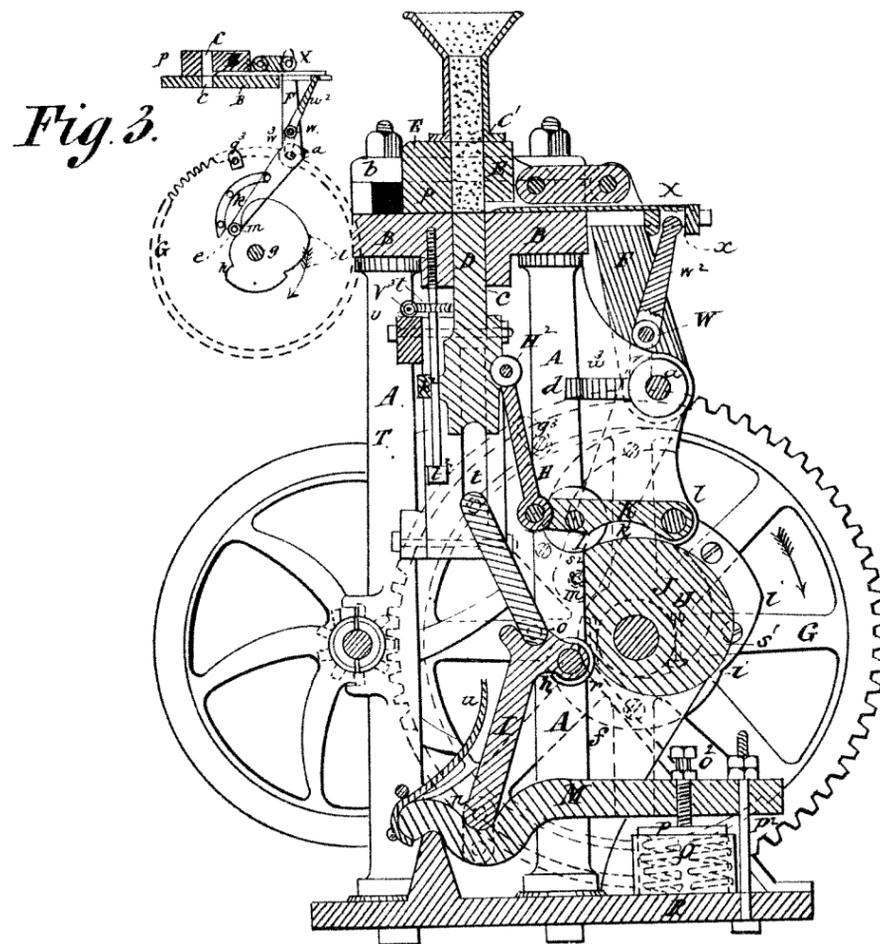
Inventor:
Alfred Walker.

*This is the Sheet of Drawings marked B. referred
to in the annexed Letters of Registration granted
to Alfred Walker, this twenty second day of May,
AD. 1882.*

Augustus Loftus.

A. WALKER.
 MACHINE FOR MOULDING AND COMPRESSING ARTIFICIAL
 BLOCKS OR BRICKS.

Fig. 2.



Witnesses:
Henry Eschling
J. P. Roberts

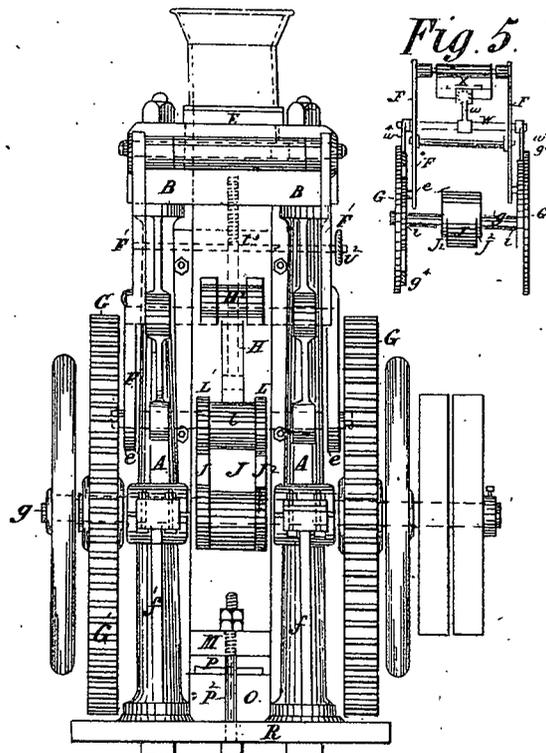
Inventor:
Alfred Walker

*This is the Sheet of Drawings marked C. referred
 to in the annexed Letters of Registration granted to
 Alfred Walker this twenty second day of May A. D. 1882.*

Augustus Loftus.

A. WALKER MACHINE FOR MOLDING AND COMPRESSING ARTIFICIAL BLOCKS OR BRICKS.

Fig. 4.



Witnesses:

Henry Cookington
L. R. Robinson

Inventor:

Alfred Walker

This is the Sheet of Drawings marked D. referred to in the annexed Letters of Registration granted to Alfred Walker; this twenty second day of May AD 1882.

Augustus Loftus.

(Sig. 875.-)



A.D. 1882, 8th June. No. 1079.

IMPROVEMENTS IN TELEPHONIC AND TELEGRAPHIC SIGNALLING APPARATUS.

LETTERS OF REGISTRATION to Alfred Charles Brown and Henry Alfred Charles Saunders, for Improvements in Telephonic and Telegraphic Signalling Apparatus.

[Registered on the 8th day of June, 1882, 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 CHARLES BROWN and HENRY ALFRED CHARLES SAUNDERS, both of 66, Old Broad-street, in the city of London, 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 Telephonic and Telegraphic Signalling Apparatus," which is more particularly described in the amended 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 Charles Brown and Henry Alfred Charles Saunders, 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 Charles Brown and Henry Alfred Charles Saunders, 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 Charles Brown and Henry Alfred Charles Saunders 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 June, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Telephonic and Telegraphic Signalling Apparatus.

SPECIFICATION of ALFRED CHARLES BROWN and HENRY ALFRED CHARLES SAUNDERS, both of 66, Old Broad-street, in the city of London, England, for an invention entitled "Improvements in Telephonic and Telegraphic Signalling Apparatus."

THE object of our invention is to facilitate the intercommunication between several telephone or telegraph stations on one and the same wire.

For this purpose we employ apparatus so arranged that not only can any station call up and place itself in direct communication with any other station on the same wire without having to go through a central office, but also so that none of the other stations can interrupt or hear what is passing between the two stations occupying the wire. And when telephonic apparatus is used, we so arrange the apparatus that upon the caller replacing the telephone upon the switch hook upon which the telephone is ordinarily suspended whilst out of use, his bell will commence to ring and continue ringing until he clears the line by bringing all the instruments back to their normal position, and also so that all the stations in circuit can see that the line is engaged, and also (by one method which we shall explain) which station has been called up.

We accomplish the above objects in the following manner:—Each subscriber has a set of instruments similar to those shown in figures 1, 2, 3, 4, 5, and 6, in which figure 1 is a front elevation of the call instrument or signal, including the locking mechanism for shutting out all stations except the caller and called stations, and preventing them from tapping.

Figure 2 is a side elevation of the same call instrument or signal.

Both of these figures are shown with the cover, carrying ringing buttons and dial, removed, but with their positions indicated by dotted lines. Figure 3 is a front elevation of the switch-bell transmitter which we use with the call instrument, with the door open to show the inside; figure 4 is a detailed drawing of the slotted disc used, together with the ringing spring movement; and figure 5 is a diagram of another form which may be used instead of the slotted disc and its accompanying mechanism.

The apparatus may be thus described, similar lettering being used throughout:—

In figure 1, A is a base board, on which is mounted a clock frame, B, carrying a coiled spring and train of wheels, which actuate a main arbor or axle, C. The clock-work is controlled by an electro-magnet, D, having a pivoted armature drawn off the magnet by an adjustable spring, *b*, and to which is attached a pallet working into and controlling a scape-wheel or arm, E, mounted on an arbor carrying a pinion which gears into a wheel on the main arbor C, the wheel and pinion being properly proportioned according to the number of stations the instruments are to control, giving a different position of the arbor for each station. The scape-wheel may be on the arbor C, but it is more convenient to have it on a separate axis, geared as described. In the drawing a scape-wheel with two arms or teeth is indicated.

Or we can use, instead of the above arrangement, a step-by-step motion, actuated directly by the armature of the electro-magnet without the aid of clock-work, and turning the main arbor C either directly or through the medium of gearing, the essential feature being simply that the arbor C shall be turned according to some fixed ratio of the number of attractions and cessations or reductions of attraction of the electro-magnet D on its armature, or of reversals of polarity, if a polarized arrangement be used; we can use any arrangement which shall do this. The electro-magnet D may be excited either by the line current direct or by a local current controlled by a relay in the line circuit. The main arbor C carries a hand or pointer, F, to indicate the numbers or signals of the respective stations on the dial G, also a combined slotted disc or locking plate, H, and a cam, I.

K is a ringing key, consisting of a spring, which is attached in any suitable way to the main frame-work, but electrically insulated therefrom; it is capable of being pressed by a plunger, *d*, which projects through the case, as indicated in the drawing. L is a cross spring normally bearing on and making contact with the end of the ringing spring K, and also electrically insulated from the main frame-work. The above-mentioned two springs with the disc H can be seen more clearly in the detail views, figure 4.

The compound slotted disc H is composed of two pieces of metal electrically insulated from one another, and the upper piece also from the arbor C. The width of the slot in this disc is so proportioned relatively to the width of the end of the ringing spring K, that when the hand or pointer stands at its normal zero position (hereinafter called its first open position) or midway between the highest number or last signal on the dial and its normal zero position (hereinafter called its second open position) the end of the spring K is capable of passing through the slot from one side of the disc to the other, but when the pointer is in any other position the end of the spring K is not capable of so passing through the slot, but is locked on the one or other side of the disc as it may be placed, and according to whether or not it was pressed through the slot when the hand or pointer started from its normal zero or first open position, and if it was so pressed through, it can only return to the upper side of the disc when the hand comes round to its second open position.

In figure 5 the place of the slotted disc is taken by a lever, H, pivoted at one end and pulled in one direction by a spring, its motion being limited by a pair of studs, *aa*. This lever is raised by a cam on the main arbor C, when the hand or pointer is in neither of its open positions, but freed by the cam and allowed to move over by the pull of the spring when the hand is in any other position. The end of the ringing spring K is capable of passing from one side to the other of the lever H, when the latter is lifted by the cam, but is not capable of so passing when the lever is not so lifted. Or the locking arrangement may consist of a slotted cylinder capable of allowing the ringing spring to pass from the outer to the inner side of the cylinder, or *vice versa*, when the hand is in either of its "open" positions, but not so allowing it to pass when the hand is in any other position.

It is evident that the above locking arrangement may be constructed in a variety of ways, so that a piece of solid material will allow another piece of solid material to pass from the one side to the other of the first piece when the hand or pointer is in either of its "open" positions, but will not so allow it to pass when the hand is in any other position but will then lock it on the one side or the other of the first piece, according as it was placed prior to the hand moving from its first open position and until the hand comes round to its second open position.

When

Improvements in Telephonic and Telegraphic Signalling Apparatus.

When the hand or pointer comes opposite to the number or signal denoting the station in which that particular instrument is placed, the end of the cam I, on arbor C, comes in contact with and slightly lifts the ends of two springs, lettered respectively N and O (see also figure 1^a), and in so doing lifts the upper one, N, out of contact with a screw stud, *c*, with which it normally makes contact when not lifted by the cam. The springs N and O are held by a piece of insulating material as indicated in the drawing, or attached in any other suitable manner.

The cam I, therefore, is placed at a different angle relatively to the hand or pointer in each instrument on the circuit.

Another spring, P, is secured to the main frame-work by an insulating attachment similarly to K and L, and is so placed that, when the ringing spring K is pressed, P is allowed to fall upon and make contact with a screw stud, *p*, in metallic connection with the main frame-work, but at other times is held out of contact with the stud *p* by means of the spring K, from which it is however insulated.

The internal connections of the call instrument or signal are as follows:—A wire leads the current from the terminal marked line 1 (or L¹) first to a screw connection, where it joins a wire from the lightning guard (this may be of any ordinary form), but consists in the instrument shown of three insulated wires twisted together and passed into a piece of tube; one end of each of these wires is then cut off short and the other ends are joined respectively to the wires leading from the line 1 of left-hand upper terminal, the earth or centre terminal, and the line 2 or right-hand terminal.

There is consequently no road whatever for the ordinary current through the guard, but should an intense lightning flash come along the line it will fuse the insulating covering off the wires and so take the short circuit afforded by their contact to go direct to earth.

From this point the wire from the L¹ terminal goes on through the coils of an electro-magnet D (or if a relay be used through the relay coils instead, the movement of the relay armature putting the local current on to the coils of D) to the ringing spring K, which is normally in contact with spring L. A wire then connects the spring L with the upper spring N, which is normally in contact with the screw stud *c*, from which another wire conveys the current to the terminal marked line 2 and secondary 2 (or L² and S²) calling on its way at the screw connection, where it joins the second wire from the lightning guard.

From the terminal marked local copper (or L.C.) a wire leads to the cross spring P and to the lower spring O of the pair of springs N O, and from the main frame-work B a wire leads to the terminal marked secondary 1 and transmitter copper (or S¹ and T.C.).

The switch bell transmitter, figure 3, is the one we prefer to use with our signal instrument, although others may be employed.

It consists of a transmitter, an induction coil, a switch hook, which may be of any ordinary form, and an ordinary trembling or vibrating bell for giving a continuous ring.

The connections are as follows:—

A wire leads from the terminal marked secondary No. 1 and transmitter copper (or S¹ and T.C.) to the end of the switch hook or to the pivot thereof, if a pivoted hook be used, and from thence on to one pole S of the secondary coil of the induction coil and to one pole of the bell coils respectively as shown.

From the other end S¹ of the secondary coil a wire leads to one of the pair of terminals T to which the telephone cord or cords are attached. From the other one of this pair of terminals T a wire leads first to the under stud of the switch hook (or that stud with which the hook makes contact when the telephone is hanging thereon) and thence to the terminal marked secondary 2 or S².

From the bell post or second electrical pole of the bell-actuating apparatus a wire leads first to the upper stud of the switch hook (or that stud with which the hook is in contact when the telephone is off the hook), and thence on to the lower hinge, as shown from the other side of this hinge, the wire goes on to the transmitter, and from the other side of the transmitter to the upper hinge. From the other side of the upper hinge a wire goes to one pole P of the primary coil of the induction coil, and from the other end P¹ of the primary coil a wire leads to the terminal marked local zinc (or L.Z.)

The switch bell transmitter is connected to the call instrument or signal by wires joining the terminals marked respectively S¹ and T.C. and S², on the switch bell transmitter, with the similarly lettered terminals on the call instrument as shown.

Points to be observed in figures 3 are:—1. The method of placing the ordinary carbon blocks and rods or Hughes microphones, as shown in the figure, so as to form an effective transmitter; and 2, that the bell, together with the primary coil and transmitter, are all placed in series in one circuit; also, that the action of the switch hook is to simply short-circuit the bell, and so cut out its resistance and stop its sounding when the telephone is taken off the hook, or to keep the telephone and secondary coils short-circuited, and so cut out their resistances when the telephone is hanging on the hook.

We also make a modification of the arrangement applicable to ordinary switch bell transmitters to telephones without reference to the call instrument or signal, viz., a modification by which an ordinary two-way switch hook is enabled to do the double work of shunting the line current and of making or breaking the local current for the transmitter, without requiring an extra set of contacts as in all previous arrangements.

For this purpose (see figure 7) we include the telephone and secondary coil of the induction coil in one and the same circuit as the bell coils, and use the motion of the switch hook to short-circuit the telephone and secondary coils when the telephone is on the hook and the latter in contact with stud or spring No. 1, or to break the above-mentioned short circuit and complete the battery circuit for the transmitter when the telephone is off the hook and the latter in contact with stud or spring No. 2.

Figure 7 shows a diagram of connection according to this arrangement.

Returning to our call instrument and special switch bell transmitter, the action of the whole is as follows:—

The various stations are connected up in series in one circuit as shown in figure 6 and worked preferably, but not essentially, on closed circuit, because then one strong line battery will work the whole circuit and supply all the instruments thereon as shown.

When the hands of all the instruments stand at zero, it is open to any subscriber to call any other by pressing his ringing plunger *d*. This presses spring K, figures 1, 2, and 4, through the slot in the disc and breaks

Improvements in Telephonic and Telegraphic Signalling Apparatus.

breaks its contact with spring L, thereby momentarily insulating the line. The armature of the electro-magnet D of every instrument therefore flies back and the apparatus at all the stations advances one step; then on the release of the plunger *d* spring K will come back and make contact with the back of the disc H, thereby again completing the line circuit. The armature of the electro-magnet D is therefore again attracted and the apparatus at all the stations advances another step. By therefore pressing the plunger *d* in and out, the calling subscriber can, by alternately insulating and joining up the line circuit, bring the apparatus at all the stations round to the number to which he wants to speak and there stop.

When in this position, the cam or arbor C in the instrument at the station so indicated, by making contact with and lifting spring N off its screw stud *c*, breaks the direct line circuit through that instrument and inserts the telephone and secondary coil of that station intermediate therein, and by making contact with spring O puts the local current on to the bell and transmitter together, so that the bell at that station will continue to ring until answered. The taking of the telephone off the hook by the receiving subscriber preparatory to calling "yes" through the transmitter will however short-circuit the bell coils and so stop the bell sounding, and at the same time concentrate the local current on to the transmitter.

It will be seen also that when the ringing spring K at the calling station was released after the first pressure of the plunger, it did not complete the line circuit directly in the same manner as it was made before the spring was pressed, but by making contact with the under side of the disc, which is in metallic connection by arbor C with the block frame, completes the line circuit now only through the telephone and secondary coils; the direct connection of spring K with spring L being now broken by the latter at this time simply resting on the upper or insulated side of the disc. As this consists of an insulated ring of metal, the rubbing of the metallic surfaces as the disc revolves will always keep the contacts of the spring clean. The telephone and secondary will, however, still be short-circuited so long as the telephone hangs on the hook, so that it is not necessary to ring through them, notwithstanding that the road through them is open at the first return stroke of the plunger; this short circuit is, however, broken by the caller taking the telephone off the hook preparatory to listening for receiver to reply by calling "yes"; and although the resistance of two telephones and secondaries is then thrown into the line circuit, yet since the armatures are all up against the electro-magnets D the weakened current is quite sufficient to hold them there. When the ringing spring K is pressed under the disc also it allows the lower cross spring P to drop sufficiently to make contact with its screw stud *p* in the main framework, and thereby puts the local current on to the bell and transmitter; the bell therefore rings until the caller takes the telephone off the hook, when it is stopped by being short-circuited and the current is then concentrated on to the transmitter.

When the telephone is hung up again, however, this short circuit is again broken and the bell again rings, thus giving the caller an unmistakable signal to clear the line should he tend to omit to do so. This he does by hanging up his telephone and again pressing the button in and out until the apparatus comes round to zero, when the ringing spring K will come up through the slot in the disc, and thus lift spring P out of contact with its screw stud and stop the bell by breaking the local circuit; also, by making contact of itself with spring L, it will again establish the line circuit directly, and so render the whole apparatus available for any other subscriber who may wish to use it. It will be seen that by the above means both the calling and the receiving subscribers had their telephonic apparatus put into proper condition for speaking to each other, but none of the other subscribers could have heard anything, in consequence of the cams in their instruments not having put their telephones in circuit, and it is impossible for them to produce any effect whatever (except to ring their own bells) by pressing their buttons, in consequence of the slots in the discs having revolved out of position to allow of spring K being pressed through; it can, therefore, now only rest on the top of the disc and put a little pressure thereon, the friction resulting from which the coiled spring is sufficient to overcome, and spring K cannot, therefore, now by any ordinary means be made to break contact with spring L, and consequently the line circuit cannot be affected in any way whatever by any subscriber but the caller until the latter brings the apparatus back to its normal zero position.

The ordinary adjusting screw of the bell mechanism is also let out a little, so that the hammers require to make three or four vibrations before striking the bells.

The latter, therefore, are not sounded by the short momentary completion of the local circuit by the cams, as the pointer at each station in time passes the number or signal denoting that particular station, but will only be rung at that station at whose number or signal the caller allows the pointer to stop or remain.

The above is a complete description of the apparatus as used for connecting up a number (say twelve) private stations with one another.

One of the stations may, however, if desired be a central office or exchange, and the apparatus can then be arranged so that any subscriber on this circuit can be plugged through or connected to any other subscriber on the exchange system, whether or not he be on a similar or dissimilar system to our own, or brought on to the exchange by any other system whatsoever.

To do this we make use of an arrangement which permits of our line being earthed or grounded at each end while still establishing speaking communication with any branch line with which the exchange may connect it, and that without making any electrical contact with the said branch line, or in any way altering the resistance of our main lines and set of apparatus by the connection.

We accomplish this by simply inserting in our apparatus at the exchange, in place of the telephone and secondary, one coil of a special induction coil having two coils of about equal resistances, as shown in figure 8. The second coil of the induction coil then communicates the one end with earth and the other end with the branch line over which it is desired to establish communication. The resistance of our line is evidently, therefore, not affected by the connection, since the two coils are insulated from one another, while the inductive effect of the one on the other establishes effective speaking communication between them.

All the exchange has to do, therefore, when a subscriber on our system calls up, is to call the attention of the subscriber on the branch line, "wanted," and connect the said branch line to the wire leading from the end of the second coil of our induction coil, the same as they would connect two branch lines together in the ordinary manner, or *vice versa*.

The speaking instruments of the central office itself may be intermediate in this branch circuit or in the main line circuit itself as desired.

The

Improvements in Telephonic and Telegraphic Signalling Apparatus.

The slotted disc H, figure 1, and springs K, L, and P can be abolished altogether at the central office when desirable, and the central is then allowed to call with an ordinary make and break key, so that their calling and speaking apparatus may be always in-circuit.

For use with telegraphs, we insert the telegraphic transmitter and receiver in place of the secondary and telephone described above, an ordinary switch shunting the local circuit on or off the call bell and short-circuiting, or in short-circuiting the telegraph instrument in a manner similar to the switch hook described above for use with telephones.

In the case of a Morse telegraph we adjust the hauling-off spring of the armatures so that the latter may not be attracted by the ordinary permanent current required to work the clocks (figures 1 and 2), but are affected by the additional battery current put on by the transmitter key.

For ABC, step-by-step, or polarized magnet telegraphs, we adjust the receivers so that the polarization in one direction caused by our line current is neutralized, or nearly so, by a permanent or electro-magnet, so that the receivers may be free to work the same as if no permanent current were on the line.

And generally, our call and locking apparatus is applicable to any form of telegraph in which the effects of our permanent current can be balanced or eliminated, and which do not produce any momentary insulations of the line; or we may work on open circuit, and by a relay may, as is well understood, so arrange that currents in the one direction or of a certain intensity may affect the call instrument or signal, while those in the opposite direction or of different intensity may affect only the telegraphic apparatus put into circuit by that call instrument or signal.

For working on open circuit we apply a ringing battery at each end of the line, with one pole connected to earth and the other pole connected to line, taking care that the pole which is connected to line be the same in each battery, so that the batteries are opposed to each other and no sensible current passes.

We then apply in our signal instruments a contact stud attached to the main framework, but electrically insulated therefrom, but connected by a wire to earth, and in such position that, on pressing the plunger *d*, spring K can make contact therewith, if the slot in the disc H is in position to allow of spring K passing through, or if it is already on the underside of the disc, in consequence of having been pressed through the slot when the apparatus stood at zero, but this contact cannot be made if spring K be not so on the underside of the disc H and the apparatus not at zero, in consequence of K being then blocked on the upper side of disc H, the slot being out of position to allow of it passing through.

According to this method also we electrically connect spring K with the main frame-work, and our slotted disc also by this method consists simply of a piece of insulating material instead of a compound disc as before, since the only effect now required to be produced by the breaking of the contact of the springs K and L is simply the breaking of the short circuit through the signal instrument of the speaking instruments or telephone and secondary, and not as before the entire breaking of the line circuit to be again joined up by the contact of spring K with the underside of the disc.

The *rationale* of working an open circuit is as follows:—

The instrument standing at zero, any subscriber can call by simply pressing his plunger *d* and so pressing spring K through the slot in the disc H on to the earth stud. This action by breaking the contact of springs K and L breaks the short circuit through the signal instrument of the speaking instruments or telephone and secondary, as before mentioned, and by the making contact of spring K with the earth stud puts an intermediate earth on the line, and so brings the two opposed batteries at the extremities of the line into action, the one battery working all the signal instruments on the one side of the caller, including his own instrument, and the other battery working all the instruments on the other side of the caller. By then alternately breaking and making the contact of spring K with the earth stud by means of his plunger *d* the caller can actuate all the clocks or step-by-step motions, stopping at the number to which he wants to speak, with his spring K up against the back of the disc H out of contact with the earth stud. The number so called will then be rung up, and all effects produced in a manner similar to that described for working on closed circuit.

The rest of the apparatus would in fact remain intact, with the exception that the hands or pointers would now point to zero or the respective numbers, when the current was off instead of on, as in the closed circuit method.

By another method also we provide that any station can, when the line is out of use, call any other station by inserting different electrical resistances into the line circuit, and we so set or adjust the apparatus at the several stations on the circuit that the bell at any one particular station will be sounded when the resistance introduced by the caller brings the total resistance of the circuit up to the point at which that particular apparatus is set to respond. And further, the speaking and receiving apparatus at that station so called is then capable of being placed in circuit and in position for communicating with the caller. We provide further, by means of switch mechanism, that the station so calling has also the power of putting his speaking and receiving apparatus into position for communicating with the station so called; and further, that a 1 other stations, excepting the two thus placing themselves in communication with one another, are locked out of circuit, so that they cannot tap or overhear the conversation nor produce any effect whatever on the line circuit until the first caller brings the apparatus back to its normal zero position. And further, we provide that when telephonic apparatus is used, upon the caller hanging up his telephone on the switch hook, upon which the telephone is ordinarily suspended whilst out of use, his own bell will commence ringing and continue ringing until he clears the line as set forth above.

We provide also (as in our first method) that all subscribers can see when the line is engaged.

We accomplish these objects by means of the apparatus shown in figures 9, 10, in which figure 9 is a front elevation of the complete instrument with the door open to show the details, and figure 10 is a detailed drawing of the switch mechanism.

Every station is provided with such an instrument, differing only from one another in their adjustments.

In figure 9, Q is a back board or case carrying or containing a single or double electro-magnet, R, having three armatures, numbered respectively 1, 2, and 3. This electro-magnet may be of any shape, or may in fact take the form of a galvanometer coil and needle, the latter having contact arms.

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The instrument also contains a switch arm capable of sweeping over and successively making contact with studs. The secondary coil of the induction bobbin T is split up into sections of various resistances. There is an ordinary trembling or vibrating bell mechanism, U, and a switch hook, V, making contact with a stud at the back when the telephone is off the hook, and a lightning guard, W.

The switch arm S has also a projection from its end (as shown more clearly in figure 10), which when the switch is turned to the right comes into contact with and slightly lifts the end of a spring, X, which carries little blocking pieces, *x*, which, when the spring X is so lifted by the switch S, come against the underside of and jam or hold by friction the ends of the armatures 1 and 3 of electro-magnet R, in whatever position they were when the switch was moved over, and the said pieces *x* will not move the armatures by themselves, but simply fix them in whatever position they were when the switch S was moved over.

When the switch arm S is on its normal zero stud the spring X is not lifted, and the armatures 1 and 3 of electro-magnet R are therefore free to move, but the action of the lifting spring X fixing the armatures 1 and 3 is completely accomplished during the passage of switch S from zero on to its stud No. 1. When the spring X is so lifted, it also makes contact at its end with another spring, Y, but does not make contact therewith when it is not so lifted.

The connections of the apparatus are then as follows:—A wire leads from the terminal marked line 1 or L¹ to one side of the coil of the electro-magnet R, calling on its way at a screw stud, where it joins one of the wires from the lightning guard W. This as before may be of any ordinary form, but consists in the instrument shown of three insulated wires wound together on to a small bobbin, one end of each wire being cut off short and the other ends joined respectively to the wires leading from the terminals marked L¹, earth or E, line 2 or L².

From the other end of the coil on electro-magnet R a wire leads to the back contact studs of armature 1 and 3 of electro-magnet R, and thence on to the stud on which switch S rests when in its normal zero position.

From this point a wire leads to one of the pair of terminals to which the telephone cord is attached, and from the second of this pair of terminals a wire leads to the stud No. 1 of switch S, *i.e.*, the first stud which the switch touches after leaving its normal zero position. From this point a wire leads on to one end of the secondary coil of the induction coil T. This secondary coil is split up into portions of various resistances as before mentioned, and a wire from the end of each of these portions goes respectively to the studs numbered 2 to 6 or upwards of the switch arm S. A wire then connects the pivot or centre of motion of switch S with armatures 2 and 3 of electro-magnet R, and thence leads on to the terminal marked L², calling on its way at the screw stud, where it meets the second wire from the lightning guard W. This completes the set of connections for the line circuit. A wire then leads from the terminal marked local copper or L.C. to the back contact stud of armature No. 2 of electro-magnet R, and thence on to the lifting spring X. A wire also connects the small spring Y, with which spring X makes contact when lifted with the small brass plate or stud Z fixed on the side of the bobbin of electro-magnet R, in such position that armature No. 3 makes contact therewith when it is towards the pole of the magnet. From this point a wire leads on to the top of switch hook V and to one end or pole of the bell-actuating coil. From the bell post or second electrical pole of the bell-actuating mechanism a wire then leads to stud of switch hook, and also through one of the door hinges to one side of the transmitter. From the other side of the transmitter a wire then leads through the second door hinge and primary coil to the terminal marked local zinc or L.Z, thus completing the set of connections for the local circuit.

It will be seen from the above that the switch arm S with the other parts form a rheostat, and by sweeping over the various contact studs the arm can put various electrical resistances into the line circuit. It can only do this, however, providing the resistances between the various studs be not all short-circuited by the armature of electro-magnet R, which it will be seen have the power by making and breaking their various contacts of short-circuiting the rheostat resistances. The short-circuit is established when armature 1 is open or away from the pole of the magnet, and armatures 2 and 3 closed or towards the pole of the magnet. When armature No. 2 opens, however, as well as No. 1, this short circuit is broken, but is again made when No. 3 also opens. There is also no short circuit when all three armatures are closed, which is their normal zero or line-disengaged position. The action of the whole is then as follows:—When the line is disengaged a subscriber can call any other station by altering the resistance of the line circuit by moving the rheostat switch S, and although by this alteration of resistance one or more of his own electro-magnet armatures would tend to fly open and so short-circuit his added resistance, yet this is prevented from taking place by the blocking of the armatures 1 and 3 by the lifting of spring X by switch S during its motion from zero on to stud No. 1, and therefore before it begins to affect the resistance armature No. 2 does not short-circuit the rheostat in opening.

At all other stations, however, some or all of the armatures fly open according to the following conditions:—The hauling off springs of armatures No. 1 are so adjusted at all stations as to pull them off or open when the resistance of the circuit reaches or exceeds the amount produced by the insertion of the resistance between the zero stud and stud No. 1 of the rheostat switch S at the calling station.

The springs of armatures No. 2 are so adjusted at the several stations that the armature of any particular station will open when the resistance introduced by the caller equals or exceeds that between his zero stud and the stud marked with the corresponding number or signal of that particular station.

The springs of armature No. 3, also, at the several stations, are so adjusted that the armature at any particular station will open when the resistance introduced exceeds that for which armature No. 2 is adjusted at that particular station; the critical point at which it is adjusted to move being somewhat below that at which armature No. 2 at the next higher station is set to move, so as to ensure that any one station shall be short-circuited when the next or any other station is being spoken to. In all cases mentioned above, when we speak of a point of resistance, it must be understood to mean any point within a certain range of the fixed or critical point, the magnitude of such range depending on the sensitiveness of the armatures, which must be adjusted to move within this working range of the fixed critical points. In practice we use about 50 ohms between the first one or two studs of the rheostat switch, and gradually increase up to about 70 ohms between the 5th and 6th studs, and still increase to a greater difference between

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between any higher numbered stud as required to compensate for the higher total resistance of the circuit as we successively insert rheostat resistances, it being required that as each stud is passed, the resistance between it and the next may make by its insertion an appreciable difference in the total resistance of the line circuit. When the caller therefore moves his switch over on to a particular stud, the armature No. 2, as well as No. 1, would have opened at the station marked with the corresponding number or signal. Armature No. 3 at this station, however, would still remain closed. This station only, therefore (with the exception of the calling station), would be un-short-circuited, while at the same time his bell would be sounded in consequence of the local current being completed through it together with the transmitter, as will be seen by tracing the local connections. It is open to him, therefore, to reply, which he prepares to do by moving his switch arm S over to the highest stud (marked "speak," as well as its proper number) and taking his telephone off the hook and calling "yes" through the transmitter.

The effect of doing this would be, by the motion of switch S, to insert his own telephone and secondary into the line circuit, the blocking of the armatures by the blocks x on spring X preventing the station from being short-circuited by this additional insertion of resistance, and by the motion of the switch hook V to short-circuit the bell and so stop its sounding and concentrate the current on to the transmitter and primary.

The caller, who would be listening at his telephone for receiver to reply by so calling "yes," would then push his switch S right over on to the stud marked "speak" and commence conversation, having both thus put their apparatus into speaking condition.

At all other stations, however, in consequence of only armature 1, or else both 1, 2, and 3, being open, the speaking apparatus would be short-circuited, and the pushing over of switch arm S, therefore, at one of those stations would only block their armatures in their short-circuited positions, and consequently the rheostat resistance could not be added nor any other effect produced on the line circuit by any of those stations.

When the communicating stations have finished speaking, they hang up their telephones and thus un-short-circuit their bells, which consequently, as in the first method, commence ringing to give them a signal to clear the line should they tend to omit to do so.

This they do by simply pushing their switch arms S back into their normal zero studs, and so alter the resistance back to its normal zero point. The armatures at all stations, therefore, take their normal zero positions, and the line is open for any other subscriber who may wish to use it.

We render our apparatus according to this method applicable for use with telegraphs in a manner similar to that according to the first method, viz., by providing means to balance or eliminate the effects of our line current on the telegraphic apparatus, such telegraphic apparatus being inserted instead of the telephone between any pair of the studs of the rheostat switch, and parts of its resistance may or may not form the working resistances of the rheostat, with which we control the calling and short-circuiting or un-short-circuiting of the particular stations.

Having thus described the nature of our said invention and the manner of performing the same, we would have it understood that we claim—

First—The combination substantially as described in a telephonic or telegraphic call apparatus of—(1) a step-by-step or clock mechanism controlled by pulsations in the line current, and capable of being thus set from a distant station to a position in which alone the receiving instrument is in effective connection with the line wire; (2) a key or contact-maker by which such pulsations may be produced; and (3) a locking device, which renders the key inoperative as soon as the clock is moved from its zero point by an incoming signal.

Second—The combination, substantially as described, consisting of a telephonic or telegraphic circuit, through which a current normally flows, and a series of step-by-step or clock mechanism, actuated by breaking and making the circuit and operating to put the telephone or telegraph instrument into effective connection with the line wire.

Third—The combination, substantially as described, consisting of a telephonic or telegraphic circuit on which are opposed batteries and a series of step-by-step or clock mechanism actuated by putting the line to earth at any station on the circuit, and operating to put the telephone or telegraph instrument into effective connection with the line wire.

Fourth—The combinations of the parts H, K, and L, substantially as described.

Fifth—Our improved telephonic and telegraphic apparatus, substantially as described, and illustrated by figures 1 to 6 of the annexed drawings.

* * * * *

Sixth—The combination, substantially as described, on a telephonic or telegraphic circuit, of a series of transmitting and receiving instruments, all differently adjusted, and dependent for their effective connection with the line upon the amount of resistance in circuit.

Seventh—The combination, substantially as described, in a telephonic or telegraphic call instrument, of—(1) resistances which can be inserted in the line circuit; (2) appliances which admit the receiving and operating parts into effective connection with the line circuit only when the resistance in the line circuit has a prearranged value.

Eighth—Our improved telephonic and telegraphic apparatus, substantially as described, and illustrated by figures 9 and 10 of the annexed drawings.

In witness whereof, we, the said Alfred Charles Brown and Henry Alfred Charles Saunders, have hereunto set our hands and seals, this fourth day of January, 1882.

Witness—

GEO. PITT.

A. C. BROWN.

H. A. C. SAUNDERS.

This is the amended specification referred to in the annexed Letters of Registration granted to Alfred Charles Brown and Henry Alfred Charles Saunders, this eighth day of June, A.D. 1882.

AUGUSTUS LOFTUS.

REPORTS.

Improvements in Telephonic and Telegraphic Signalling Apparatus.

REPORTS.

Sir,

In compliance with your request, we have examined the specification and drawings forwarded with an application of Messrs. Brown and Saunders, for Letters of Registration, 82-4 234, for "Improvements in Telephonic and Telegraphic Signalling Apparatus," and see no objection to Letters of Registration being granted, except for claims Nos. 6 and 7, which are included in the Edison, Bell, and Crossley instruments.

The Under Secretary of Justice.

Sydney, 4 April, 1882.

We have, &c.,

E. C. CRACKNELL.
FRANCIS HIXSON.

Sir,

We have the honor to report that Messrs. Brown and Saunders having struck out the clauses 6 and 7 in their specification accompanying their application for Letters of Registration, entitled "Improvements in Telephonic and Telegraphic Signalling Apparatus," 82-4,234, there is no further objection to their prayer being granted.

The Under Secretary of Justice.

Sydney, 4 May, 1882.

We have, &c.,

E. C. CRACKNELL.
FRANCIS HIXSON.

[Drawings—one sheet.]

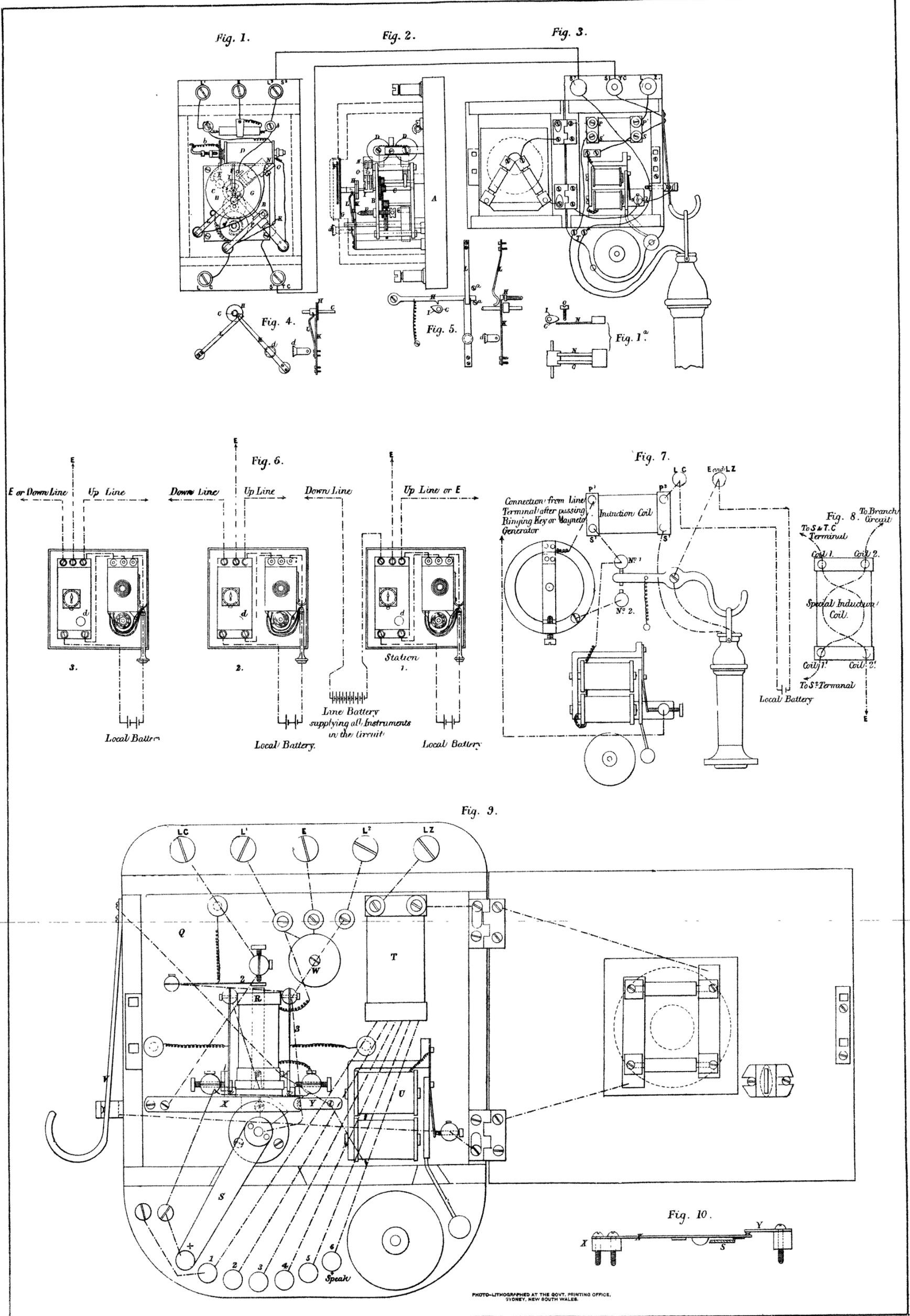


PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE, SYDNEY, NEW SOUTH WALES.

This is the Sheet of Drawings referred to in the annexed Letters of Registration granted to Alfred Charles Bromme, and Henry Alfred Charles Saunders this eighth day of June, A.D. 1882.

Augustus Loftus.



A.D. 1882, 8th June. No. 1080.

IMPROVEMENTS IN THE PREPARATION OF MATERIALS FOR ELECTRIC INSULATION.

LETTERS OF REGISTRATION to John Ambrose Fleming, for Improvements in the preparation of materials to be employed for the purposes of electric insulation.

[Registered on the 8th day of June, 1882, 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 AMBROSE FLEMING, of University College, Nottingham, 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 the preparation of materials to be employed for the purposes of electric insulation," 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 Ambrose Fleming, 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 Ambrose Fleming, 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 Ambrose Fleming 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 June, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in the preparation of materials to be

SPECIFICATION of JOHN AMBROSE FLEMING, of University College, Nottingham, in the county of Nottingham and Kingdom of England, for "Improvements in the preparation of materials to be employed for the purposes of electric insulation."

My invention relates to improvements in the preparation of materials to be employed for the purposes of electric insulation, whereby advantages in economy and facility of production are obtained.

It is well known that the insulators or insulating substances in common use are difficult to work or fashion with tools. For example, glass and porcelain and likewise ebonite or vulcanite can easily be cast or moulded whilst hot, but are difficult to cut, and ebonite is in addition expensive. Now my invention has for its object the production of an insulating or non-conducting material not permitting of the passage of electricity through it readily, and which is capable of being very easily cut or fashioned with edged tools or in a lathe, so as to admit of it being worked into various forms for insulators for telegraphic purposes, for insulating the conductors conveying the electric currents for electric lights, or for any purpose in constructing electric apparatus in which an insulating substance is required.

According to one mode of carrying out my invention, in order to effect this object, I take the best quality of wood of various descriptions, which has been treated in such a manner as to remove from it water and all acids, and I then cause melted paraffine wax to be forced into the wood under pressure. The paraffine wax solidifies in the fibre and convert the wood from a moderate conductor into a nearly perfect non-conductor, the wood not being simply immersed in the paraffine, but impregnated with it into its interior or throughout its mass.

In carrying out the process I may employ any one of the well-known types of apparatus for extracting moisture from wood and impregnating it with a liquid; the apparatus shown in diagram elevation in the accompanying sheet of drawings is found convenient in practice.

A is a strong iron box, in which the wood in the form of planks or blocks, B, is placed when dried; the box being then closed and made air-tight is enclosed in an oven, C, heated by gas or a fire to a temperature of (say) about 120° Centigrade. Above the box is a vessel, D, containing the melted paraffine wax, which communicates with the box by a pipe, E, provided with a tap, F.

From the box also passes a pipe, G, which is in communication with an exhaust air apparatus, H, a regulating tap, G¹, being provided; the pipe opens into a vessel, I, for collecting water and acid which distil out from the wood, and from this vessel extends a worm or condenser, K, to condense the water, vapour, or acid vapours, whilst beyond the condenser and communicating therewith is a tube, L, filled with some hygroscopic substance, such for example as chloride of calcium. The tube L is in direct communication with the air exhaust apparatus H, which may consist of an ordinary air-pump or (as indicated in the drawing) of a water jet aspirator, connected at its upper end *a* with a cistern of water or water supply pipe, and at its lower end *b* with a waste pipe.

The apparatus operates in the following manner, *videlicet* :—

The wood chosen is first air-dried or dried in any convenient manner as far as possible, and is next placed in the iron box A, as shown at B, and the box is closed up air-tight. The tap F is then closed and the tap G¹ opened and a vacuum is produced in the box, at the same time the box is heated to a temperature of (say) about 120° Centigrade. Under the combined influence of the vacuum and heat the moisture and acids are extracted from the wood and condense in the vessel I. The vacuum should be of such a degree that the barometer gauge provided at M stands at a height of 28 inches.

The paraffine wax having now been melted and poured into the vessel D, in quantity sufficient for the purposes, the tap G¹ is then closed and the tap F opened; the atmospheric pressure then forces down the melted wax into the box and compresses it into the fibre of the wood; the heat is then withdrawn, and when the apparatus is cold the box is opened and the impregnated wood cut out, the operation being then complete.

I have found that the most suitable woods for the purpose of my invention are Canadian poplar, pine or other white deal, as they are capable of absorbing a greater weight of the paraffine, but any other descriptions of wood, as for example, sycamore or Honduras or Cuba mahogany may be employed, although I prefer those previously mentioned. In lieu of using paraffine alone I may employ mixtures of paraffine and resin. I have found in practice that a mixture of (say) about three parts by weight of paraffine wax and one part by weight of resin gives good results, but other proportions may be employed. I have found, however, that in all cases it is desirable to have the paraffine wax largely in excess of the resin, the object of the resin being chiefly to raise the melting-point of the impregnating material and reduce the brittleness of the same.

The material produced in the manner hereinbefore described forms an electric insulator, which can be easily shaped with tools into any required form.

According to another mode of carrying out my invention, in lieu of employing wood in bulk or in mass, I take wood in a finely divided condition, or other vegetable fibrous material, such for example as wood, flour, bran, straw, cotton, jute, hemp, papier mâché, in a finely divided condition, and having thoroughly desiccated the same by drying it in an oven or in a current of hot air, or in the manner first hereinbefore described, or by any other equivalent method, I saturate or impregnate it with melted paraffine wax or mixtures of paraffine wax and resin. To accomplish this the material, which may be fine sifted sawdust or ordinary sawdust reduced to a state of finer division, or any of the other materials above mentioned, in a finely divided state, is heated to a temperature somewhat above that of the liquefying point of the paraffine wax or mixture used, and maintained at such a temperature, while the paraffine wax or mixture, which must also be at such a temperature as to be thoroughly liquid, is poured upon it. The whole is then maintained at such a temperature that the paraffine wax or mixture remains perfectly liquid until the dry sawdust or other material has absorbed as much of it as it is capable of doing. No more of the paraffine wax or mixture should be used than can be absorbed, as an excess would render the resulting material softer and less suitable for the purposes for which it is intended to be used. The whole is stirred during the process of saturation, and becomes a thick pasty mass, which is then placed in moulds of the required shape and subjected to pressure by a screw or hydraulic press, or by some other equivalent method. The mould should be warmed previously to the mixture being put into it, and maintained at such temperature until the pressure has been applied, so as to prevent the paraffine wax or mixture being solidified before the pressure is applied. The greater the pressure and the longer it is maintained, the harder and stronger the resulting material will be, but there is no necessity to maintain the pressure for more than a few minutes.

For

employed for the purposes of electric insulation.

For the purpose of obtaining a material of great homogeneity and strength, I take the finest wood flour, and having desiccated the same thoroughly in a current of hot air or in an oven, or by any other convenient process, I impregnate it with the paraffine wax or mixture used under pressure, in a manner substantially similar to that first hereinbefore described as applied to the treatment of wood in bulk or in mass. The wood flour thus treated is subjected to slight pressure, in order to eliminate all superfluous or adherent impregnating material, and is then moulded under pressure into any form adapted to the purposes for which it is to be applied; or I may introduce the saturated material into a perforated mould and express the superfluous impregnating material through the interstices of the mould, by the act of applying pressure in order to mould the material into shape. A material is thus obtained formed by the cohesion of small particles of wood, each of which has been separately impregnated and rendered insulating by the process first hereinbefore described.

In order to obtain a better imitation of ebonite, or to impart to the material any requisite shade of colour, I may add to the material in the course of preparation a small quantity of lamp-black, vegetable black, or other vegetable colouring matter of such a nature and in such proportions as to give the required shade. The amount of such colouring matter must be small compared with the mass to which it is added, that it may not interfere with the insulating qualities of the finished product. There is, however, little danger of this, as a very small amount of such colouring matter will give a sufficiently deep shade. It is most conveniently added to the sawdust or other material used when it has undergone desiccation, and before the paraffine wax or mixture is poured upon it, and the colouring matter should be thoroughly stirred up with the dry material so as to disseminate it equally throughout the mass.

By the term "paraffine wax" as used in this my specification, I mean any of the substances known by the ordinary names of ozokerite or solidified petroleum or mineral wax, or more strictly a substance whose main constituents are hydro-carbons the composition of which is denoted by the formula $C_n H_{2n} + 2$; and by the term "resin" as used in this my specification, I mean any of the substances known as "resin" or "rosin" which are the exudation of various species of pines and firs.

The materials prepared according to my invention I propose to designate "Insulite."

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 my invention is—

First—The employment, for the purposes of electric insulation, of wood deprived of its moisture and impregnated with paraffine wax or with a mixture of paraffine wax and resin, substantially as hereinbefore described.

Second—The preparation of materials to be used for the purposes of electric insulation, by the employment of wood or other vegetable fibrous material as herein set forth, in a finely divided condition, desiccated, and saturated or impregnated with paraffine wax, or with a mixture of paraffine wax and resin in conjunction or not with other substances, the whole being moulded under pressure, all substantially as hereinbefore described.

In witness whereof, I the said John Ambrose Fleming have to this my specification set my hand and seal, the twenty-second day of February, one thousand eight hundred and eighty-two.

JOHN AMBROSE FLEMING.

Signed and sealed in the presence of,—

EDMUND SEARLE,
42, Southampton Buildings, London, W.C.

LOUIS SILVESTER,
42, Southampton Buildings, London, W.C.

This is the specification referred to in the annexed Letters of Registration granted to John Ambrose Fleming, this eighth day of June, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

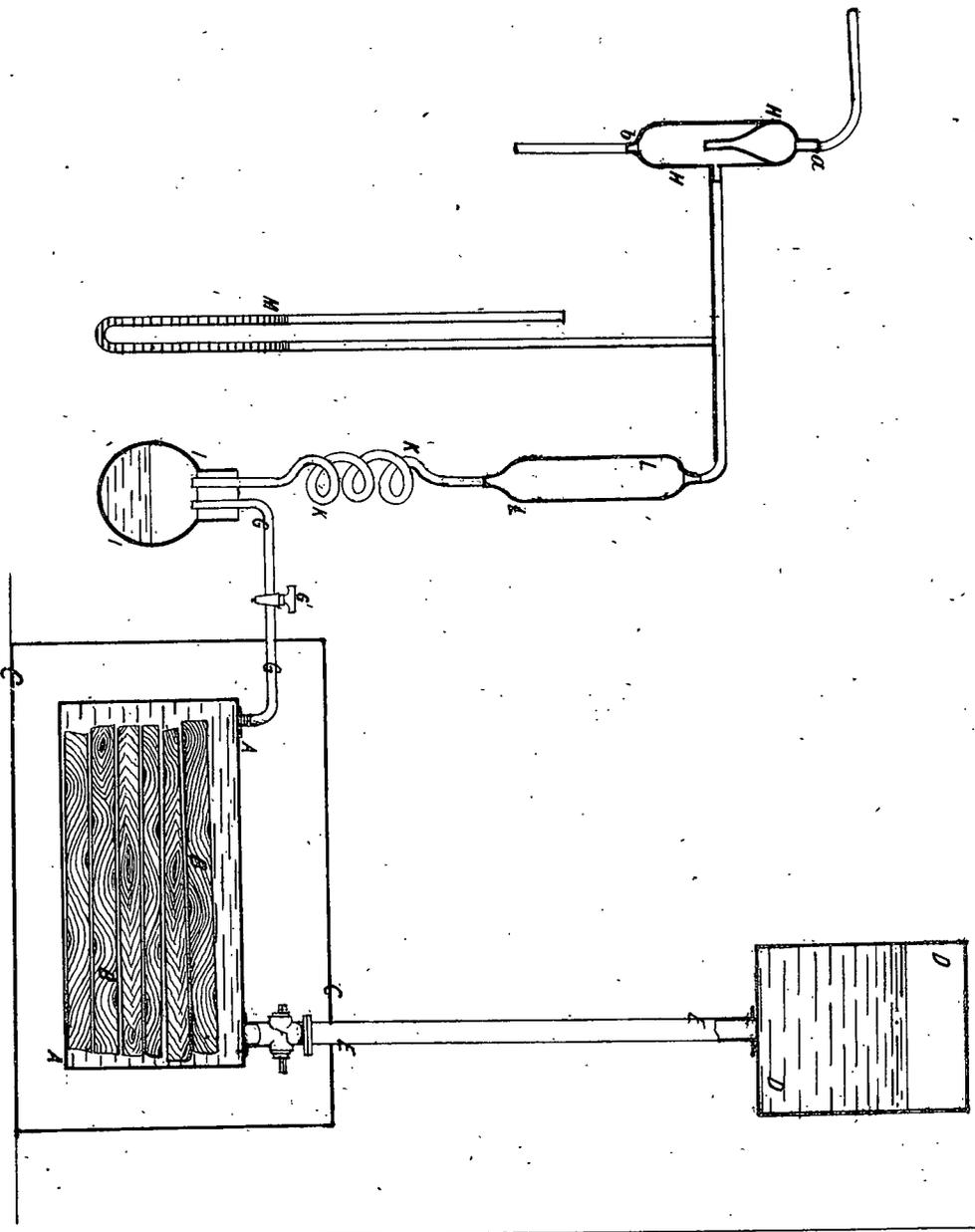
Sir,

We have carefully examined the specification and drawing submitted with Mr. J. A. Fleming's application for Letters of Registration, 82-4,723, for the preparation of materials to be employed for the purpose of electric insulation, and see no objection to the same being granted.

We have, &c.,

E. O. MORIARTY,
E. C. CRACKNELL.

The Under Secretary of Justice.



*This is the Sheet of Drawings referred to in the annexed
Letters of Registration granted to John Ambrose
Flaming, this eighth day of June, A.D. 1882.
Augustus Loftus.*

(Sig. 32 -)



A. D. 1882, 8th June. No. 1081.

**IMPROVEMENTS IN THE PREPARATION OF PHOSPHORIZED MATERIAL FOR THE
DESTRUCTION OF VERMIN.**

LETTERS OF REGISTRATION to Frederick Sheppard Grimwade, for Improvements in the preparation of Phosphorized Material for the destruction of Vermin.

[Registered on the 8th day of June, 1882, 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 SHEPPARD GRIMWADE, of No. 31, Flinders-lane West, in the city of Melbourne and Colony of Victoria, wholesale druggist, 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 Phosphorized Material for the destruction of Vermin," 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 Frederick Sheppard Grimwade, 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 Sheppard Grimwade, 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 Sheppard Grimwade 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 June, in the year of our Lord one thousand eight hundred and eighty-two.

[L.s.]

AUGUSTUS LOFTUS.

Improvements in the preparation of Phosphorized Material, &c.

SPECIFICATION of FREDERICK SHEPPARD GRIMWADE, of No. 31, Flinders-lane West, in the city of Melbourne and Colony of Victoria, wholesale druggist, for an invention entitled "Improvements in the preparation of phosphorised material for the destruction of vermin."

PHOSPHORIZED material, as hitherto prepared, has consisted simply of grain or other material which has acquired more or less of a coating of phosphorus by being stirred about in it when it is in a liquid state. This coating gradually loses its poisonous nature by exposure to the atmosphere, which oxidises it and in a short time renders it perfectly innocuous.

Now my invention has been devised for the purpose of preventing this oxidizing of the phosphorus, and consists in mixing it with a material which will envelop its particles with an impervious covering, and so prevent such oxidation, and in subsequently painting the grain or other material with such mixture and then allowing it to dry.

Any material that vermin will eat and that will coat or envelop the particles of phosphorus will answer the purpose, such as common paste or starch, or flour and sugar, with water or gelatine, but it should in all cases be made into a paste or pasty consistency.

Before mixing the phosphorus with such pasty material I find it preferable to dissolve it in some suitable vehicle; the most suitable is bi-sulphide of carbon.

Having prepared a saturated solution of bi-sulphide of carbon and phosphorus, I mix it with the pasty material in certain proportions so as to be capable of forming an impervious envelope of any required (poisonous) strength when painted or smeared on the bait. I find that four ounces of such saturated solution mixed with a quart of ordinary paste is sufficiently strong.

With this mixture I paint the grain or other material to be phosphorized and allow it to dry, when it is ready for use.

Having thus described the nature of my invention and the manner of performing same, I would have it distinctly understood that I do not confine myself to any particular material for coating or enveloping the particles of phosphorus, nor to the precise proportions of the different materials mentioned, nor to the vehicle in which the phosphorus is to be dissolved, although in all these particulars I have stated what I believe to be the best; but what I believe to be new, and therefore claim as my invention, is—

First—The preparation of phosphorized material for the destruction of vermin, in which the phosphorus is coated with or enveloped in a substance which will protect it from the oxidizing influence of the atmosphere, substantially as herein described and explained.

Second—The precise method herein described of preparing such coating, which consists in mixing together a saturated solution of bi-sulphide of carbon and phosphorus with a pasty material that vermin will eat.

Third—Painting grain with such phosphorized coating and subsequently drying it, in the manner and for the purpose herein described and explained.

In witness whereof, I the said Frederick Sheppard Grimwade have hereto set my hand and seal, this eleventh day of April, one thousand eight hundred and eighty-two.

F. S. GRIMWADE.

Witness—

EDWD. WATERS,
Melbourne, Patent Agent.

This is the specification referred to in the annexed Letters of Registration granted to Frederick Sheppard Grimwade, this eighth day of June, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

The application of Mr. F. S. Grimwade for Letters of Registration for an invention entitled "Improvements in the preparation of Phosphorized Material for the destruction of Vermin" 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.

The Under Secretary of Justice.

Sydney, 28 April, 1882.
We have, &c.,
CHAS. WATT.
JAMES BARNET.



A.D. 1882, 8th June. No. 1082.

NEW AND USEFUL IMPROVEMENTS IN CIGARETTES.

LETTERS OF REGISTRATION to John F. Allen and Lewis Ginter, for new and useful Improvements in Cigarettes.

[Registered on the 8th day of June, 1882, 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 LEWIS GINTER, citizens of the United States, residing at Richmond, in the county of Heurice and State of Virginia, 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 "New and useful Improvements in Cigarettes," 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 F. Allen and Lewis 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 Lewis 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 Lewis 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 eighth day of June, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

New and useful improvements in Cigarettes.

SPECIFICATION.

TO ALL TO WHOM THESE PRESENTS SHALL COME: We, JOHN F. ALLEN and LEWIS GINTER, citizens of the United States, residing at Richmond, in the County of Heurice and State of Virginia, send greeting.

WHEREAS we are desirous of obtaining 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 cigarettes; 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 Lewis Ginter, do hereby describe the nature of such invention or improvement to be as hereunder described and shown in the accompanying drawings, viz.:—

The invention relates to cigarettes, and the novelty consists in the construction, form, and adaptation of the same for convenient use and handling, as will be fully described hereinafter and specifically pointed out in the claim.

The object of the invention is to produce a cigarette which will, because of its treatment and form, be convenient in use between the lips, more conveniently carried in packages, retain the strength and aroma or flavour, and be more closely packed for transportation.

In the use of cigarettes, great inconvenience and discomfort have arisen from the fact that particles of tobacco from the central portions are drawn into the mouth by the suction employed in smoking, and this fault accrues more markedly when fine tobacco is used. It is also an established fact that round cigarettes packed in paper parcels, themselves round, lose the valuable flavour of the tobacco and its strength, due to the interstices between the cigarettes and the package wrapper; and round cigarettes cannot be packed without more or less of space, being thus detrimental.

To avoid these difficulties, and to form a package which may conveniently be carried in the waistcoat pocket, without tearing, breaking, or wearing the cigarettes, because of the friction of the outer coat, we form a cigarette and press the same into a flat or rectangular shape, and in this form they may be packed or placed in flat parcels, ten or more in a parcel. By this construction we are enabled to use the finer particles of the best brands of tobacco which would otherwise be wasted or become less valuable, and which could not be used in cigarettes if round in form. The sides approaching each other, because of the pressure, force the particles into more immediate contact, and they interlock with each other in such close contact that the danger or liability to be sucked into the mouth of the user is obviated. They pack closely together, and the wrapper of the package hugs the ends tightly, leaving no space or interstices between them or them and the package wrapper. The form of the end corresponds more nearly with the normal and natural plane of the lips, and the lip compression prevents even the small particles of tobacco at the mouth end of the cigarette from being displaced in use. The package of ten or more is received snugly in the vest pocket, and the flat form allows it to hug the form of the person carrying it, and the protruding ends do not become damaged by the friction of the coat.

Added to all these advantages which accrue to a flat cigarette over a round one is the ease with which the first one, or in fact any subsequent one, may be taken from the package without injury, while in round packages it is impossible to grasp both sides of a cigarette with the thumb and finger at the same time, and the pressed cigarette is not so quickly consumed.

In the accompanying drawings, figure 1 is a perspective view of one of our cigarettes, and figure 2 is a package thereof.

Referring to the drawings, A represents a single cigarette, and B a package of the same. The cigarette is pressed after the wrapper has been placed around the tobacco and is in an approximately round form. After pressing it assumes a flattened rectangular form, with approximately abrupt or slightly rounded corners or edges.

Cigarettes have been formed square and round, and these forms are not sought to be covered in this application; but what is claimed as new is—

As a new article of manufacture, the cigarette herein described, having plain flat sides and rounded edges, formed by pressing from the round cigarette, and having the particles of tobacco interlocked and firmly compressed, substantially as herein set forth.

JOHN F. ALLEN.

LEWIS GINTER.

Per HENRY HALLORAN, Agent.

Dated at Sydney, this 14th day of April, A.D. 1882.

This is the specification referred to in the annexed Letters of Registration granted to John F. Allen and Lewis Ginter, this eighth day of June, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

The application of Messrs. John F. Allen and Lewis Ginter for Letters of Registration for "An invention of new and useful Improvements in Cigarettes" 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 applied for.

We have, &c.,

THOS. RICHARDS.
ARCH. C. FRASER.

To the Under Secretary of Justice.

Fig. 1.

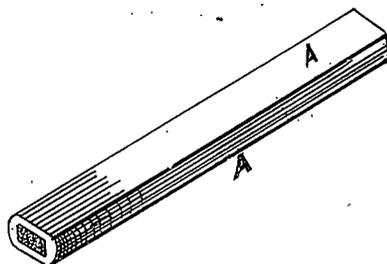
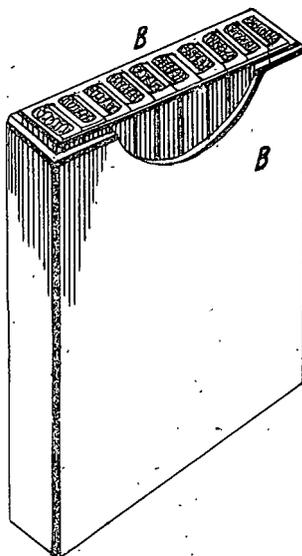


Fig. 2.



*This is the Sheet of Drawings referred to in the annexed
Letters of Registration granted to John F. Allen and
Lewis Ginter this eighth day of June, A.D. 1882.*

Sig. 32. -

Augustus Loftus.



A.D. 1882, 8th June. No. 1083.

BULL'S AUSTRALIAN CEMENT.

LETTERS OF REGISTRATION to Knud Geelmuyden Bull, for an Invention entitled "Bull's Australian Cement."

[Registered on the 9th day of June, 1882, 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 KNUD GEELMUYDEN BULL, of Sydney, in the Colony of New South Wales, artist, 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 "Bull's Australian Cement," 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 Knud Geelmuyden Bull, 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 Knud Geelmuyden Bull, 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 Knud Geelmuyden Bull 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 June, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Bull's Australian Cement.

SPECIFICATION of KNUD GEELMUYDEN BULL, of 61, Botany-street, in the city of Sydney, in the Colony of New South Wales, for an invention entitled "Bull's Australian Cement," which is an improvement in the manufacture of cement for building and other purposes.

My invention consists in the mingling of aluminum (clay) and silicate of lime (limestone) by which a hard, firm, and durable cement is made by the following process:—

I take clay and limestone, and burn them separately in kilns.

When these are burnt, and yet in the kilns, I place vessels containing burning sulphur under the grates of the kilns, so that the mass becomes impregnated with sulphur.

I allow the burnt material to cool for two or three days, then crush it, and afterwards grind it to a fine powder in a mill.

In mixing the clay and lime I have regard to the amount of aluminum or hydraulic properties possessed by the limestone, and add when deficient.

When I can procure limestone containing a sufficiency of aluminum I burn it alone, sulphurizing it as stated above.

I test the mixture by taking out a small portion, pulverizing it, and mixing it with water; its solidification being the proof of the correctness of proportions of aluminum and lime.

I can also test this by submitting a small portion of the stone to the main process before putting the bulk into the kiln.

The sulphur prevents the cement from cracking in the process of solidification, and allows it to gradually become hard.

The clay and limestones of the Colony vary so considerably in their chemical contents that it is impossible to correctly determine the ratio of each to the other without the testing of small quantities, when an addition of one or the other ingredient can be made in the mixing of the bulk.

I can also approach a correct estimate by burning a small portion and cooling it in water.

In witness whereof, I, the said Knud Geelmuyden Bull, have to this my specification set my hand and seal, this seventeenth day of April, in the year of our Lord one thousand eight hundred and eighty-two.

KNUD GEELMUYDEN BULL.

Signed and sealed in the presence of,—

E. LEWIS SCOTT.

This is the specification referred to in the annexed Letters of Registration granted to Knud Geelmuyden Bull, this eighth day of June, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

The application of Mr. K. G. Bull for Letters of Registration for an invention entitled "Bull's Australian Cement" 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, 3 May, 1882.
We have, &c.,

JAMES BARNET.
CHAS. WATT.

The Under Secretary of Justice.

No. 1084.

[Assignment of "New Automatic Multicolour Printing Apparatus."]

No. 1085.

[Assignment of No. 941. See Letters of Registration for 1881, page 149.]



A.D. 1882, 17th June. No. 1086.

IMPROVEMENTS IN COCKS AND VALVES.

LETTERS OF REGISTRATION to David Reginald Ashton and James Neville Sperryn, for Improvements in Cocks and Valves.

[Registered on the 20th day of June, 1882, 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 REGINALD ASHTON, of Clapton, in the County of Middlesex, and JAMES NEVILLE SPERRY, of Brixton Hill, in the County of Surrey, both in 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 Cocks and Valves," 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 David Reginald Ashton and James Neville Sperryn, 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 David Reginald Ashton and James Neville Sperryn, 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 David Reginald Ashton and James Neville Sperryn 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 seventeenth day of June, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Cocks and Valves.

SPECIFICATION of DAVID REGINALD ASHTON, of Clapton, in the County of Middlesex, and JAMES NEVILLE SPERRY, of Brixton Hill, in the County of Surrey, both in England, for an invention entitled "Improvements in Cocks and Valves."

OUR invention relates to improvements in bib-cocks, stop-cocks, ball-cocks, or other cocks or valves for controlling the passage of gas, steam, water, and other fluids.

The cocks or valves are of the screw-down kind, and the invention consists, first, in making a tight joint around the spindle by means of a cupped plunger or piston secured upon the spindle, and fitting in a barrel formed on the body of the cock, through which the valve and its spindle pass, the plunger forming a tight closure under any pressure, and preventing all contact of the steam, water, or other fluid with the screw by which the valve is operated, whereby undue wear of the screw from this cause and consequent leakage is prevented; and the invention consists, secondly, in operating the valve by a screw-cap separate from the spindle, and having an internal screw-thread which screws upon an external screw-thread upon the barrel, the cap enclosing the end of the barrel and protecting the plunger from dirt.

Another characteristic feature of the invention is the few parts of which the cock is made.

In order that the invention may be more readily understood, we have illustrated examples thereof in the accompanying drawing, and will proceed to describe it in detail with reference thereto.

Figure 1 is an external view, and figure 2 a central longitudinal section of one form of bib-cock.

a is the body, of any suitable form, and having the inlet and outlet in any convenient position relatively to the valve and valve-seat, according to the purpose for which the cock or valve is intended. *b* is the barrel position of the body, cast in one therewith, through which the valve-spindle passes axially, the barrel being large enough to permit of the valve passing through it; *c* is the valve, preferably of the usual disc form, or it might be conical and closing down upon a corresponding seat formed in the body *a* as usual; *d* is the valve-spindle, and *e* is a cupped plunger or piston of metal, leather, india-rubber, vegetable fibre, or other suitable material, fixed upon the spindle *d*, this plunger or piston fitting in the barrel *b*, and moving up and down therein with the spindle *d*. The plunger *e* is secured upon the spindle *d*, as shown in section in figure 3, between a shoulder, *d'*, formed on the spindle, and a nut, *d''*, screwed upon a part, *d'''*, and forming a head for the spindle, between which and the shoulder *d'* the plunger is tightly clamped; the barrel *b* is turned true internally, and the plunger fits accurately therein.

f is a cap enclosing the top of the barrel *b*, and formed with a quick coarse internal screw-thread, which works upon a corresponding screw-thread, cut upon the exterior of the barrel *b*; *g* is a set screw in the cap, the point of which comes under an external shoulder on the barrel, to prevent the cap being unscrewed too far. The cap is provided with a cross-handle, *h*, by which it is turned, but it might be a knob or a wheel-handle, or in the case of a ball-cock, the ball-arm would take its place, and the axis of the valve would be horizontal instead of vertical.

In figures 1 and 2 the cap *f* is wholly separate from the spindle *e*, and merely presses upon the top of the spindle in order to force the valve down upon its seat, the valve being intended to be raised off its seat by the pressure of the fluid alone. Figure 4 shows a precisely similar cock, except that the spindle is provided with an extension, *i*, which enters loosely a hole in the cap, and has a neck or groove, *j*, at its upper end, in which the point of a set-screw, *k*, in the handle is received, in order to so far connect the cap to the spindle that, although the former turns independently of the latter as before, the valve will be raised off its seat by the cap when it is unscrewed, instead of by the fluid pressure as before. Instead of the groove *j* and set-screw *k*, the part *i* of the spindle might be continued quite through the handle and have a nut upon it above the handle.

Figure 5 shows a cock differing only from that shown in figure 1 in the position of the valve and screw-cap relatively to the inlet and outlet, the term screw-down being herein intended to include a screwing-in in any direction.

Having described the nature of the said invention and the manner of performing the same, we declare that what we claim is—

- 1st—A screw-down cock or valve in which the valve-spindle is furnished with a cupped plunger or piston, and the body of the cock is formed with a barrel in which said plunger or piston works, substantially as herein shown and described.
- 2nd—In a screw-down cock or valve, the combination with a valve and spindle provided with a cupped plunger or piston working in a barrel on the body as herein specified, of a screw-down cap, handle, or knob pressing on but turning independently of the valve-spindle, substantially as herein shown and described.
- 3rd—In a screw-down cock or valve, a screw-cap enclosing and screwing upon a barrel formed on the body and acting on a valve-spindle, having a suitable packing or piston contained in the barrel, substantially as herein shown and described.
- 4th—A screw-down cock or valve in which the valve-spindle has a cupped plunger or piston working in a barrel, and is pressed on by a screw-cap, as herein described, in which the cap is connected to the spindle so as to lift it when unscrewed, whilst turning independently thereof, substantially as shown and described.

In witness whereof, we, the said David Reginald Ashton and James Neville Sperry, have hereunto set our hands and seals, this twenty-seventh day of February, 1882.

Witness—WM. CLARK,
53, Chancery-lane, London,
Patent Agent.

D. R. ASHTON.
JAS. N. SPERRY.

This is the specification referred to in the annexed Letters of Registration granted to David Reginald Ashton and James Neville Sperry, this seventeenth day of June, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT

Improvements in Cocks and Valves.

REPORT.

Sir,

Sydney, 4 May, 1882.

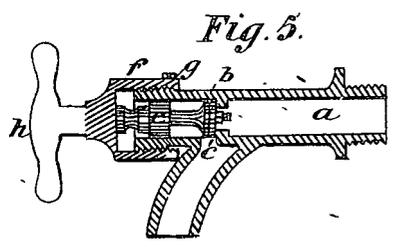
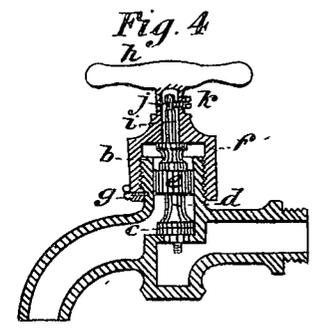
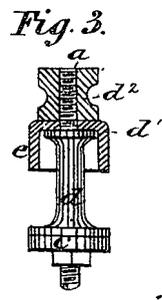
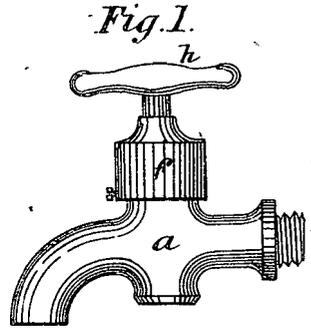
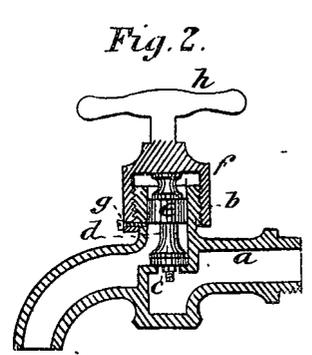
The application of Messrs. Ashton and Sperryn for Letters of Registration for an invention entitled "Improvements in Cocks and Valves" having been referred to us, we have examined the specification and drawing accompanying the same, and have now the honor to report that we see no objection to the issue of Letters of Registration as applied for.

We have, &c.,

ARCH. 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 David Reginald Ashton,
and Neville Sperryn this seventeenth day of June A.D. 1882.*

Augustus Loftus.



A.D. 1882, 21st June. No. 1087.

IMPROVED PROCESS FOR THE MANUFACTURE OF GAS.

LETTERS OF REGISTRATION to Alexander Binnie and Edward Wills U'Ren, for an Improved Process of and Apparatus for the manufacture of Gas for illuminating and other purposes.

[Registered on the 21st day of June, 1882, 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 ALEXANDER BINNIE, of Maori Hill, near Dunedin, in the Provincial District of Otago, in the Colony of New Zealand, bricklayer, and EDWARD WILLS U'REN, of Dunedin aforesaid, builder, have by their Petition humbly represented to me that the said Alexander Binnie 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 and Apparatus for the manufacture of Gas for illuminating and other purposes," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed ; and that the said Edward Wills U'Ren is the assignee of one-half share of and in the said invention ; 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 Alexander Binnie and Edward Wills U'Ren, 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 Alexander Binnie and Edward Wills U'Ren, 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 Alexander Binnie and Edward Wills U'Ren 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 June, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improved Process for the manufacture of Gas.

SPECIFICATION of ALEXANDER BINNIE, of Maori Hill, near Dunedin, in the Provincial District of Otago, in the Colony of New Zealand, bricklayer, for an invention entitled "An Improved Process of and Apparatus for the manufacture of Gas for illuminating and other purposes."

My improved process of manufacturing gas for illuminating and other purposes, consists, first, in a novel combination of materials for the purpose; and second, in the peculiar condition to which they are reduced before and in the act of combination.

My novel combination of materials is air, water, and animal fats, or vegetable or mineral oils; but the air must be under pressure, the water reduced to the condition of superheated steam, and the animal fats or vegetables or mineral oils to heated gases, before these three ingredients are combined together to form my gas. And further, I find it necessary to combine them in very small quantities at a time; thus the water and animal fats (the latter being first reduced to a fluid), or vegetable or mineral oils, are treated in drops, and the air in proportionately small quantities. These ingredients are conveyed to a generator kept at a cherry-red heat, and are there internixed the one with the other in the form of gas, and conveyed away to a condenser and purifier, and from there to a gas-holder, as is commonly the case in gas manufacture.

Although I have stated that vegetable or mineral oils may be substituted for melted animal fat, I much prefer the latter, because it makes a better gas, is cheaper, and will not condense, whereas vegetable oils are expensive, and gas made from mineral oils will condense more or less in the gas-holder.

My improved apparatus consists of a novel combination of essential features in a gas-producing apparatus, some novel contrivances necessitated by the process, and their combination with others which are well known.

Referring to my drawings, figure 1 shows side elevation of my apparatus for the manufacture of my gas; figure 2, plan; and figure 3, end elevation of the furnace and its contents. A is an air-pump; B, an air-holder; C, a purifier; D, a condenser; E, a furnace; F, the reservoir for animal fat or its alternatives; G, the water reservoir; H, the generator; I, the retort attached thereto; A¹ is a pipe from the air-pump to the holder; B¹ is a pipe from the holder to the gas generator; F¹ is a cup for receiving the drops of melted fat, or its alternatives, as they fall from the reservoir F; F² is a pipe leading from the bottom of such cup to very nearly the bottom of chamber F³, from either side of the upper part of which are connecting pipes, F⁴ and F⁵; the former leading into a down pipe, F⁶, which reaches down to the generator H; G¹ is a glass bulb, just below the water reservoir G and between the taps G² and G³, the latter being at the top of a down pipe, G⁴ (into which connecting pipe F³ leads), which also reaches down to the generator H. At the top of the retort is a pipe, I¹, leading to the condenser, from which pipe D¹ leads to the purifier, another pipe, C¹, leading from thence to a gas-holder not shown.

The mode of operation is as follows:—I first charge the air-holder with air by means of the air-pump, then kindle a fire in the furnace, and when the generator H and retort I have attained a cherry-red heat, I open the taps leading from the air, water, and animal fat (or its alternatives) reservoirs respectively, the water and animal fat (reduced to a liquid) or its alternatives being supplied only in drops, so that in these minute quantities they may reach and be heated in the generator, the water being converted into steam as it descends its pipe G⁴, the liquid fat being first received into chamber F³, from thence overflowing through connection F⁴ into and down pipe F⁶ from whence it is discharged in a gaseous condition into the generator. The three ingredients are here superheated, and combine together into a gas, passing upwards through the retort I into pipe I¹, from whence it passes into an ordinary condenser, D, and from thence into an ordinary gas purifier, C, and lastly, from thence into an ordinary gas-holder. There is therefore nothing new about any of the parts of this apparatus except in the furnace, its contents and immediate connections, as will be hereinafter more specifically set forth.

With regard to the proportions and speed of feeding the machine, I have found that in a machine of the size indicated by the drawing, sixty drops of liquid fat and fifteen drops of water per minute, with a constant air-pressure of about one-tenth of a pound to the inch, supplied through the contracted nozzle of an inch pipe, makes gas of a reasonably good quality. As a means of testing the quality of the gas while in course of manufacture, I attach a tap, F⁷, to the upper part of pipe F⁶. If this tap be opened and the gas ignited, it will burn blue if too much air is being supplied, it will sparkle if too much steam is being supplied, and it will smoke if too much liquid fat is being supplied. If too little water is being supplied it will burn with a yellow glare; if too little air, it will burn blue in addition to the yellow glare; and if too little animal fat or vegetable or mineral oils is being supplied it will scarcely burn at all.

Referring to the water reservoir, it will be at once understood that when tap G² is opened G³ must be closed, as it only is opened in order to fill the glass bulb G¹ between them. In cup F¹ there is no mechanical valve, the liquid fat itself forming a valve. The generator H and retort I, I prefer to make of iron, but the materials of which this as well as every other part of the apparatus herein shown and described may be made, is perfectly well known to every one possessed of ordinary skill in the art to which this invention refers, and therefore I do not claim any speciality in, nor do I confine myself to any particular materials of which such apparatus may be made or manufactured; but what I do claim as my improved process of and apparatus for the manufacture of gas for illuminating and other purposes is—

First—The manufacture of gas for illuminating and other purposes by the combined use of air, water, and animal fat, or its alternatives, in comparatively minute quantities, the water being first reduced to steam, the animal fat or its alternatives to a heated gas, and the air being supplied in suitable quantities, and the whole mingled together in a heated vessel, which I call a generator, so as to form a homogeneous gas, substantially as herein described and explained.

Second—The combination and arrangement of the cup F¹ with its pipe F², chamber F³, connecting pipes F⁴ and F⁵, and down pipe F⁶, in the manner and for the purposes substantially as herein described and explained.

Third

Improved Process for the manufacture of Gas.

Third—The combination and arrangement of the water reservoir G with glass bulb G¹, taps G² and G³, and down pipe G⁴, in the manner and for the purposes substantially as herein described and explained.

Fourth—The combination and arrangement of the contrivances mentioned in the two preceding claims with generator H and retort I, in the manner and for the purposes substantially as herein described and explained.

Fifth—The combination in apparatus for the manufacture of gas for illuminating and other purposes of air reservoirs, water reservoirs, and reservoirs for animal fat or its alternatives; the contents of each of which are to be used in the manufacture of such gas.

In witness whereof, I the said Alexander Binnie have hereto set my hand and seal, this nineteenth day of April, one thousand eight hundred and eighty-two.

Witness—

W. S. BAYSTON,
Clerk to Edwd. Waters,
Patent Agent, Melbourne.

ALEX. BINNIE,
By his duly authorized Attorney,
EDWD. WATERS.

This is the specification referred to in the annexed Letters of Registration granted to Alexander Binnie and Edward Wills U'Ren, this twenty-first day of June, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

We have examined the specification and drawings forwarded to us with Messrs. Alexander Binnie and U'Ren's application, 82-5,242, for Letters of Registration for an improved Process and Apparatus for the manufacture of Gas for illuminating and other purposes, and we see no objection to the Petition being granted.

The Under Secretary of Justice.

Sydney, 12 May, 1882.

We have, &c.,
JAMES BARNET.
E. C. CRACKNELL.

[Drawings—one sheet.]

Fig. 1.

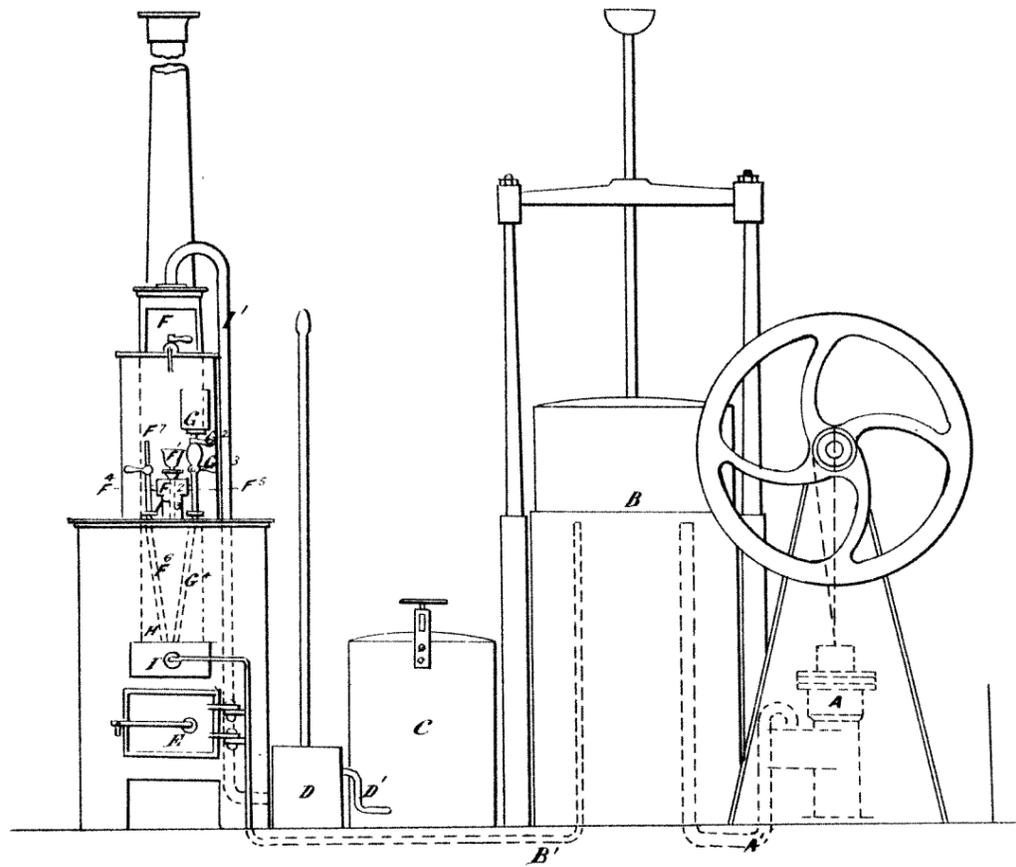


Fig. 3.

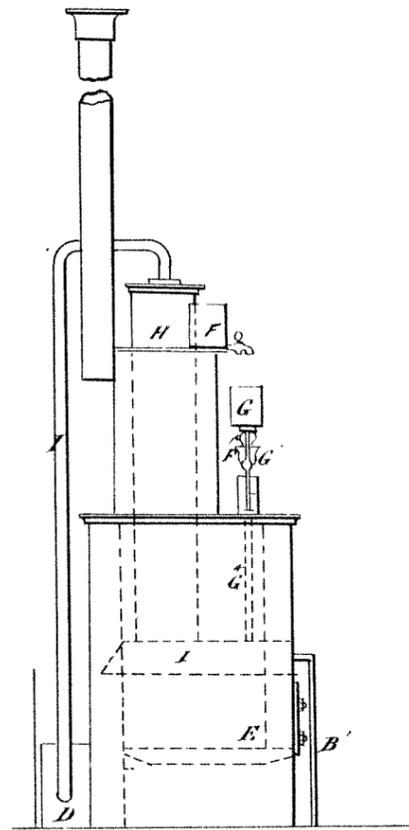
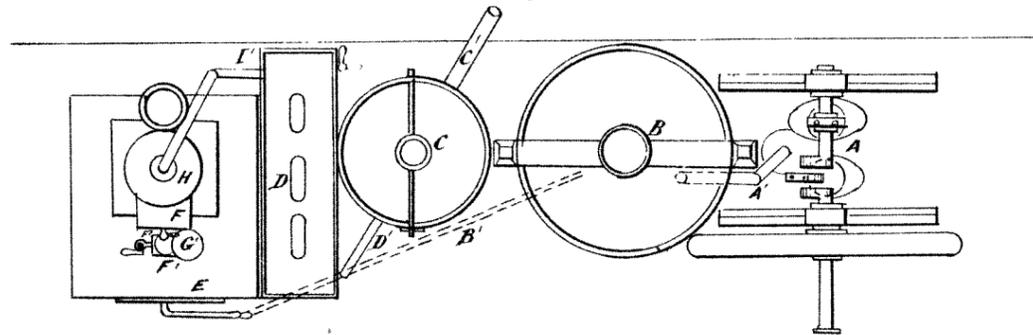


Fig. 2.



Scale of Feet.



This is the Sheet of Drawings referred to in the annexed Letters of Registration granted to Alexander Binnie and Edward Wills U Ren, this twenty first day of June, A D. 1882

Augustus Loftus.



A.D. 1882, 21st June. No. 1088.

**A NEW COMPOUND TO BE EMPLOYED IN THE PRESERVATION OF ORGANIC
SUBSTANCES.**

LETTERS OF REGISTRATION to Frederick Settle Barff, for a new compound to
be employed in the preservation of organic substances.

[Registered on the 21st day of June, 1882, 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 SETTLE BARFF, of Kilburn, in the County of Middlesex and Kingdom of
England, professor of chemistry, 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 new compound to be employed in the preservation of organic substances," 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 improve-
ment 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 Settle
Barff, 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 Settle Barff, 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 Settle Barff 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 twenty-first day of June, in the year of our
Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

A new compound to be employed in the preservation of organic substances.

SPECIFICATION of FREDERICK SETTLE BARFF, of Kilburn, in the County of Middlesex, professor of chemistry, for an invention of "A new compound to be employed in the preservation of Organic substances."

MY said invention relates to the preparation of a new material or chemical compound to be employed for the preservation of organic substances.

For this purpose I take boracic acid and dissolve it in a glycerine by the aid of heat, maintaining the temperature for about four or five hours, or until the desired combination is effected, care being taken, however, that the temperature employed shall not be so excessive as to decompose the glycerine; and I add to such solution or compound a further quantity of boracic acid, from time to time, until the boracic acid ceases to be dissolved. The compound resulting, when allowed to cool, is solid, and is what I have called boroglyceride, which is a new chemical compound.

As an example of the manner in which my said invention may be effectively carried out, I proceed as follows:—

I heat glycerine to near its boiling-point and add boracic acid until it ceases to be dissolved, the proportions being about 92 parts by weight of glycerine to 62 parts by weight of boracic acid (crystallized), which is equivalent to 3 molecules of glycerine, $C_3 H_5 O_3$, to one of boric oxide, $B_2 O_3$. I maintain the mixture at a temperature of about 200° Centigrade as long as water is given off. When the mass cools, it becomes a yellowish, transparent, glacial substance, tough and deliquescent; this dissolves in water, but when boiled in large quantities of the same it is decomposed into glycerine and boracic acid.

This before-mentioned compound is also soluble in alcohol, and the solution has the property of preventing the putrefaction of organic substances. The composition of the glacial body, as determined by analysis, is nearly $C_3 H_5 BO_3$, or $H_3 BO_3$, in which H_3 is replaced by the trivalent radicle BO_3 ; by using the constituents in different proportions different (substitution) products are formed, but the one mentioned is that which I prefer to use.

In order to employ the compound consisting of boracic acid and glycerine, I prepare a solution of the same, either in water, alcohol, or other suitable solvent, and I either immerse in or impregnate with such solutions the organic substances to be operated upon.

Solutions may be prepared of various degrees of strength, but I have found that a solution consisting of about one part by weight of the compound before referred to and forty parts by weight of water will give good results, but other proportions may be adopted.

Solutions of the compound hereinbefore described may be applied to the preservation of all organic substances, either animal or vegetable.

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 is—

The employment and use of the compound of boracic acid and glycerine herein referred to, for and in the preservation of organic substances.

In witness whereof, I, the said Frederick Settle Barff, have to this my specification set my hand and seal, the ninth day of March, one thousand eight hundred and eighty-two.

FRED. S. BARFF.

Signed and sealed in the presence of,—

CHAS. MILLS, 47, Lincoln's Inn Fields, London.

JOHN JAMES, 47, Lincoln's Inn Fields, London.

This is the specification referred to in the annexed Letters of Registration granted to Frederick Settle Barff, this twenty-first day of June, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 16 May, 1882.

The application of Mr. Frederick Settle Barff for Letters of Registration, for an invention entitled "A new compound to be employed in the preservation of organic substances," 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.,

CHARLES WATT.

WILLIAM C. BENNETT.

The Under Secretary of Justice.



A.D. 1882, 21st June. No. 1089.

AN IMPROVED METHOD OF CONSTRUCTING ENGINES AND MACHINES, &c.

LETTERS OF REGISTRATION to Wilkinson Wayman and George Kay, for an improved method of constructing Engines and Machines, in which the motive power is applied to either side of the piston alternately.

[Registered on the 21st day of June, 1882, 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 WILKINSON WAYMAN and GEORGE KAY, 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 "An improved method of constructing Engines and Machines, in which the motive power is applied to either side of the piston alternately," 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 Wilkinson Wayman and George Kay, 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 Wilkinson Wayman and George Kay, 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 Wilkinson Wayman and George Kay 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 June, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

An improved method of constructing Engines and Machines, &c.

SPECIFICATION of WILKINSON WAYMAN and GEORGE KAY, both of Stawell, in the Colony of Victoria, engineers, for an invention entitled "An improved method of constructing Engines and Machines, in which the motive power is applied to either side of the piston alternately."

OUR invention has been designed as a substitute for the slide and other valves now in common use for engines, boring and other machines, to which a reciprocating motion is imparted by the pressure of the motive power on either side of the piston alternately. Ours is a jump valve and not a slide valve, and has no mechanical connection with the piston whatever. Ours is a double valve, or two valves connected together, and is so constructed as that the closing of the valve at one end effects the opening of the valve at the other. When that side of the piston which the open valve is supplying reaches its exhaust, the pressure is thereby reduced and the valve closes, opening the other at the same time so as to conduct the pressure to the opposite side of the piston. This method of construction ensures the exact motion of the supply valves at exactly the right time, and frees them from all liability to derangement or leakage. They are simple, self-contained, occupy little space, are very light, and can be made cheaply.

Ours is the only invention by which a reciprocating motion is obtained by the passage of compressed air or steam through a conical or other valve, whereby pressure is given alternately to either side of the piston by and in consequence of opening to the atmosphere by the travel of the piston.

This invention is clearly illustrated in our drawings, in which figure 1 shows a longitudinal section of a rock-drill with our invention affixed, and figures 2 and 3 elevation and plan of the same.

A is the cylinder, with ends marked A¹ and A², and B the piston therein; C, the valve chamber, preferably cylindrical, having compressed air or steam ingress port, C¹. In this chamber are valves, D¹ and D², joined by stem D, and also ports or passages, E¹ and E², leading to other ports or passages, F¹ and F², in the cylinder leading to either end; G is the exhaust port. The mode of operation is as follows:—Supposing the piston B to be on its inward or back stroke (towards end A¹ of the cylinder), as soon as it has passed the exhaust port G, by and in consequence of opening the cylinder and passages F² and E² to the atmosphere, the pressure on the valve D² will be reduced, and it will immediately jump from the position shown in the drawing, thereby opening valve D¹, and the compressed air or steam entering through port C¹, will take the direction of the arrow, viz., through passages E¹ and F¹ to the end A¹ of the cylinder, forcing piston B towards the end A², and when it again passes port G, opening the cylinder and passages F² and E² to the atmosphere, closes the valve D¹ in a similar manner to that described with reference to valve D², and opens the valve D² to move the piston back again.

Having thus described the nature of our invention and the manner of performing same, we would have it understood that we do not claim to be the inventors of those valves which have no mechanical external connection with the piston of reciprocating engines or other like machines, nor of double valves (or two valves connected together), nor of constructing such double valves so that the closing of one of them will open the other; neither do we confine ourselves to any particular arrangement; but what we claim as our improved method of constructing engines and machines, in which the motive power is applied to either side of the piston alternately, is so constructing them as to make the opening of the exhaust the means of causing the valve to cut off the supply to that side of the piston and of opening it to the other.

In witness whereof, we, the said Wilkinson Wayman and George Kay, have hereto set our hands and seals, this twelfth day of April, one thousand eight hundred and eighty-two.

Witness—R. E. MITCHELL.

WILKINSON WAYMAN.
GEORGE KAY.

This is the specification referred to in the annexed Letters of Registration granted to Wilkinson Wayman and George Kay, this twenty-first day of June, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

The application of Wilkinson Wayman and George Kay, of Stawell, in the Colony of Victoria, engineers, for Letters of Registration for an invention entitled "An improved method of constructing Engines and Machines, in which the motive power is applied to either side of the piston alternately," 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, 16 May, 1882.

We have, &c.,

E. O. MORIARTY.
WILLIAM C. BENNETT.

The Under Secretary of Justice.

— WAYMAN & KAYS —
PATENT

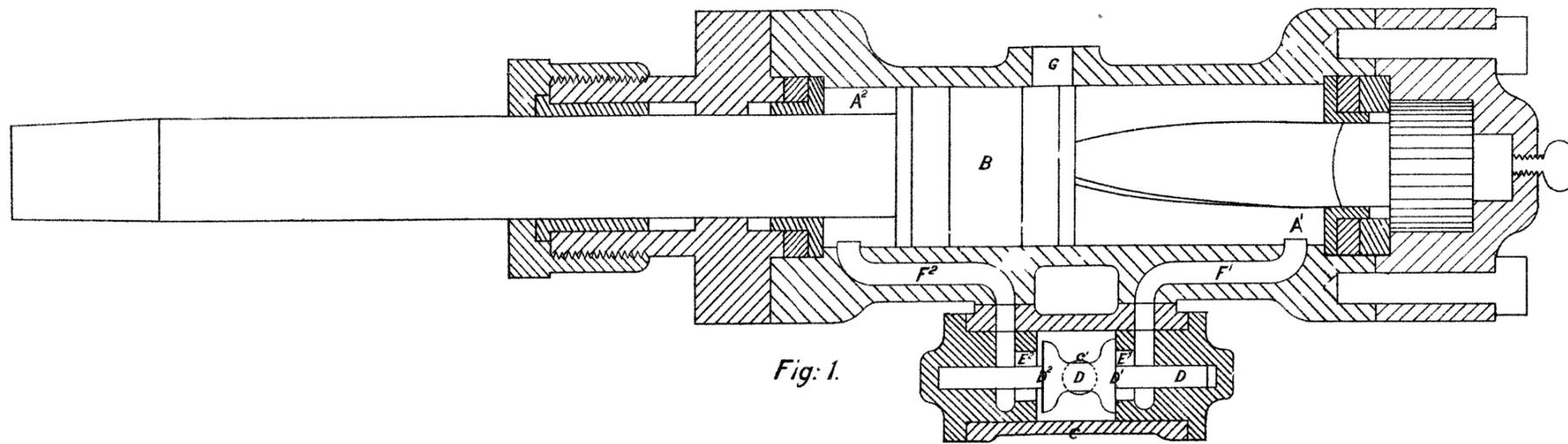


Fig: 1.

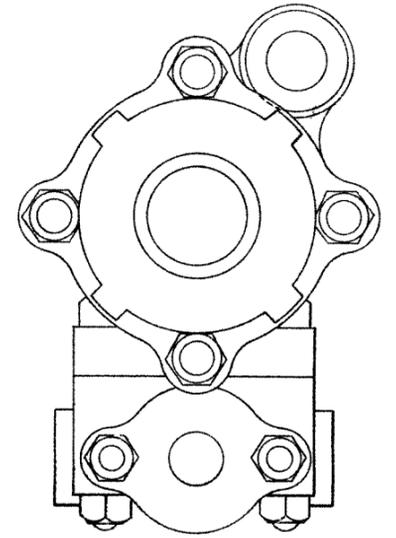


Fig:3.

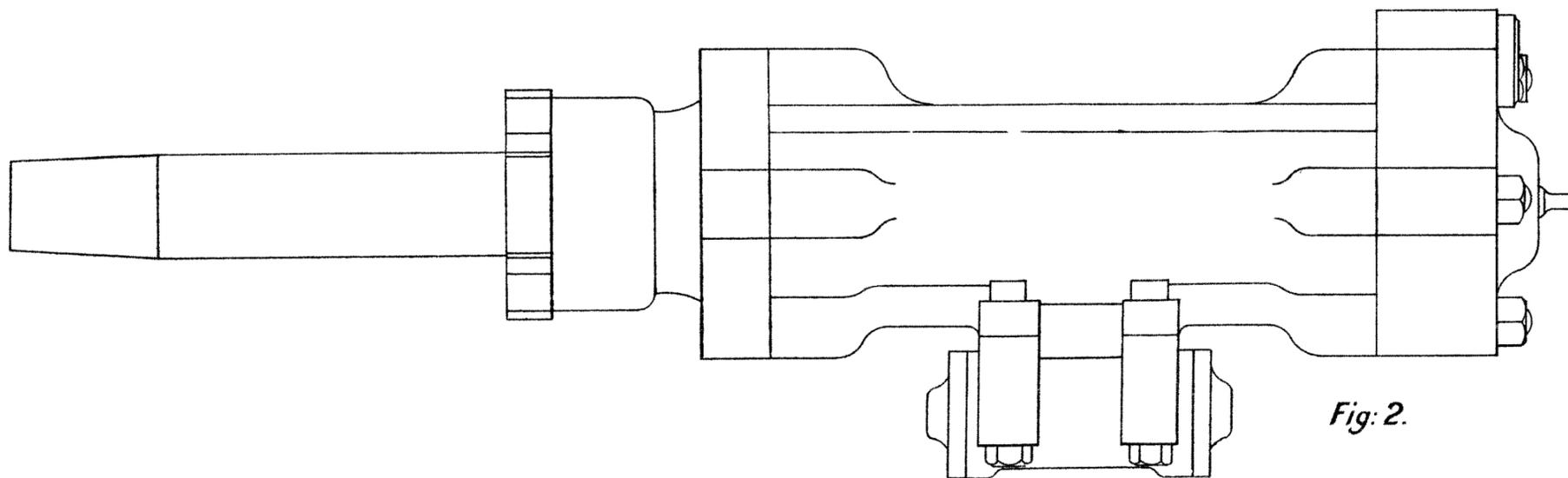


Fig: 2.

*This is the Sheet of Drawings referred to in the annexed
Letters of Registration granted to Wilkinson Wayman and
George Kay, this twenty-first day of June, A.D. 1882.*

Augustus Loftus.

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



A.D. 1882, 21st June. No. 1090.

IMPROVED COMPOSITION FOR UNHAIRING AND PRESERVING HIDES & SKINS.

LETTERS OF REGISTRATION to Jules Louis Moret, for an Improved Composition for unhairing and preserving hides and skins.

[Registered on the 21st day of June, 1882, 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 LOUIS MORET, of Paris, in the Republic of France, hath by his Petition represented to me that he is the assignee of Charles Jules Pierre Desnos, of Paris, who is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "An Improved composition for unhairing and preserving hides and skins," 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 Jules Louis Moret, 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 Jules Louis Moret, 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 Jules Louis Moret 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 June, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improved composition for unhairing and preserving hides and skins.

SPECIFICATION of CHARLES JULES PIERRE DESNOS, of Paris, in the Republic of France, for an invention entitled "An improved composition for unhairing and preserving hides and skins."

MY invention consists in an improved composition for unhairing hides and skins and preserving them in such a condition as to be as fit for the subsequent operations as they were when they were green.

To form this composition, I take limestone and orpiment, of each 200 grammes, and make a paste therewith in the following manner:—The lime is placed in a copper with water at a high temperature; the lime is slaked immediately it commences to split, and the orpiment is then added and also more water, the mixture being stirred meanwhile for about five minutes so as to form a paste. I then add to the above proportions of lime and orpiment about one kilogramme of American potash if sheep-skins are to be treated, and a greater portion of potash if hides are to be treated, together with a sufficient quantity of water (10 litres about) to render the mixture perfectly homogeneous. The mixture is then exposed to a moderate heat until it marks 10° Beaumé, after which it is allowed to settle and the liquid decanted off.

The liquid or composition thus obtained is ready for use for the purpose of unhairing hides and skins.

The proportions of the ingredients, and particularly of the potash, should be varied according to the nature of the hides or skins treated, and according to the quality of the ingredients used.

The depilatory composition also possesses the property of preserving hides and skins of all kinds, and forms an efficient substitute for the process of salting as at present practised for the purpose of preservation for transport, which operation it is well known deprives the hides for the purposes of the subsequent operations to a certain extent of the properties they possessed when they were green.

This composition when applied to the hides and skins has the effect of preserving them when dried for transport in such manner that, by being merely plunged in water, they will in effect be restored to their former green condition, and swelled so that they may be treated with the same ease as when they were actually green.

The depilatory composition is applied with a brush to the flesh side of the hide or skin, and on turning it after a few hours the whole of the hair or fleece, wool, down, &c., can be removed with the greatest facility without deteriorating the hides or skins, which are left in a condition fit for undergoing the subsequent operations of tanning and tawing. They are moreover ungreased at the same time that they are unhaird, without injury either to the skin or to the wool or hair.

Having described the nature of the said invention, and the manner of performing the same, I declare that what I claim is,—

The liquid composition hereinbefore described, composed of lime, orpiment, and potash in suitable proportions for unhairing hides and skins, and preserving them in a condition fit for the subsequent operations, essentially as herein described.

In witness whereof, I, the said Charles Jules Pierre Desnos, have hereunto set my hand and seal, this thirtieth day of January, in the year of our Lord one thousand eight hundred and eighty-two.

C. J. P. DESNOS.

This is the specification referred to in the annexed Letters of Registration granted to Jules Louis Moret, this twenty-first day of June, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 16 May, 1882.

The application of Mr. Jules Louis Moret, of Paris, in the Republic of France, for Letters of Registration for an invention entitled "An improved composition for unhairing and preserving hides and skins" 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.

The Under Secretary of Justice.

We have &c.,

CHAS. WATT.

WILLIAM C. BENNETT.



A.D. 1882, 28th June. No. 1091.

IMPROVEMENTS IN CONTRIVANCES USED IN TELEPHONY AND TELEGRAPHY.

LETTERS OF REGISTRATION to Francis Raymond Welles, for Improvements in contrivances used in Telephony and Telegraphy.

[Registered on the 28th day of June, 1882, 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 RAYMOND WELLES, of Antwerp, in the Kingdom of Belgium, telegraph 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 contrivances used in Telephony and Telegraphy," 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 Raymond Welles, 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 Raymond Welles, 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 Raymond Welles 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 June, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in contrivances used in Telephony and Telegraphy.

SPECIFICATION of FRANCIS RAYMOND WELLES, of Antwerp, in the Kingdom of Belgium, telegraph engineer, for an invention entitled "Improvements in contrivances used in Telephony and Telegraphy."

THE improvements herein are designed to facilitate the use of the telephone, and consist of certain improvements in the telephone, the exchange apparatus and appliances, and the cable of conducting wires.

I.

Fig. 1 shows a new system of circuits which may be termed the grouping system. Eight subscribers, stations S^1 , S^2 , S^3 , S^4 , S^5 , S^6 , S^7 and S^8 are shown connected with the central office by telephone lines. Any well known subscriber's outfit of bell, receiving telephone, transmitter, and switch may be used. Each telephone line is connected with its own switch upon the switch-board at the central office. The novelty in the circuits shown consists in grouping or connecting the telephone lines to an outer common line, and at the central office to a common ground line connected with a listening operator's outfit. An outfit is shown somewhat in detail at three of the stations. A particular description of the outfit at station S^8 will be sufficient for all.

The telephone line a extends from the central office to the station S^8 , where it is connected permanently with the switch lever b . When the telephone c is taken from the lever, the circuit of line a is cut off from the call bell d and closed to ground through the telephone c and secondary of the induction coil, while at the same time the local circuit of the transmitter e is closed through the primary of the induction coil. On hanging the telephone c upon the lever, the circuit of telephone line a will be closed through the coils of the bell d , and open to the telephone. This subscriber's outfit need not be more fully described or illustrated, as it is well known. The telephone lines of the first four stations, after passing through their bells respectively, are grouped together by common outer line f . The telephone lines of the other four stations are united by common outer line g into a second group. Thus many lines may be arranged in groups of convenient size. The lines of each group are also connected with a common line at the central office. Thus the first group is connected with line h , and the second group with line i . By means of the switch k the groups may be connected to the same line at the central office, as shown. The number of lines assigned to the different operators may thus be varied from hour to hour according to the demands of business.

The telephone l is the ordinary pony crown, which is provided with the usual permanent magnet. Telephone m is of novel construction, and it may be defined as the operator's telephone, since it is made so light that it may be worn upon the ear without fatigue. In the operator's telephone, instead of the usual permanent magnet, a battery current is used.

This battery current passes through the coil of the electro-magnet of the telephone, which should be of about four ohms resistance, and through the low resistance winding of an induction coil.

The main line passes through the high resistance winding of said coil. The low resistance winding should be of about one half an ohm, while the high resistance winding should be of about one hundred and fifty ohms.

Fig. 2 shows a detail sectional view of the operator's telephone.

Fig. 3 is a sectional view of the spring-jack switch, with a connecting plug inserted. The plug when thus inserted wedges the spring r away from contact point s . The ground wire is thus removed automatically when a plug is inserted in any given switch of the central office switch-board.

Operation of Grouping System.

Suppose subscriber S^8 wishes to converse with subscriber S^4 , subscriber S^8 at once takes down his telephone and speaks to the operator at telephone m , who is always listening, and says, "Give me S^4 ." Thereupon the operator sends a current through the telephone line of S^4 , and rings his bell. This current is sent from the signalling battery 4, which in the drawing is shown connected with the line of S^5 . As soon as the signal is answered by the subscriber called for, the calling and called subscribers' switches are connected.

The switches u and v of S^8 and S^4 are shown thus connected by means of a flexible conducting cord w and terminal conducting plugs. At night when the demands upon the central office are few, the operator may hang his telephone on the switch x , and thus connect the common line at the central office through the call bell y in the circuit of a battery. Any subscriber on taking down his telephone will thus close the circuit through the bell y , and notify the operator to attend to the call.

If line a of station S^8 should be broken, the subscriber, by depressing key z , may talk directly to the central office over line g and the lines of S^5 , S^6 , and S^7 . Thus each subscriber has two circuits to the central office.

II.

In fig. 4 are shown the circuits of a subscriber's call-box; the main line a^1 passes around the generator b^1 by the shunt wire c^1 to the call bell d^1 ; and thence by line e^1 to the switch lever, and thence by line f^1 to ground as shown.

When the generator is set in motion the shunt circuit c^1 is automatically opened at g^1 , so that the current from the generator is directed to line a^1 which extends to the central office. The subscriber thus answers a call from the central office by turning the generator, and thereby automatically opening the shunt circuit c^1 of low resistance around the generator. Having thus answered the call, the subscriber takes the telephone receiver h^1 from the switch, and in so doing moves the lever i^1 , thus closing the circuit between the shunt or branch line k^1 and the line e^1 . The telephone line thus finds a short circuit of low resistance around the bell d^1 through the secondary of the induction coil l^1 and the receiver h^1 to ground as shown. The local circuit of battery m^1 is at the same time closed through the transmitter n^1 and primary of the induction coil.

III.

The annunciators and circuits shown in fig. 5 are designed for use at the central office, and are of great advantage as a night call where each subscriber's individual line is connected at the central office with a separate calling annunciator.

Improvements in contrivances used in Telephony and Telegraphy.

o^1 is a front view of the annunciator, p^1 is a rear view of an annunciator, q^1 is a sectional view. The annunciator magnets are constructed in the usual manner and arranged upon an iron support, serving as a heel-piece and common ground connections for the lines passing through the electro-magnets. Insulated contact points r^1 r^1 of any number of annunciators are connected together and to one pole of the battery S^1 in the circuit of the bell or signalling instrument t^1 . The other pole of the battery may be grounded, or connected with the springs or levers u^1 of all the annunciators. The drop v^1 is pivoted, as shown at point w^1 , to the frame x^1 of the annunciator; the weight of the drop when falling crowds the eccentric y^1 against the spring or lever w^1 with sufficient force to bring said spring into electric contact with contact point r^1 . The circuit is thus closed to battery through the signalling instrument t^1 , which notifies the attendant that a shutter of the connected annunciators has been thrown down. The shutter or drop v^1 falls until arrested by stop z^1 .

IV.

Heretofore each subscriber has been provided with one or two elements of battery in the local circuit of his transmitter and the primary of his induction coil.

By the use of the Wheatstone Bridge many or all of the subscribers of a system may use the same battery for their primary currents.

It has been impracticable heretofore to use the transmitters of several subscribers in the circuit of a single battery, since the resistance in the common line would be so great that the variation caused by the voice upon a single transmitter would not be sufficient to induce a distinct voice-current in the secondary of the induction coil; and, moreover, if two should speak into their transmitters at once, great confusion would result.

These practical difficulties are overcome by means of a Wheatstone Bridge placed at each subscriber's station in the circuit of the common battery. In one of the four arms of the bridge is placed a battery transmitter, which may be of the form known as the "Edison Transmitter" or a microphone. The other arms of the bridge are balanced to the resistance of the transmitter by inserting resistance coils. In the cross wire of the Wheatstone Bridge is placed the primary of the induction coil, and in consequence of the bridge being balanced, there will be no current passing through the cross wire of the bridge and primary of induction coil when the system is not in use. In addition to the circuit wire to the subscribers, an individual wire is run to each subscriber for talking. This individual wire passes through a switch to the call bell, and to ground when the telephone receiver is on the hook, or through the receiving telephone and secondary of the induction coil when the receiving telephone is off from the hook.

Speaking into the transmitter varies the resistance of that arm of the bridge in which the transmitter is inserted. The variation of the resistance of the one arm of the bridge causes the main battery current to flow through the cross wire of the bridge and through the primary of induction coil in vibrations corresponding to the vibrations of the diaphragm of the transmitter, and by induction these vibrations are communicated to the individual wire, and thence to the distant station to which the individual wire may be connected.

In the drawing, fig. 6 is a diagram of a central office outfit and a subscriber's outfit in detail, with the circuit of the battery passing through two other subscribers' stations. The subscribers' stations 1, 2, and 3 are provided with telephone lines, a^2 , b^2 , c^2 , which run to the switch-board at the central office, and from their respective switches through calling annunciators and to ground in the usual manner. The circuit may be traced from the negative pole of battery d^2 , as indicated by line e^2 through station 1, and by line f^2 through station 2, and by line g^2 through station 3, and by line h^2 through the operator's outfit at the central office, and thence by line i^2 to the positive pole of the battery.

The resistance coils are placed in the three arms k^2 l^2 m^2 of the bridge, and the transmitter n^2 is placed in the arm o^2 . The resistance of the four arms is so adjusted that the bridge is balanced, hence there is normally no effective current through the primary of the induction coil p^2 which is placed in the cross wire of the bridge. Speaking into the transmitter n^2 varies the resistance of the arm o^2 in waves corresponding to the vibrations of the voice; varying the resistance of the arm o^2 , throws the bridge out of balance, causing a current to flow through the cross wire of the bridge and through the primary of the induction coil; this current being an undulatory current induces undulatory currents in the secondary of the induction coil, and thence through the telephone line to the distant station.

The cord and plug connecting with the battery at the central office are designed to signal the different subscribers, which is effected by inserting the plug in the spring jack of the desired subscriber.

V.

Where it is necessary to run many telephone lines parallel, great trouble is experienced on account of induction, and the escape of current from one line to another.

Lead pipes have been used to enclose the core of conductors, and various methods have been adopted for insulating the wires of the core and protecting them from external injury.

The methods hereinafter described of insulating and protecting the wires, and preventing induction, are found preferable to any of the methods heretofore employed.

Fig. 7 is a section of a telephone cable made according to the new methods.

Figs. 8 and 9 are side views showing the wires which form the flexible armour, wound spirally about the lead pipe.

Fig. 10 is a perspective view of the apparatus for filling the pipe with insulating substance.

The wires wound about the lead pipe form a flexible armour of great tensile strength, which protects the pipe from external injury. Galvanized wires, or wires covered with a coating of zinc, are preferable to plain wires. Where the cable is to be laid in salt water, the wires should be coated with a mixture of tin and lead; about one part of tin to four parts of lead is found sufficient. Electro-chemical action is thus prevented. The wires of the core are insulated with a fibrous covering, and bunched together and drawn into the pipe. A large special conductor of low resistance is run through the centre of the core of conductors, and completed outside the core by the ground or a metallic conductor of low resistance.

Paraffine,

Improvements in contrivances used in Telephony and Telegraphy.

Paraffine, resin, beeswax, and other similar substances, alone and in combination, have been used as an insulating substance. These substances, as is well known, shrink on becoming cold. Thus cavities have been left within the pipe, which have caused great trouble. Among the difficulties experienced on account of this shrinkage may be mentioned the increased liability of moisture to penetrate through flaws or joints in the pipe, on account of the vacuums thus formed, and also the liability of water to penetrate the cavities to a considerable distance, in case a cable should be broken under water. In order to compensate for this shrinkage, the melted paraffine or other insulating substance is charged with carbonic acid gas, or other suitable gas or mixture of gases, and the liquid thus prepared is forced into the heated pipe around the core, allowing the air to escape from the other end of the pipe through a small orifice, so that the pressure will not be removed from the charged paraffine, and allow the gas and paraffine to separate. When filled, the pipe is closed and allowed to cool. The gas is held in very minute bubbles, hardly visible to the naked eye. As the substance cools and contracts, these bubbles expand, and the pipe is thus kept entirely full. These bubbles are isolated from each other, and uniformly diffused throughout the mass of solid substance. The insulating substance is thus formed into a light, porous, homogeneous mass.

The gas may be generated and forced into the insulating substance in any well known way, but should be dried, so as not to injure the insulating qualities of the paraffine.

In the drawing, fig. 10, the gas generator and filter for drying the gas are shown on the left, and resemble somewhat a soda-water apparatus. The tank for holding the melted paraffine stands in the centre, and the stone or brick oven is placed at the right of said tank. The gas is conducted from the filter which contains chloride of calcium, which absorbs any moisture that may be in the gas, by a pipe running from the top of said filter to the bottom of the tank of melted paraffine, terminating in a coil in the bottom of the tank, and is punctured with small holes, so as to allow the gas to escape and diffuse itself throughout the melted wax. The wax is melted by means of steam in the chamber below the bottom of the tank. The drying oven is heated by means of steam pipes which are arranged on the bottom of the oven. The coil of cable is placed in the oven. One end of the cable is connected to the pipe, which projects above the top of the oven, and extends towards the bottom of the tank of paraffine. A stop-cock is provided for opening and closing this pipe, and one also for regulating the vent at the other end of the cable. A blow-off cock and tube for letting in a thermometer may be arranged upon the top of the tank as shown. A pressure gauge may be provided for the generator as shown.

The operation of the apparatus is too simple to require further description. When the cable is filled with the melted insulating substance charged with gas, it is closed and allowed to cool. The interstices between the pipe and the conductors of the core being thus filled with a homogeneous mass of insulating substance, the cable may be transported to any distance, and uncoiled in the place where it is wanted.

The higher the degree of heat to which the substance is raised the more will the substance shrink in cooling, and the greater will be the pressure required to keep it charged with gas. It is preferable therefore to charge the substance and force it into the cable at a temperature but little above the melting-point.

If the core of conductors consists of insulated wires, they should be dried and soaked in an insulating substance like paraffine, after which the covering should be compressed in any well known way, so that the insulating substance may thoroughly fill the cores of the fibrous covering; otherwise air would be left in the cable, and, in case of injury to the cable, water might penetrate to a considerable distance.

CLAIMS.

1. The system of circuits which consists in the combination of the telephone lines in groups, so that each subscriber may have two circuits to the central office, one circuit over his own line, the other over the other lines of his group.
2. Two or more groups of telephone lines in combination with switching apparatus, whereby the groups may be united or separated at the central office as the demands of business require, substantially as described.
3. The operator's telephone, in which no permanent magnet is used, substantially as shown and described.
4. The spring-jack having the spring r and the insulated contact point s so arranged that when a plug is inserted the spring and point are separated, and the circuit directed through the plug and its cord as described.
5. The shunt circuit c^1 around the generator, which is held open automatically while the generator is in motion, substantially as described.
6. The branch or shunt line h^1 whereby the call bell is shunted when the main line a^1 is completed by line e^1 through the induction coil l^1 and the receiver h^1 , substantially as shown and described.
7. The calling annunciators at the central office so connected in the circuit of battery s^1 that when the shutter of an annunciator falls, the circuit of a battery is closed through a bell or signalling instrument, l^1 .
8. The induction coil p^2 in the cross wire of the Wheatstone Bridge, and the microphone or transmitter n^2 in one of the arms, the other arms being balanced by means of resistance coils, substantially as shown and described.
9. The line c^2 connecting with battery d^2 at the central office, and extending outwardly through several Wheatstone Bridges at the subscribers' stations, so that all the transmitters may be worked from the same battery, substantially as shown and described.
10. The lead pipe of a telegraph cable combined with wires wound spirally so as to form a flexible armour of great tensile strength, substantially as shown and described.
11. The conductors of a telegraph cable in combination with an insulating substance charged with gas, substantially as specified.

Improvements in contrivances used in Telephony and Telegraphy.

12. The method of charging the paraffine or other insulating substance with gas, and the apparatus therefor, as herein described and shown.

In witness whereof, I, the said Francis Raymond Welles, have hereto set my hand and seal, this twenty-seventh day of April, one thousand eight hundred and eighty-two.

Witness—

EDWD. WATERS,
Melbourne, Patent Agent.

F. R. WELLES,
By his Agent,
THOS. F. SIMPSON.

This is the specification referred to in the annexed Letters of Registration granted to Francis Raymond Welles, this twenty-eighth day of June, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

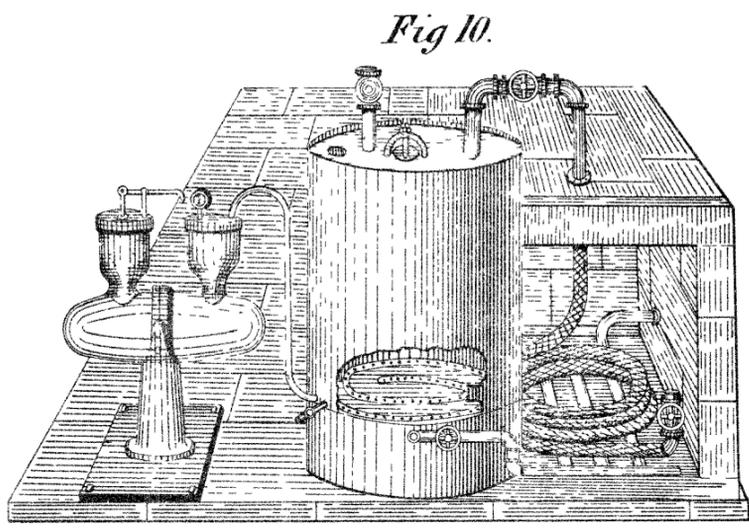
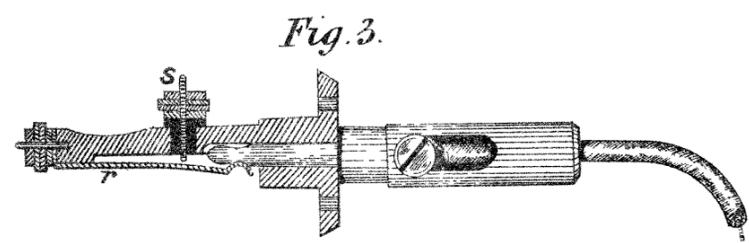
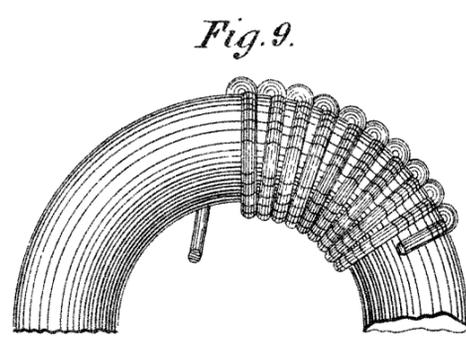
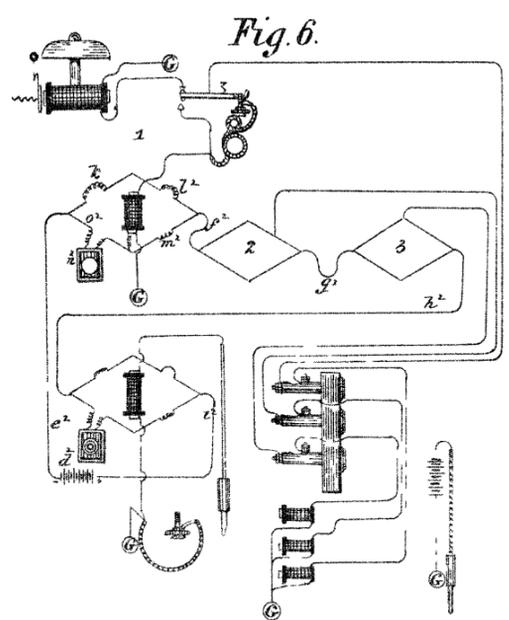
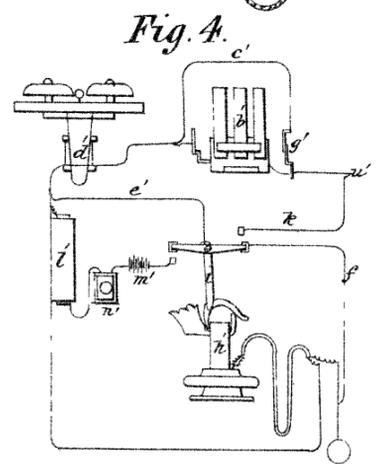
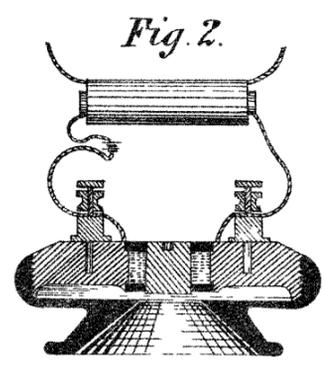
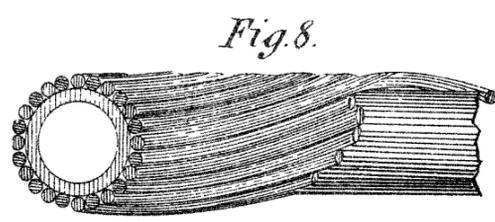
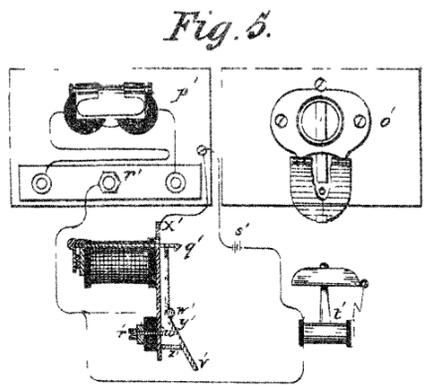
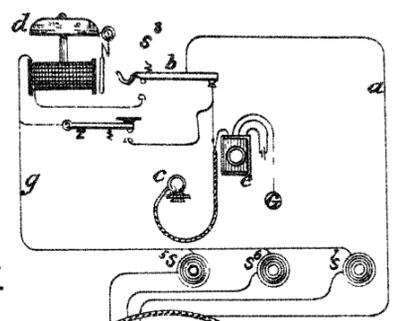
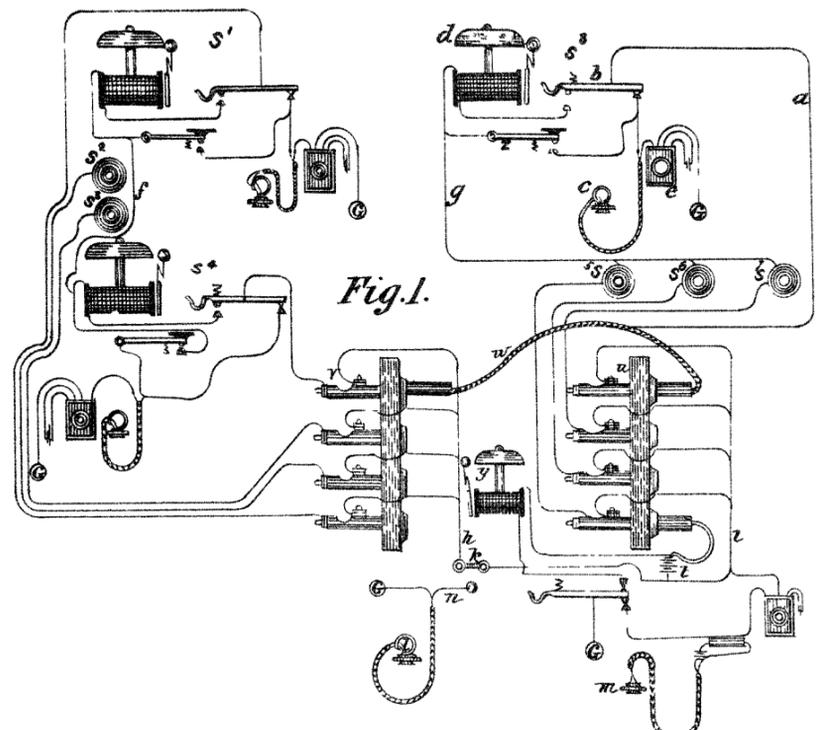
We do ourselves the honor to report, in reply to your blank cover communication of the 6th instant, No. 5,566, transmitting Mr. Francis Raymond Welles' application for the registration of "Improvements in contrivances used in Telephony and Telegraphy," that we are of opinion Mr. Welles' application may be granted.

Sydney, 30 May, 1883.
We have, &c.,

E. C. CRACKNELL.
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 Francis Raymond Welles, this twenty eighth day of June, A.D. 1882.

Augustus Loftus.



A.D. 1882, 28th June. No. 1092.

**AN IMPROVED APPARATUS FOR GIVING MOTION TO CARRIAGES, VESSELS,
MACHINES, &c.**

LETTERS OF REGISTRATION to Gustaf Liedman and Carl Beger, for an improved Apparatus for giving motion to carriages, vessels, machines, and other moving bodies.

[Registered on the 28th day of June, 1882, 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 GUSTAF LIEDMAN, gentleman, and CARL BEGER, mechanic, both of Berlin, in the German Empire, 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 Apparatus for giving motion to carriages, vessels, machines, and other moving bodies," 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 Gustaf Liedman and Carl Beger, 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 Gustaf Liedman and Carl Beger, 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 Gustaf Liedman and Carl Beger 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 June, in the year of our Lord one thousand eight hundred and eighty-two.

[L.s.]

AUGUSTUS LOFTUS.

Improved Apparatus for giving motion to carriages, vessels, machines, &c.

SPECIFICATION of GUSTAF LIEDMAN, gentleman, and CARL BEGER, mechanician, both of Berlin, in the German Empire, for an invention entitled "An improved Apparatus for giving motion to carriages, vessels, machines, and other moving bodies."

THE invention relates to carriages and other moving bodies, the continuous movement of which is effected by one or several persons seated thereon, by the action of a rocking seat upon the driving apparatus.

In figures 1 and 2 of the drawings, A is the body of the carriage, B the rocking seat, the swinging movement of which is facilitated by a hand lever, *d*.

The body A of the carriage is connected with the axle *c* by means of a system of springs, *ss*; *xx* are the fulcra of the rocking seat B.

The steering or guiding is effected by a lever, *e*, in the usual way.

On the axle *c* is placed the spring and pawl mechanism *f*, shown to an enlarged scale and more in detail in figures 3 and 4, in which *gg* are two bosses keyed on the axle *c*; *hh* are two discs, turning loosely on the said axle, but held sidewise by collars, *qq*. The bosses *gg* are fitted with pawls, *ii*, so arranged and adapted that when the discs *hh* are turned in the direction of the arrow, fig. 3, the axle *c* turns with them, but when the said discs *hh* are turned in the opposite direction they have no effect on the axle.

On the bosses of the discs *hh* grooves, *kk*, are turned over, which pass cords, bands, or chains, *ll* and *mm*, one end of each of which is fixed in the said grooves, the other ends being connected at *oo* to the rocking seat B.

One set of cords, bands, or chains, *ll*, by each alternate swing of the rocking seat B, turns the discs *hh* and the axle *c* forwards, and moves the carriage; the other set of cords, bands, or chains, *mm*, being made of elastic material, such as India-rubber, or provided with spiral springs, draws back each disc *h* in the direction opposite to that by the arrow indicated, when the corresponding actuating chain is not operating upon it, and places it ready for another operation.

This principle and apparatus are also applicable to railways, velocipedes, boats, vessels, and machinery of all kinds, when the aforesaid spring and pawl mechanism shown at *f* in figures 1 and 2, and to larger scale in figures 3 and 4, is applied to a suitable shaft, and by the employment of a suitable arrangement of gearing, the carriage or other body may be moved forwards or backwards, and in some cases the wheels may be furnished with paddles or floats.

Having now described the nature of the said invention and the manner in which the same is to be carried into effect, we would have it understood that what we claim is—

The apparatus for the transmission of motion to carriages, boats, vessels, and machinery from a rocking seat B and lever *d* to the wheel axle *c*, consisting essentially of the bosses *gg*, discs *hh*, and pawls *ii*, and the cords, bands, or chains *ll* and *mm*, arranged, combined, applied, and operating as hereinbefore described, and illustrated in the drawings.

In witness whereof, we, the said Gustaf Liedman and Carl Beger, have hereto set our hands and seals, this twentieth day of August, in the year of our Lord one thousand eight hundred and eighty-one.

GUSTAF LIEDMAN.
CARL BEGER.

Witnesses—

OSCAR STEIN.
FRIEDRICH GOLDSTEIN.

This is the specification referred to in the annexed Letters of Registration granted to Gustaf Liedman and Carl Beger, this 28th day of June, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

We do ourselves the honor to report, in reply to your blank cover communication of the 29th instant, No. 6,255, that we are of opinion Messrs. Gustaf Liedman and Carl Beger's application for the registration of "An improved Apparatus for giving motion to carriages, vessels, machines, and other moving bodies," may be granted.

The Under Secretary of Justice.

Sydney, 31 May, 1882.

We have, &c.,

E. C. CRACKNELL.
GOTHER K. MANN.

Fig.1.

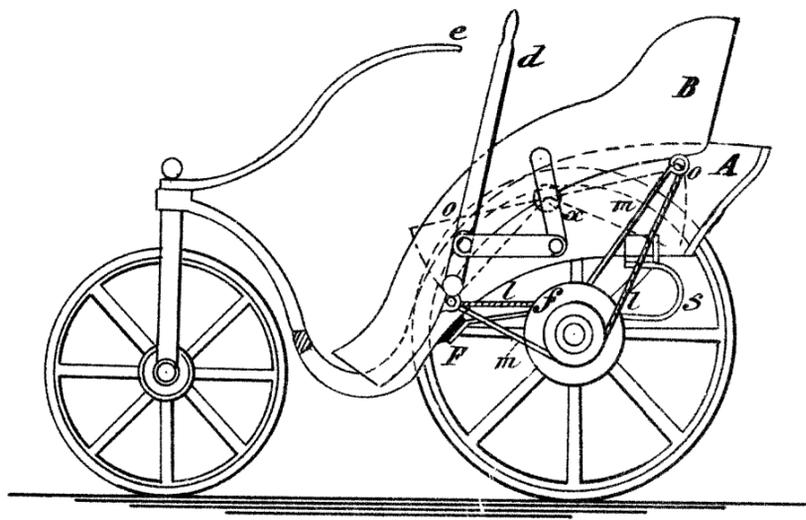


Fig. 2.

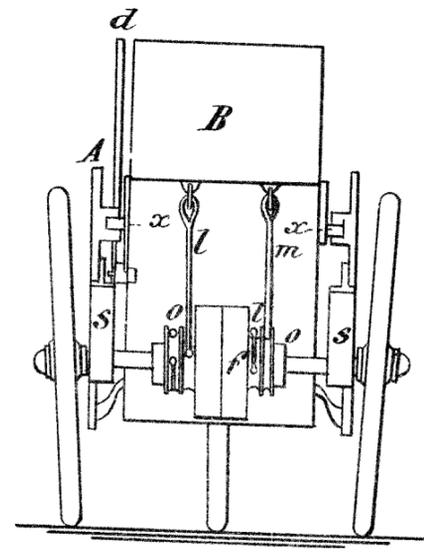


Fig.3.

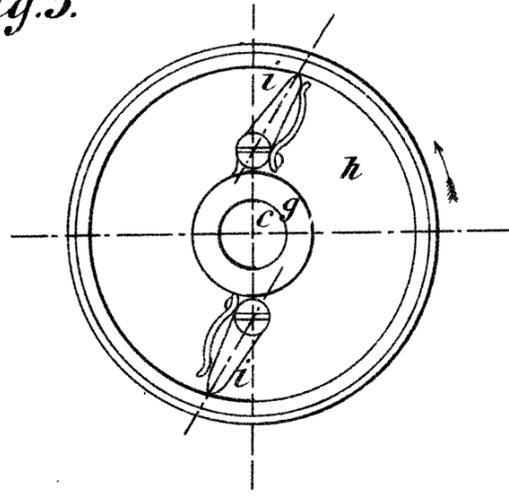
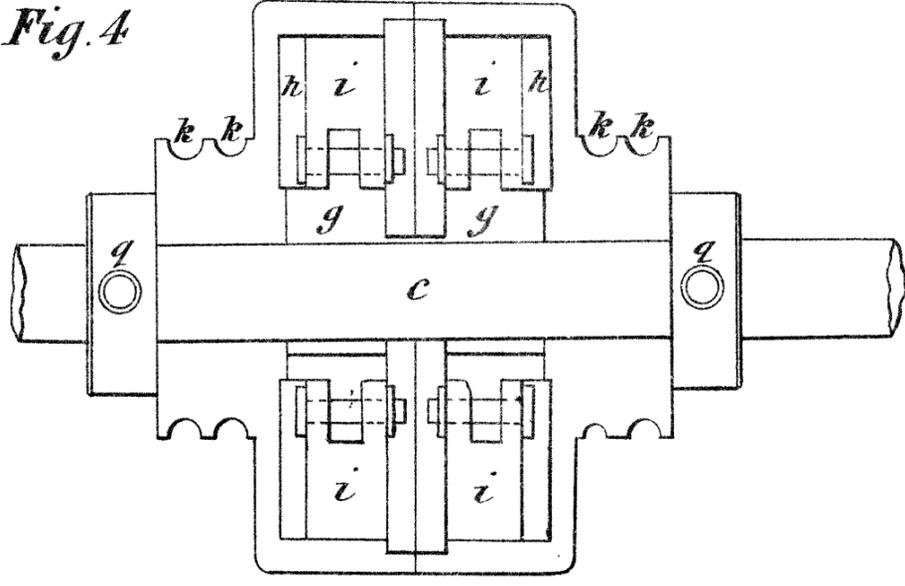


Fig.4.



*This is the Sheet of Drawings referred to in the annexed
 Letters of Registration granted to Gustaf Liedman,
 and Carl Beger; this twenty eighth day of June A.D. 1882
 Augustus Loftus.*



A.D. 1882, 28th June. No. 1093.

IMPROVEMENTS IN OBTAINING ELECTRIC LIGHT, &c.

LETTERS OF REGISTRATION to Tom Ernest Gatehouse, for Improvements in obtaining Electric Light, and in Apparatus to be employed therefor.

[Registered on the 28th day of June, 1882, 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 TOM ERNEST GATEHOUSE, of Camberwell, in the County of Surrey, England, 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 obtaining Electric Light, and in Apparatus to be employed therefor," 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 Tom Ernest Gatehouse, 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 Tom Ernest Gatehouse, 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 Tom Ernest Gatehouse 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 June, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in obtaining Electric Light, &c.

SPECIFICATION of TOM ERNEST GATEHOUSE, of Camberwell, in the County of Surrey, England, electrician, for an invention entitled "Improvements in obtaining Electric Light, and in Apparatus to be employed therefor."

THIS invention relates to a method of electric-lighting by the incandescence of suitable material, and the regulation of the light-giving substance by simple and novel means; also, to the increasing the durability of the incandescent material.

It is well known that the electrical resistance of metallic wires is increased by the application of heat, and, on the other hand, that a rod of carbon or graphite conducts better when hot.

When a wire—as, for instance, platinum—is used alone for the purpose of producing an incandescent electric light, there is considerable risk of fusion upon any increase of current passing through. Regulators have been proposed to prevent this fusion, but without any practical success. I propose to take advantage of the foregoing and opposite properties of carbon and such like material, and metallic wires, such as platinum, iridium, and other suitable metals or alloys, to produce an incandescent light, the carbon or like material acting as a regulator to the incandescent wire.

According to one arrangement, I use the light-giving material in conjunction or combination with the carbon or such body in a parallel circuit, the two materials having their lengths and sections properly proportioned, and therefore also their respective resistances. The carbon-rod may be movable and adjustable, or both materials may be so.

When a current of suitable strength is passed through the materials, the greater portion flows through the wire, rendering it incandescent, and producing light.

A certain quantity however passes through the carbon, raising its temperature in a slight degree. Now any increase of current will take effect on both materials; but while the greater heating of the wire renders it more difficult for the current to pass, the carbon-rod, on the other hand, will, by becoming warmer, allow more current to pass through than before, thus taking away the excess of current in a greater proportion than does the wire, and keeping the latter from fusion. I also, for greater safety, automatically adjust the length of carbon-rod, according to the current strength, by a sliding contact actuated by a solenoid or electro-magnet in the circuit.

In connection with these arrangements, an artificial resistance may be employed in such a manner that, if a lamp should break down or be extinguished, the remaining ones in the circuit shall not be affected. Individual or single lights may be arranged on the system above described, or a number of lamps may be regulated in a body in like manner. I further propose, with a view to increasing the durability of the incandescent material *in vacuo*, such as a carbon filament or metallic wire, to employ, in combination or conjunction with the incandescent material, any metal or substance which has a greater affinity for oxygen than the light-giving material.

With the object of preventing the carbon being acted upon by oxygen, and also to maintain a vacuum, I propose to employ a readily fusible material for forming the point or connection of the wires with the globe of the lamp, and I so arrange the carbon filament that when incandescent it shall fuse the said material in immediate contact therewith, and thus maintain and perfect the air-tight point. In order to avoid shocks to the light-giving material, I prefer to mount or suspend the bulb of an incandescent lamp on springs, providing it with flexible conductors.

And in order that my invention may be the better understood, I now proceed to describe the drawings hereunto annexed, reference being had to the figures and letters marked thereon.

Figure 1 shows a diagrammatic view of one of the simplest forms of my improved arrangement. The platinum wire P is used as an incandescent light-giving material, in conjunction with the carbon C, in parallel or alternative circuits, having their sections and lengths, and therefore their normal resistances properly proportioned. I arrange, in combination with the above, the sliding contact-spring S, movable upon a metal bar, B, in such a manner as to shorten or increase the length of the carbon in the circuit between the wires W and W¹, the current at the same time passing through the platinum P.

Any increase of current will take effect then on both the platinum and the carbon; but whilst on the one hand the greater heating of the wire increases its resistance to the current, on the other hand the heating of the carbon causes it to offer less resistance to the current, and more electricity to pass through it than before. The action of the current on the carbon is thus of a repeating or reduplicating character, any excess of current serving to remove resistance by heating, and thus to admit the passage of a further increase of current by that very heating. It is obvious that by this arrangement the platinum or other metallic wire may be heated to within a few degrees of its fusing point, and yet be safe under a great access of current, as the larger proportion will pass through the carbon, almost entirely relieving the wire of any excess, as the resistance of the latter is increased.

Without this carbon shunt a small excess of current would fuse the wire. I propose to take advantage of these electrical properties of carbon and metals to regulate any electric lamp, or to control an electro-magnetic machine, and for electric-lighting purposes generally.

Figure 2 shows my arrangement of both the metallic wire P and the carbon C enclosed in an exhausted glass globe G, and both used as incandescent lights. This globe is hermetically sealed, and the wires W W¹ are introduced in a special manner. The wires W W¹ are passed through the glass tube T, which has a pinched-together neck and a turned-over lip, as shown in detail in figure 3, so as securely to hold the wires. The tube T is passed through a stopper or cork K of conical shape, and is introduced into the neck of the globe, which is provided with a special circular bulge, *g*. Above the end of the cork, and filling the bulging neck of the globe, is placed a quantity of an easily melted lump or powdered composition, F, of similar carbonaceous character to that known as Chatterton's, which is composed of a mixture of tar, resin, and gutta-percha. At the last stage of exhaustion of the air I apply heat to the neck of the globe, and also make the filament incandescent, and melt the compound, which runs into and fills up all the pores in the stopper *k* and the interior of the tube T. The lip of the tube T and the bulge *g* in the neck of the globe both serve to prevent the atmospheric pressure from forcing either the tube or the composition into the globe. When filaments become incandescent, the composition at the top and in immediate vicinity to the wires becomes slightly solvent, and thus tends to keep the joint good. The composition is also slightly volatilized,

Improvements in obtaining Electric Light, &c.

volatilized, and the carbon vapour is precipitated upon the incandescent filament, thus feeding the filaments and preserving them from diminution. The joints at J are made with fine wire. I apply this improved form of joint, as above described, to any kind of electric lamp, whether with one incandescent filament or more.

Figure 4 represents a lamp in which the carbon filament C is alone placed inside a crescent-shaped exhausted globe, G, the platinum or other metallic incandescent filament P being placed outside. I attach the two filaments together, and support them in a metal holder, M, with clips, H. The wire P is held by the spring clips N N', which open and release the wire when pressed together at the lower part, or a taper screw-clip may be used for the same purpose. W W' are the main wires.

Figure 5 shows a front elevation, and figure 6 a section of another form of lamp, in which the platinum or other wire, P, connected to the main wires W W', is alone rendered incandescent. These wires are supported on the insulating slab V, and are inside a globe, G, which is almost air-tight, but not exhausted. The carbon resistance C, figure 6, is arranged inside the top of the standard A, and the adjustable contact brush S slides in a groove, B, and so raises and lowers the light in P. The action of the carbon and travel of the current is the same as in figure 1.

Figure 7 is a modification of figure 5, the sliding arrangement differing only in being operated by the rotation of a tap.

Figure 8 shows, by a diagram, the introduction of a resistance, R, into one of my improved lamps, so that when the light is put out by the movement of the spring S, the resistance R, equal to the former resistance of the lamp, is automatically introduced by the springs into the circuit.

Figure 9 shows the incandescent wire P contained in a separate exhausted globe supported on the flexible wires E within a second outer globe, G. The carbon resistance C is contained in the base, and is automatically adjusted as to its length in the circuit by the solenoid M and the sliding contact-rollers S. These rollers are attached to the iron core I, which is drawn in and out of the coil by the fluctuations of the main current through the solenoid and the reaction of the spiral spring. Any increase of the main current from W shortens the length of the carbon C, and the increase of temperature of the carbon also reduces its resistance. A very sensitive automatic regulator of the current through the wire P is thus provided.

Figure 10 shows the application of my carbon alternative circuit or shunt to the regulation of a number of lamps arranged either in series or in a parallel circuit. The solenoid coil M and carbon-rod C are arranged and operate as described in figure 9, but effect the regulation of the current through a series of lamps, and prevent damage to the lamps by any unusual or sudden excess of electrical current through the main circuit.

Figure 11 shows a construction of incandescent lamp in which the carbon filament C, bent into loop form, has pieces of platinum wire, P P, connecting its ends to the conductors W W', so that should the electricity be so strong as to endanger the filament C, the increased resistance of the platinum wires P P acts as a safeguard against injury to the carbon C.

And having now fully described the nature and object of my invention, be it known that what I consider novel and useful, and desire to protect by my Letters of Registration is—

First—The combination, in electric-light lamps or apparatus, of a material the electrical resistance of which decreases by heating, with a metal filament, the electrical resistance of which increases by heating, in parallel or alternative circuits, for purposes of control or regulation, substantially as described.

Second—In electric-light lamps, the combination with the above-claimed parallel circuits of a sliding contact S on the carbon shunt C, to regulate its length, and at the same time the degree of light from the lamp, as shown and described in reference to figures 1, 5, 6, and 7.

Third—In electric-light lamps, the combination with claim 1 of a solenoid M or electro-magnet, to automatically regulate the carbon C in one lamp, or in a series of lamps, according to the strength of current, as shown and described in reference to figures 9 and 10.

Fourth—In electric-light lamps, the combination with claim 1 of a resistance R, for the purpose hereinbefore described and shown in reference to figure 8.

Fifth—In electric-light lamps with exhausted globes, the construction of the air-tight joint with an elastic, carbonaceous, fusible, volatilizable material, F, as and for the purposes shown and described in reference to figures 2 and 3.

Sixth—The construction and general arrangement of the lamps shown and described in reference to figures 4, 5, 6, 7, and 9, consisting of a parallel circuit (claimed in No. 1), in combination with alternative subsidiary apparatus.

Seventh—The construction of incandescent lamps, substantially as described with reference to figure 11.

In witness whereof, I the said Tom Ernest Gatehouse have hereto set my hand and seal, this fifth day of May, one thousand eight hundred and eighty-two.

T. E. GATEHOUSE,
(By his Agent, EDWD. WATERS).

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 Tom Ernest Gatehouse, this twenty-eighth day of June, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Improvements in obtaining Electric Light, &c.

REPORT.

Sir, We have carefully examined the specification and drawings forwarded with Mr. T. E. Gatehouse's application for Letters of Registration, 82-5,819, and see no objection to his Petition being granted.

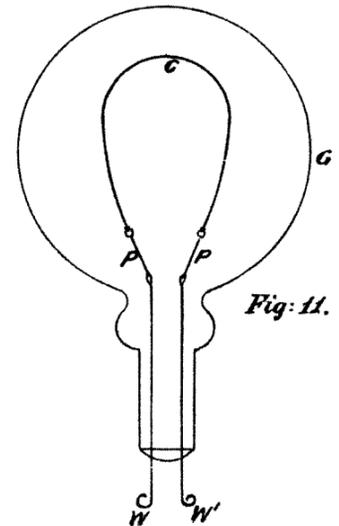
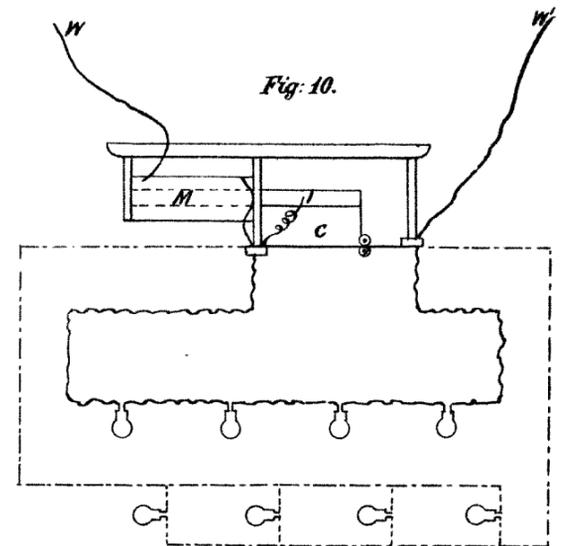
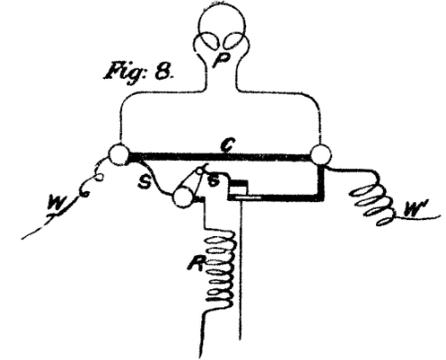
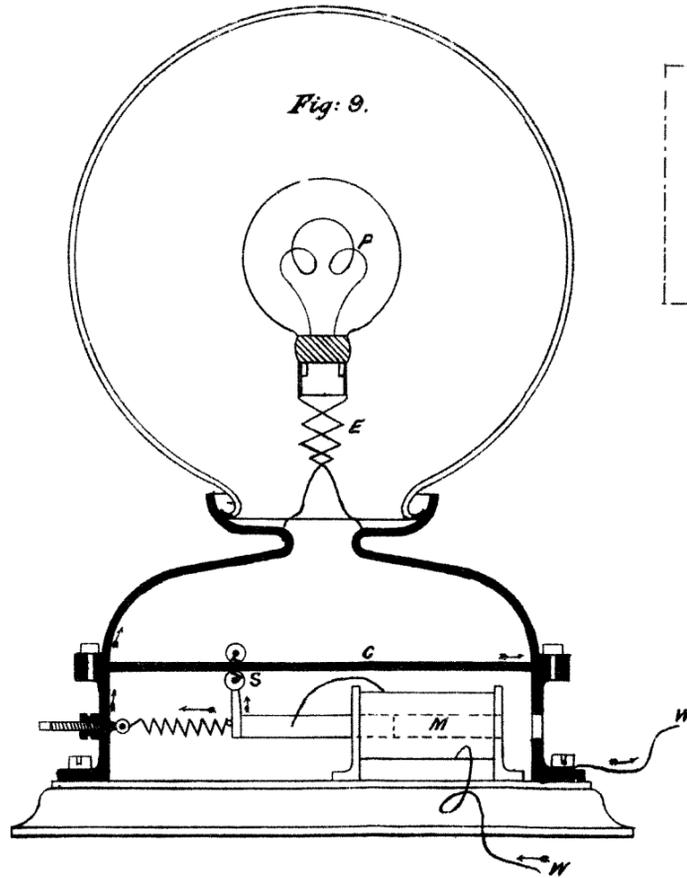
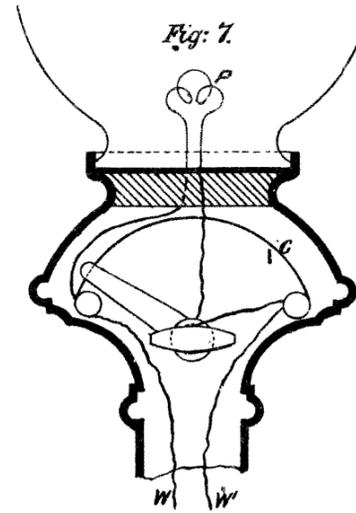
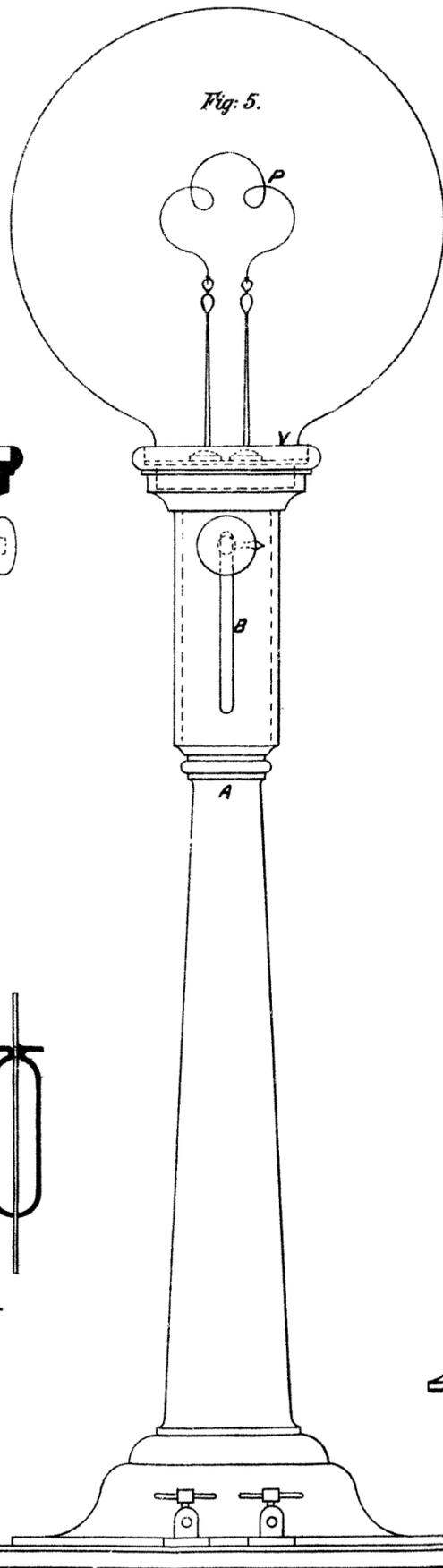
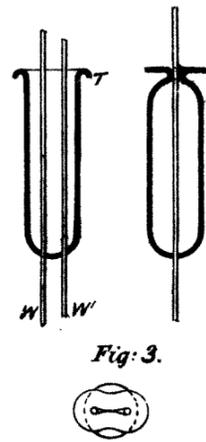
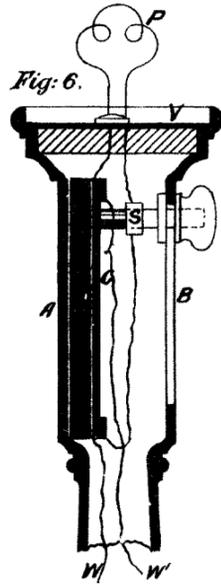
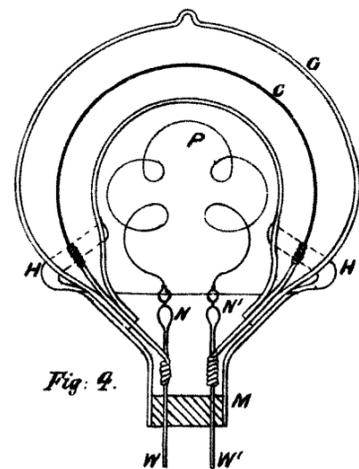
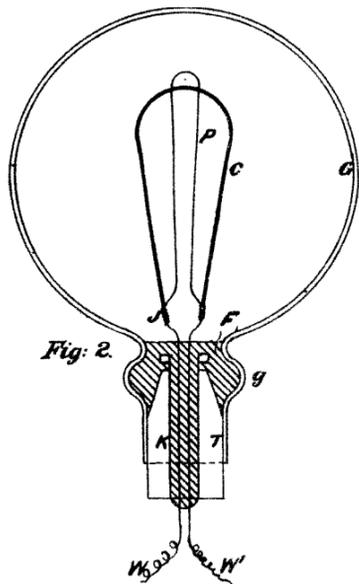
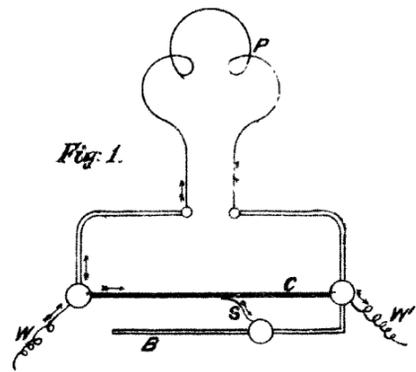
Sydney, 31 May, 1882.
We have, &c.,

E. C. CRACKNELL.
GOTHER K. MANN.

The Under Secretary of Justice.

[Drawings—one sheet.]

T. E. GATEHOUSE'S PATENT.



This is the Sheet of Drawings referred to in the annexed Letters of Registration granted to Tom Ernest Gatehouse, this twenty-eighth day of June, A. D. 1882. Augustus Loftus.



A.D. 1882, 28th June. No. 1094.

IMPROVEMENTS IN MACHINERY FOR CUTTING CLOTH, &c.

LETTERS OF REGISTRATION to Edgar Dredge, David Beath, and Joshua Alexander Kay, for Improvements in Machinery for cutting cloth, leather, rubber, wood, &c.

[Registered on the 28th day of June, 1882, 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 EDGAR DREDGE, mantle-maker, DAVID BEATH, merchant, and JOSHUA ALEXANDER KAY, engineer and machinist, all of Melbourne, in the Colony of Victoria, 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 Machinery for cutting cloth, leather, rubber, wood, &c.," 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 Edgar Dredge, David Beath, and Joshua Alexander Kay, 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 Edgar Dredge, David Beath, and Joshua Alexander Kay, 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 Edgar Dredge, David Beath, and Joshua Alexander Kay 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 June, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Machinery for cutting cloth, &c.

SPECIFICATION of an invention entitled "Improvements in Machinery for cutting cloth, leather, rubber, wood, &c."

WE, EDGAR DREDGE, mantle-maker, DAVID BEATH, merchant, and JOSHUA ALEXANDER KAY, engineer, all of Melbourne, Victoria, do hereby declare the nature of our said invention, and the manner in which the same is to be performed, to be particularly described and ascertained in and by the following statement, that is to say:—Our invention consists of a long frame of any required length, made of either wood or iron, on the cross rails of which are fastened four movable brackets for carrying four band pulleys, and which are placed as wide apart as may be desired. Around these four pulleys is stretched a steel band, knife, or saw, constructed to run at a great speed. Another short frame or trussel is fixed a little to one end of the long frame, on top of which is bolted a flat shanked spindle for carrying a large fly-wheel grooved on face for gut-band, to transmit motion to small grooved pulley cast on side of band pulley. This arrangement is only used when the machine is driven by hand power. Suspended from the top rail close to the cutting part of knife or saw is an adjustable guide, carrying a wooden slit guide block, to steady and prevent twisting of knife. The accompanying drawings will better illustrate what we mean:—AA are the two standards, into which are mortised and screwed two cross rails, A1 A1, constituting the frame; BB are shifting brackets to carry the band pulleys CC; D is the endless saw or knife; E is the short frame or trussel for carrying grooved fly-wheel F; G is the gut-band to transmit motion from fly-wheel to machine; H is wood slit guide block.

The novelty of our invention consists—first, in having two or more standards, or in other words, a support at either end of frame, thus obviating the necessity of a massive iron bed plate to carry the usually short projecting arm; and secondly, in having the adjustable wood slit guide blocks to steady and prevent twisting of knife or saw when cutting sharp circles. The end supports may be made to suspend from above like hanging brackets or as pillars from the floor. We do not confine ourselves to either the one plan or the other, so long as the principle of our invention is maintained, which is to gain unlimited space around the knife or saw. We thus produce, at a small cost, a durable machine, simple in construction, and capable (when for cloth-cutting) of taking in any required length of garment, without disturbing the various plies of material operated upon.

We claim the novelty of our invention, a band-cutting or sewing-machine, having two or more end supports to carry more or less cross rails of any required length, and adjustable wooden slit blocks as knife or saw guides, as herein described, and as shown on drawings.

In witness whereof, we, the said Edgar Dredge, David Beath, and Joshua Alexander Kay, have hereunto affixed our hands and seals, this second day of May, in the year of our Lord one thousand eight hundred and eighty-two.

EDGAR DREDGE.
DAVID BEATH.
JOSHUA A. KAY.

Signed, sealed, and delivered by the said Edgar Dredge, David Beath, and Joshua A. Kay, in the presence of,—

E. BURCHNE, }
ST. P. FOLEY, } Clerks to Beath, Schiess, & Co.

This is the specification referred to in the annexed Letters of Registration granted to Edgar Dredge, David Beath, and Joshua Alexander Kay, this twenty-eighth day of June, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

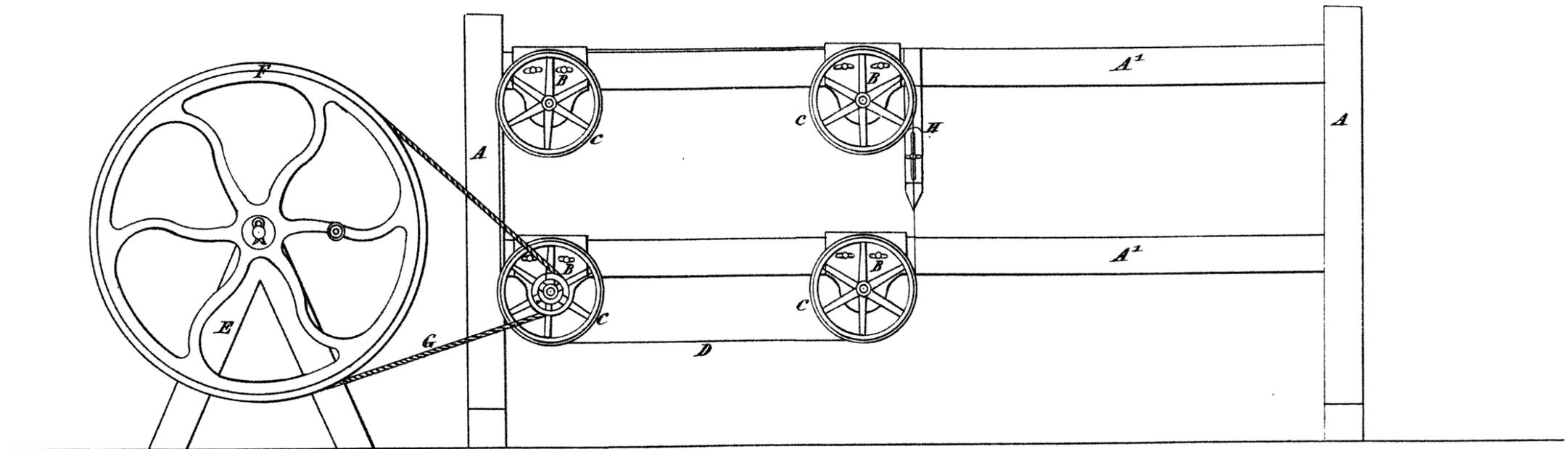
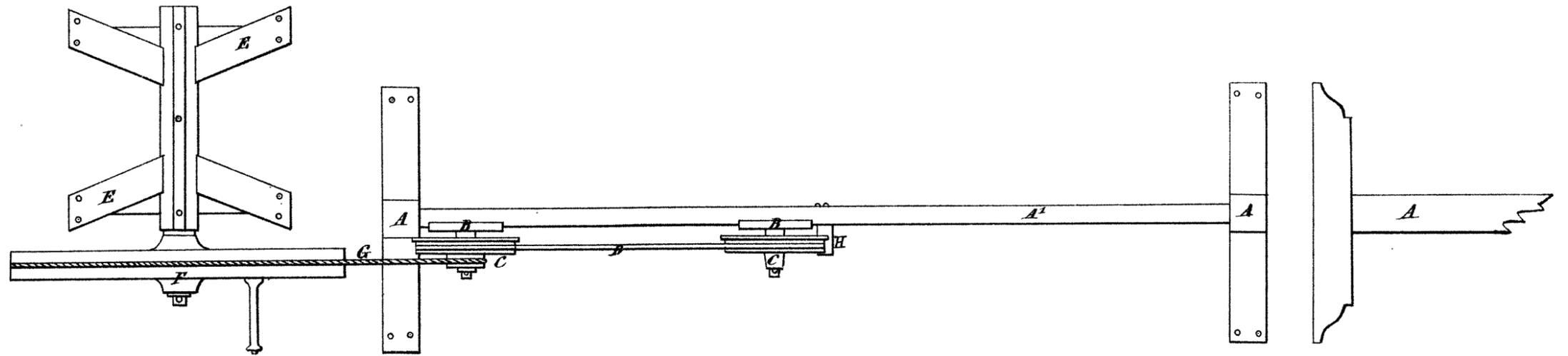
Sir,

The application of Messrs. Dredge, Beath, and Kay, for Letters of Registration for an invention entitled "Improvements in Machinery for cutting cloth, leather, rubber, wood, &c.," having been referred to us, we have examined the specification and drawing accompanying the same, and have 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.

The Under Secretary of Justice.



This is the Sheet of Drawings referred to in the annexed Letters of Registration granted to Edgar Dredge David Beath and Joshua Alexander Kay, this twenty eighth day of June 1882.

Augustus Loftus.

Sig 32.



A.D. 1882, 28th June. No. 1095.

HARRISON'S HYDROGEN SMELTING PROCESS.

LETTERS OF REGISTRATION to William Henry Harrison and John Cornelius Craigie Halkett, for an Invention entitled "Harrison's Hydrogen Smelting Process."

[Registered on the 28th day of June, 1882, 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 and JOHN CORNELIUS CRAIGIE HALKETT, both of Sydney, 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 "Harrison's Hydrogen Smelting Process," which is more particularly described in the amended 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 William Henry Harrison and John Cornelius Craigie Halkett, 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 Henry Harrison and John Cornelius Craigie Halkett, 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 Henry Harrison and John Cornelius Craigie Halkett 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 June, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Harrison's Hydrogen Smelting Process.

A.

AMENDED SPECIFICATION.

TO ALL TO WHOM THESE PRESENTS SHALL COME, WILLIAM HENRY HARRISON and JOHN CORNELIUS CRAIGIE HALKETT, both of Sydney, in the Colony of New South Wales, send greeting:

WHEREAS we are desirous of obtaining Royal Letters Patent for securing unto us Her Majesty's special license that we, our executors, administrators, and assigns, and such others as we 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 the reduction of metallic oxides and other ores to a metallic state, by certain chemical and mechanical contrivances, to be designated "An improved method of smelting ores by 'Harrison's Hydrogen Process'"; and in order to obtain the said Royal Letters Patent we must, by an instrument in writing, under our hands and seals, 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:—

We divide the above-named improved method of smelting by Harrison's Hydrogen Process into two separate systems or processes, viz.—"The direct Reduction Process," and "The Oxidizing Process"; the latter being devised for the purpose of converting certain ores into oxides, and subsequently reducing such oxides to a metallic state by the first-named "Reduction Process." The Reduction Process consists of a furnace which, as to its shape, may be rectangular, angular, circular, or elliptical, but we prefer it to be rectangular, its size determined by the amount of work designed. It is provided with a hearth of refractory material, being slightly dished near its centre. It is surrounded by a brick wall about fifteen inches high, from which is sprung the crown, through which at any convenient part thereof an aperture is pierced about twelve inches wide, and provided on the top with a door capable of being luted air-tight. A cistern is mounted on any convenient part of the crown, by preference of iron, or other metal, being about twenty inches deep by about thirty long, and fifteen inches wide, more or less. This cistern is termed the "main," on one side or end of which a gallery of stop-cocks, about three inches apart, is attached; the said stop-cocks being connected with a horizontal pipe by a vertical pipe, which horizontal pipe is termed "The waste-water pipe." This arrangement is for the purpose of maintaining any desired level of water in the main, which is also furnished with a pipe delivering water into it. The main is provided with a dip-pipe conducted to about three inches from the bottom of the main. The top of the dip-pipe is in communication with a pipe ascending from the crown of the furnace, which it pierces, being devised for the purposes of conveying unused gas and steam from the furnace to the main. The latter is furnished with an ascension pipe fitted into its top cover, which ascension-pipe is in connection with a gas-holder. Into one or more of the walls of the furnace one or more twyers are inserted, for injecting hydrogen, oxygen, or air, or they may be inserted through the crown or into the pillar hereinafter named and described, such gases being used in proportions and pressure as may be desired. The said twyers are of metal, and consist of a series of pipes arranged in two rows—the one imposed over the other—each row being in communication with one pipe provided with regulating-valve. The series of pipes in two rows serve as nozzles, and are enclosed in a water-jacket, as in ordinary water-twyers. The bottom part of the hearth is furnished with a pillar, which consists of a depression in the hearth, being about eight inches deep by four inches wide, more or less. Into the pillar two pipes or sets of twyers, as described, are inserted, for conveying oxygen or air and hydrogen gas. Above the pillar a perforated tile of any shape is fixed for the purpose of keeping the contents of the furnace from falling into the pillar; one or more working-doors are fitted into the walls of the furnace, each door place being fitted with a door capable of being luted air-tight; or instead of the furnace, as described, an ordinary retort is erected, its mouth-piece being provided with a main, as described, and a twyer inserted at the other end of the retort, for the purpose of forcing the said hydrogen gas into the retort. This is termed "The Muffle Furnace."

The oxidizing furnace is an ordinary reverberatory, being provided with a sump, furnished with slag and tapping-holes, and provided with one or more twyers, above described, either in the sides, through the crown, or into the lower part of the sump, as may be found desirable. This furnace is in communication with a condenser constructed as follows:—It is a chamber of wood or brick, or any material capable of resisting the action of sulphurous and other acids. Its length may be about twelve to fifteen feet; its height about 8 feet, and its width about 5 feet. This chamber is divided into compartments by diaphragms of brick or other suitable material, as above named, being 18 inches (more or less) apart, and fixed in such a manner that the first and each alternate diaphragms shall be opened about 6 inches from the water-level to be named hereafter, and closed at the top level of the chamber. The second and each alternate diaphragm are about 6 inches open from the top of the chamber, but sealed about 3 inches in the said water-level. A cistern is mounted on the top of the chamber, the bottom of which is floored, so that between the first and second, the fourth and fifth (and so on) shall be of perforated metal or material capable of resisting acids. The rest of the floor is of timber, and water-tight. The perforated spaces of the floor described are termed "douches." The cistern when in use is supplied with water. At one end of the chamber one or more pipes or flues are inserted in communication with the oxidizing furnace. At the opposite end of the chamber similar pipes or flues are inserted, communicating with a stack. Between each diaphragm above the water-level a door is provided, for the purpose of removing from the condenser its products of condensation. The bottom of the condenser is kept at a water-level about 8 inches from the floor by means of a syphon.

The method of the action of "The Reduction Process" is as follows:—The ore to be reduced is charged on to the hearth. The hydrogen and oxygen blasts turned on in such proportions and under such pressure as shall conduce to the most rapid method of bringing the ore to a temperature below its fusing point, which, being attained, the oxygen blast is turned off, the aperture through the crown and working-doors luted up, and the hydrogen blast urged so as to combine with the combined oxygen of the ore, the resulting steam and any hydrogen in excess escaping by the pipe into the main. The latter gas rising through

Harrison's Hydrogen Smelting Process.

Sir,

Sydney, 18 April, 1882.

We beg to acknowledge the receipt of the returned application of Messrs. Harrison and Halkett for Letters of Registration, accompanied by a letter from Colonel Halkett to yourself.

We have now the honor to report that we had a personal interview with those gentlemen, and have agreed to recommend that they be permitted to modify their claims.

We return the application and drawings herewith, and suggest that the applicants be permitted to substitute a fresh specification.

We have, &c.,

A. LEIBIUS.

CHAS. WATT.

The Under Secretary of Justice.

Sir,

Sydney, 31 May, 1882.

In the matter of the application of Messrs. Harrison and Halkett, for Letters of Registration for an invention entitled "Harrison's Hydrogen Smelting Process," which has again been referred to us in an amended form, we have the honor to report further that we now see no objection to the issue of Letters of Registration as prayed for.

We have, &c.,

A. LEIBIUS.

CHAS. WATT.

The Under Secretary of Justice.

[Drawings—two sheets.]

AN IMPROVED METHOD OF SMELTING BY HARRISON'S HYDROGEN PROCESS.

Scale of Feet.



Fig. 1.

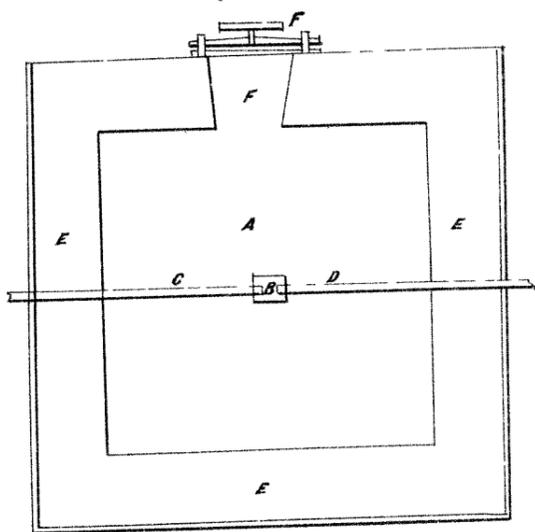


Fig. 2.

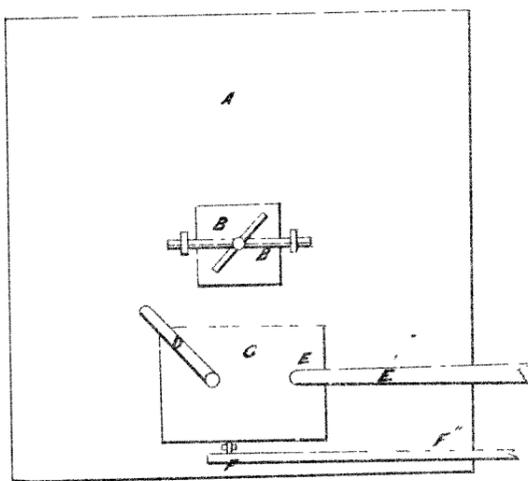


Fig. 3.

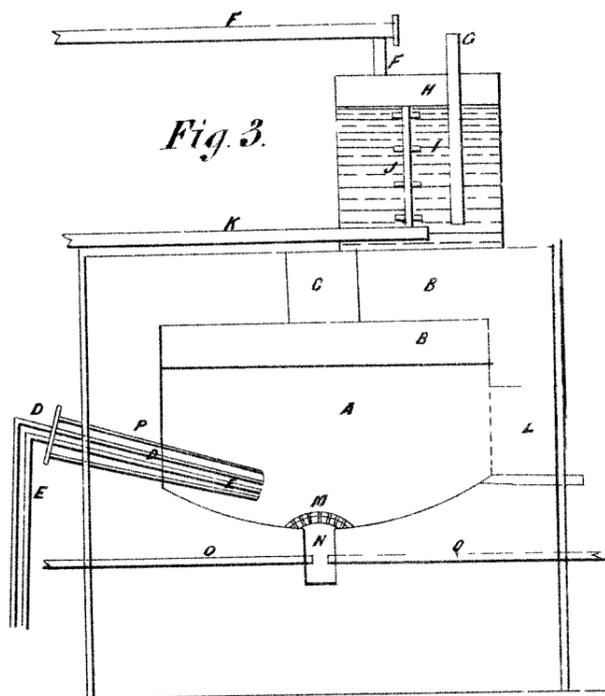


Fig. 4.

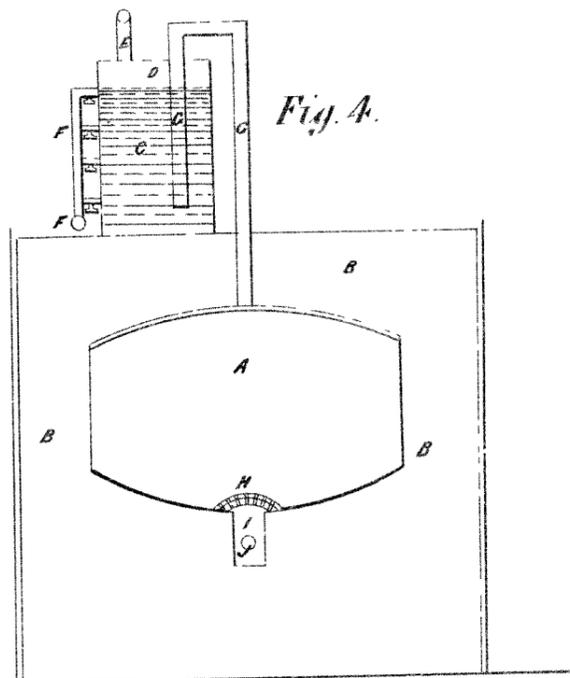
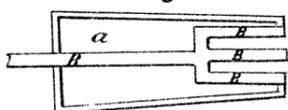
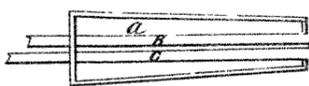


Fig. 5.



Plan of Trayer

Fig. 6.



Section of Trayer

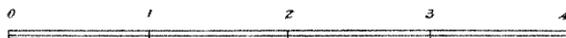
This is the Sheet of Drawings marked B referred to in the annexed Letters of Registration granted to William Henry Harrison, and John Cornelius Craigie Halkett, this twenty eighth day of June, A D 1862.

Augustus Loftus.

W. H. Harrison & J. C. Halkett
10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100

AN IMPROVED METHOD OF SMELTING BY HARRISON'S OXY-HYDROGEN PROCESS.

Scale for Figs 5, 6 and 7



Scale for Figs 8 and 9

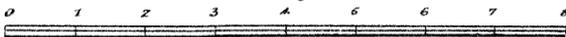


Fig 5.

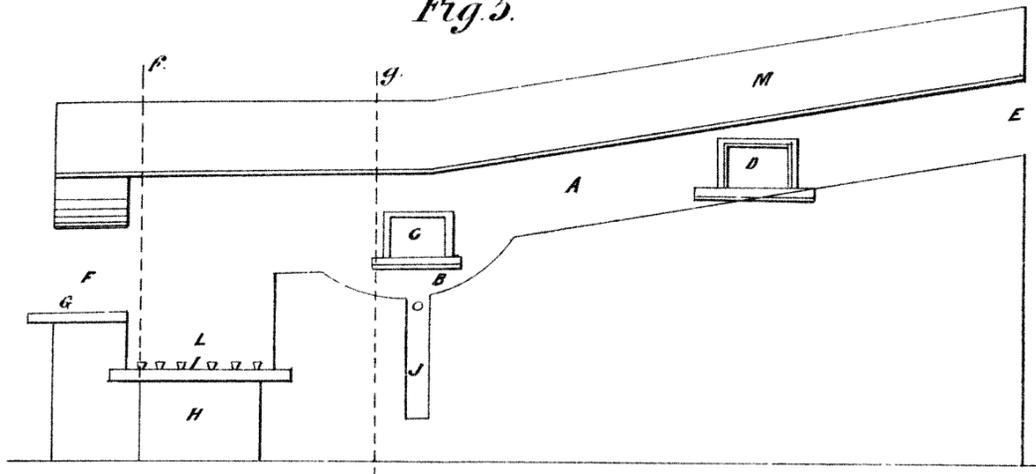


Fig 6.

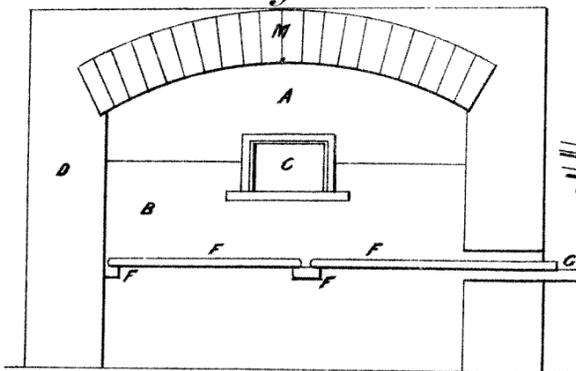


Fig 7.

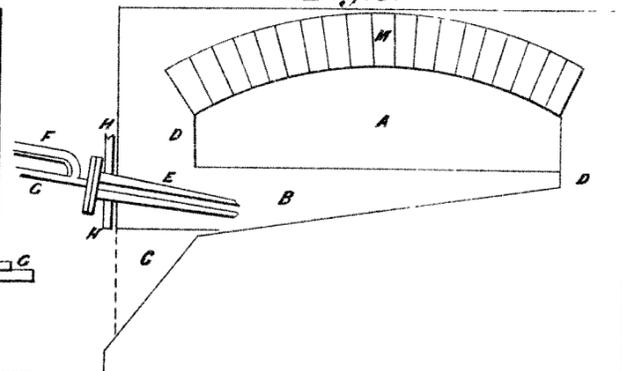


Fig 8.

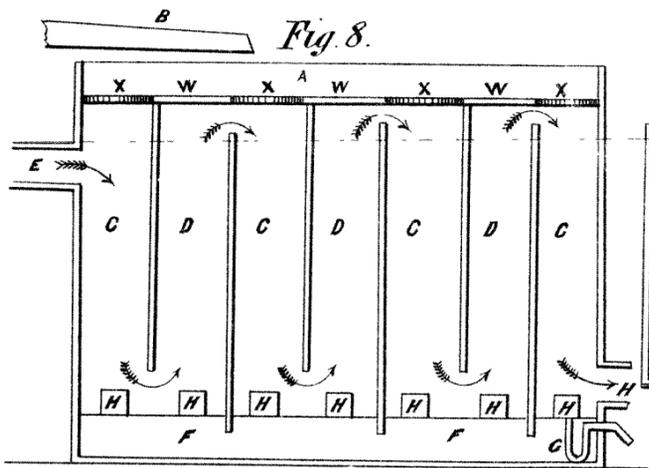
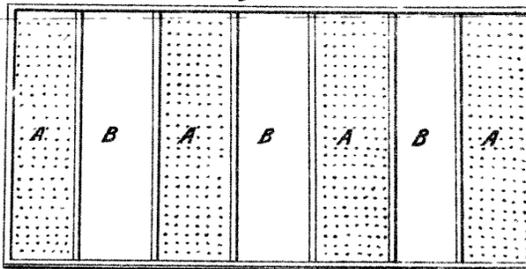


Fig 9.



This is the Sheet of Drawings marked C referred to in the
conceded Letters of Registration granted to William Henry
Harrison and John Cornelius Graze Balfett, this twenty eighth
day of June A.D. 1852.

Augustus Loftus.

W. H. Harrison
John Graze
June 28 1852.



A.D. 1882, 12th July. No. 1096.

THE DRY-BLOWING ORE SEPARATOR,

LETTERS OF REGISTRATION to Thomas Kenedy Park, for an invention entitled "The Dry-blowing Ore Separator."

[Registered on the 12th day of July, 1882, 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 KENEDY PARK, 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 "The Dry-blowing Ore Separator," which is more particularly described in the specification and the sheet of photographs 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 Kenedy Park, 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 Kenedy Park, 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 Kenedy Park 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 twelfth day of July, in the year of our Lord one thousand eight hundred and eighty-two.

[L. S.]

AUGUSTUS LOFTUS.

The Dry-blowing Ore Separator.

SPECIFICATION.

TO ALL TO WHOM THESE PRESENTS SHALL COME: I, THOMAS KENEDY PARK, of Sydney, in the Colony of New South Wales, send greeting:

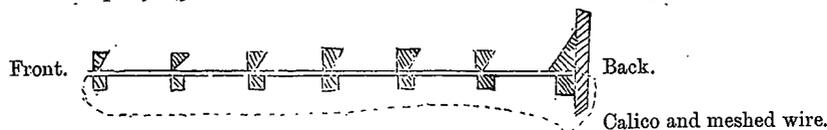
WHEREAS I am desirous of obtaining Royal Letters Patent for securing unto me Her Majesty's special license that I, my executors, administrators, and assigns, and such others as I or they should at any time agree with, and no others, should and lawfully might, from time to time, and at all times during 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 of, exercise, and vend, within the Colony of New South Wales and its dependencies, an invention hereafter known as "The Dry-blowing Ore Separator"; and in order to obtain the said Letters Patent, I must, by an instrument in writing under my hand, 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:—

My invention relates to separators and concentrators, as applied to the collecting and saving of gold and other precious metals from dry earth, gravel, sand; tailings, wash-dirt, pyrites, &c.

The general arrangement of my invention (as will be seen from accompanying photograph, which is of a machine made according to my invention) consists of a box or receiver open on one side (which side shall hereinafter be known as the front side), and mounted upon a convenient form of frame or stand. On the top, and at the back side of this box, is formed a bell-mouthed opening or hopper, through which the dry earth or similar material to be acted upon is fed or delivered. Under the top of, and in the box, and communicating with the hopper by a small opening, is placed in a horizontal slide a trough having a meshed wire bottom, presenting two inclined planes, so, A—B. This trough or sieve extends across the machine (from end to end) and also projects beyond the ends, and is made of suitable breadth and depth. When the machine is in operation, a reciprocating motion is given to this trough or sieve, by an arrangement hereinafter described. So as to regulate the delivery of dry earth, &c., from the hopper into the trough or sieve, means are provided to reduce or increase the quantity at pleasure. Under the trough or sieve, at a convenient distance, is fixed a frame, hereinafter known as the ripple frame. This frame is removable, and is held in its place during the working of the machine by means of tapered keys or similar arrangement. It is placed so as to incline towards the front or open side of the box, and forms the bottom of said box.

The ripple frame is formed of calico and meshed wire, or similar materials—the calico on the top of the wire—stretched upon a wooden frame or between two frames, and into a number of shallow compartments similar to accompanying sketch, which shows a cross section through the centre.



Underneath the ripple frame are fixed bellows (or a blow-fan) which are operated by an arrangement afterwards described, and which direct a current or currents of air upward against the meshed wire and calico of the ripple frame. The ripple frame, as well as forming the bottom of the box or receiver, it will be seen, also forms the top of the air chamber of the bellows or fan, and in consequence receives the whole of the air produced directly against the bottom side. Escapes are provided, so as to regulate the strength of the current or currents of air. A hinged shutter or flap is fixed to the front of the frame, and can be brought over the open side of the box during the working of the machine, so as to shut in the dust. Motion is given to the reciprocating sieve, and also to the bellows or blow-fan, by an ordinary arrangement of wheels, &c., operated by hand, horse, or steam power, which can be fixed to the machine in any convenient manner. From its extreme lightness and convenient arrangement, the machine is rendered portable, and can be removed from place to place with little trouble, either by pack-horse or by men. In the latter case poles are used, by which two men can carry the machine with the greatest ease.

The explanation of the action of my invention will refer particularly to a machine constructed upon a plan similar to accompanying photograph. Dry earth, &c., from which it is desired to separate gold or other precious metals, is thrown into the bell-mouthed opening or hopper on the top of the machine, from which it finds its way through an opening at the bottom of the hopper, and falls into the trough or sieve previously described. This trough rests in a slide, and is agitated backwards and forwards across the machine by means of a connecting rod attached to the end, and worked by an eccentric fixed on the lower shaft, shown on the photograph, which shaft receives its motion by a wheel and pinion driven or propelled by a crank handle. The bottom of the trough or sieve is formed of meshed wire, so, A—B, and portions of the dry earth, &c., which may be too large to pass through the meshes, gradually slide down the inclines, and are ejected at A and B, through openings in the side of the frame provided for that purpose. These portions may be allowed to fall to the ground or be caught in boxes. Those portions of the dry earth, &c., which pass through the meshes of the sieve, fall on to the ripple frame previously described, and are kept in a bubbling motion, or agitated, by the current or currents of air which is or are directed against the under side of the ripple frame as previously described. The current or currents of air is or are produced by bellows fixed under the ripple frame, and operated by a connecting rod attached to a crank fixed on the lower shaft—shown in photograph—kept in motion by the same means as is the reciprocating sieve. The agitation or bubbling motion imparted to the dry earth, &c., causes it—in consequence of the inclination at which the ripple frame is set—gradually to run towards the lower side of the ripple frame, and ultimately out through the open side of the box, leaving the gold or other precious metals lying in the compartments on the ripple frame. The retention of the gold is effected by its greater weight in comparison to the dirt, &c., by the bevelled form given to the strips of wood on the frame, shown in sketch of section, and also by the clinging nature of the calico which is stretched on the frame. When a quantity (say a ton) of dry earth, &c., has been passed through the hopper and over the ripple frame, the latter

Nature of the invention.

Arrangement of the invention.

Action of the invention.

The Dry-blowing Ore Separator.

latter is lifted out and the gold removed. The ripple frame is then returned to its place, and work continued as before. At the close of a day's work, the gold collected can be again passed over the machine and finally separated.

Having now particularly described and ascertained the nature of my invention and in what manner the same is to be performed or carried out in practice, I hereby wish it to be distinctly understood that it is not necessary for the successful working of my invention that any portion of it should be exactly in position, size, or shape to those shown in accompanying photograph, nor that any particular material be employed in the construction of my invention; also, that the current or currents of air directed on to the underside of the ripple frame may be produced by any form of bellows or blow-fan, or by any contrivance which may be capable of producing a current or currents of air, and that the motion required to operate the same, as well as the reciprocating sieve, may be effected by any means whatsoever, without interfering with the successful working of my invention. I also hereby declare that I claim the invention of the "Dry-blowing Ore Separator," as applied to the separating and concentrating of gold and other precious metals from dry earth, gravel, sand, tailings, washdirt, pyrites, &c., substantially as hereinbefore set forth and described, wherein the following are important points or features, and which I claim as belonging exclusively to my invention, that is to say:—

Firstly—The general arrangement of the Dry-blowing Ore Separator, as hereinbefore described, or any mere modification thereof.

Secondly—The application of my invention to the separating and concentrating of gold and other precious metals from dry earth, gravel, sand, tailings, wash-dirt, pyrites, &c., substantially as hereinbefore described.

Thirdly—The general arrangement and construction of the ripple frame, that is to say, its division into shallow compartments, the bevelled side of the strips of wood which form the same, also the bottom formed of meshed wire and calico, or similar materials, all substantially as hereinbefore described, or any mere modification thereof.

Fourthly—The introducing or directing a current or currents of air upward from the bellows or fan on to the underside of the ripple board, and vertically through the bottom of the same, thereby causing the thorough agitation of the dirt, &c., and effectively separating the gold and other precious metals from it, all substantially as hereinbefore described, or any mere modification thereof.

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 hereinbefore described to be a new invention, as to the public use and exercise thereof, and I do not know or believe that any other person or persons than myself is or are the true and first inventors 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.

T. K. PARK.

Witness—

L. C. RUSSELL JONES,
Solicitor and Notary Public.

This is the specification referred to in the annexed Letters of Registration granted to Thomas Kenedy Park, this twelfth day of July, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 7 June, 1882.

We have the honor to inform you that, having examined the specification and photographs of an invention by Mr. Thomas Kenedy Park, of Sydney, of an apparatus for the separating and concentrating of gold and other precious metals from dry earth, gravel, sand, quartz, tailings, &c., we see no objection to the issue of Letters of Registration as prayed for.

We have, &c.,

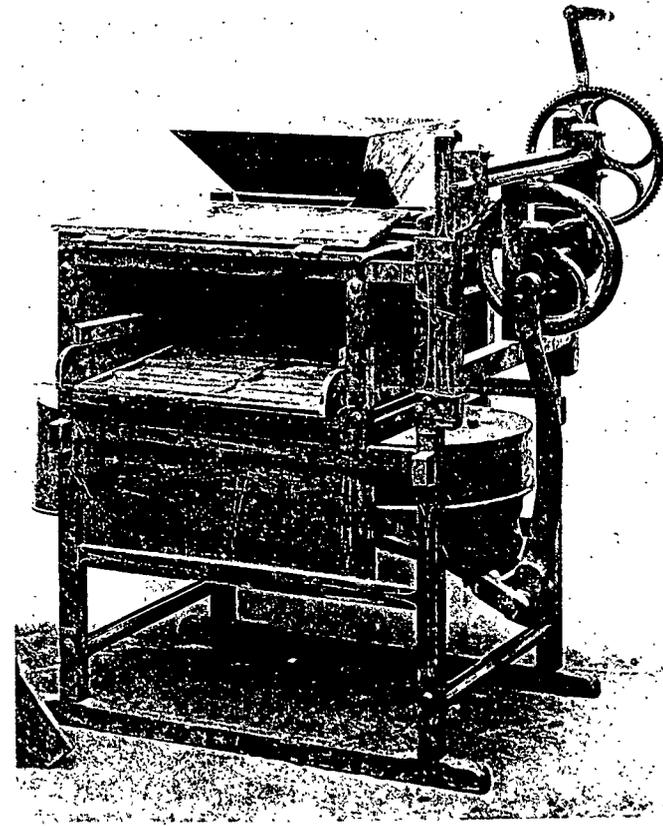
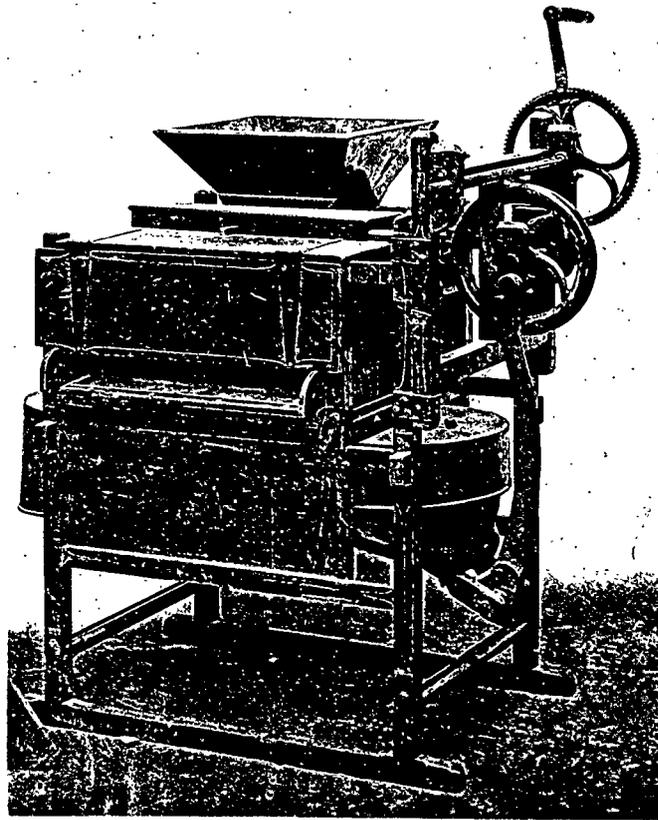
A. LEIBIUS.
CHAS. WATT.

The Under Secretary of Justice.

[Drawings—one sheet.]

No. 1097.

[Assignment of No. 1087. See page 229.]



*This is the Sheet of Photographs referred to in the annexed
Letters of Registration granted to Thomas Kenedy Park,
this twelfth day of July, A.D. 1882.*

T. K. Park.

Augustus Loftus.



A.D. 1882, 1st August. No. 1098.

IMPROVEMENTS IN THE MANUFACTURE OF EXPLOSIVES.

LETTERS OF REGISTRATION to Walter Francis Reid and David Johnson, for
Improvements in the manufacture of Explosives.

[Registered on the 2nd day of August, 1882, 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 WALTER FRANCIS REID, of Stowmarket, and DAVID JOHNSON, of Chester, both in
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 the manufacture of Explosives," 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 improve-
ments 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 Walter Francis Reid and
David Johnson, 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 Walter Francis Reid and David Johnson, 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 Walter Francis Reid and David Johnson 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 Registra-
tion, 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 first day of August, in the year of our Lord
one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in the manufacture of Explosives.

SPECIFICATION of WALTER FRANCIS REID, of Stowmarket, and DAVID JOHNSON, of Chester, both in England, for an invention entitled "Improvements in the manufacture of Explosives."

HERETOFORE all explosive granulated powders containing nitro-cellulose or other solid organic nitro-compounds have been comparatively loose in texture and easily compressible, so that the ballistic effect of such powders, and the strain produced by their explosion upon the barrel of the gun, varied according to the degree of compression to which they were subjected in loading the cartridge or gun.

The object of this invention is to produce a powder of hard and uniform grain, the use of which is free from the irregularities due to the variations of pressure in loading cartridges and guns.

In carrying out our invention, we take explosive powders containing nitro-cellulose or other solid organic nitro-compound, which have been granulated by ordinary and well-known methods. We moisten the granulated powder with ethylic or methylic ethers or alcohols, or any mixture of these, whether with each other or with other liquids.

The amount and proportion of liquid required to saturate the granulated powder vary according to the size of the grains and the nature of their composition, but from 50 to 80 parts by volume of the liquid will, in most cases, be found sufficient to moisten 100 parts by volume of powder granulated in the usual manner. After the addition of the liquid the powder is dried, during which process the volatile portions may be recovered and afterwards used again. The grains, which adhere slightly to each other, are then separated by rubbing them through a sieve, and are ready for use. If necessary, suitable substances, which are soluble in the liquids which we employ, may be added to them for the purpose of water-proofing the powder or modifying its explosive properties; but we have found that compounds of nitro-cellulose, which are hygroscopic when their texture is loose, do not absorb moisture when they have been hardened in the manner described.

We claim hardening grains of explosive powders containing nitro-cellulose or other solid organic nitro-compounds, substantially as heretofore described.

In witness whereof, we, the said Walter Francis Reid and David Johnson, have hereto set our hands and seals, this eighth day of February, 1882.

WALTER F. REID.
DAVID JOHNSON.

Witnesses—

E. G. BREWER, }
E. W. ECAILLE, } 33, Chancery-lane, London, England.

This is the specification referred to in the annexed Letters of Registration granted to Walter Francis Reid and David Johnson, this first day of August, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Having examined the specification accompanying the Petition, we have the honor to recommend that Letters of Registration should be issued to Messrs. Reid and Johnson, for an invention entitled "Improvements in the manufacture of Explosives," as described in the specification attached to their Petition.

We have, &c.,

E. O. MORIARTY.
JOHN WHITTON.

The Under Secretary of Justice.

Sydney, 15 June, 1882.



A.D. 1882, 1st August. No. 1099.

BLADEN'S IMPROVED RAIL AND GUARD FOR TRAMWAYS.

LETTERS OF REGISTRATION to Thomas Bladen, for an Improved Rail and Guard for Tramways.

[Registered on the 2nd day of August, 1882, 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 BLADEN, of Merville House, 31, Darlinghurst Road, Sydney, iron 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 entitled "Bladen's Improved Rail and Guard for Tramways," which is more particularly described in the specification and the drawing 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 Bladen, 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 Bladen, 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 Bladen 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 first day of August, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Bladen's Improved Rail and Guard for Tramways.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, THOMAS BLADEN, of Merville House, 31, Darlinghurst Road, Sydney, iron manufacturer, 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 shall at any time agree with, and no other, shall and lawfully may, 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, Sydney, make, use, exercise, and vend, within the Colony of New South Wales, an invention of an improved rail and guard rail combined, for tramways, to be called "Bladen's Improved Rail and Guard for Tramways," as more particularly described in the following specification and drawing, and in the model also forwarded herewith, viz. :—

SPECIFICATION.

The object of my improvement is to effect greater strength with less weight in tram rails ; greater simplicity, at less cost ; and facility of keeping the groove more open and clear than can be compassed in any tram-rails at present in use. To effect this, I propose re-rolling the ordinary T rails to form small projection, on which a rectangular web or arm, formed in rolling the guard, would rest, and form, when the rail and guard are bolted together, a rigid girder, resisting direct or slant shocks from wheels, in indentation or bulging the guards, and completing a sure and convenient groove for the flange of the wheels. In these two features and their combination are the improvement which I seek to protect ; the projections below the head of the rail, and the web or arm springing from the guard, and resting upon the projections ; these when bolted together give perfect strength and consistency to the whole structure. This may be more clearly understood by the following more precise description, wherein the letters answering to portions of the tram-rail on the plan are given :—The ordinary T rail, shown on the drawing as A B, is to be rolled with the small projections C C on both sides, either at intervals or continuous, and situated just below the head or shoulder D of the rail A B, and the guard E F is to be rolled with a rectangular web or arm, G, which, when the rail A B and guard E F are bolted together by the bolt H, would rest on the projections C C, and be firmly fixed between C and the shoulder D, and thus form a rigid girder and convenient groove for the flange of the wheel of all motors and carriages. The work may either be iron or steel.

ADVANTAGES.

The advantages claimed for the improved rail and guard are—

First—Maximum of strength with minimum of weight.

Secondly—Cheapness, from the absence of heavy blocks of iron now used for adjusting the gauge between the rail and the guard.

Thirdly—Greater simplicity in construction of line ; and

Fourthly—The facilities for keeping the groove open and clean easily and cheaply.

And having now described my invention or improvement, and enumerated its advantages, I claim specially as novelties of importance—

First—The projections in rolling the rails ; and

Secondly—The web or arm in rolling the guards, as already described and set forth.

And generally, I claim the combination of the rails and guards in the manner and for the purpose already herein stated and set forth.

15, Wentworth Court, 1 June, 1882.

THOMAS BLADEN,
(By HENRY HALLORAN, Agent).

This is the specification referred to in the annexed Letters of Registration granted to Thomas Bladen, this first day of August, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Having examined the specification and plan accompanying the Petition, we have the honor to recommend that Letters of Registration should be issued to Mr. Thomas Bladen for an invention entitled "Improved Rail and Guard for Tramways," as shown in the drawing and described in the specification attached to his Petition.

The Under Secretary of Justice.

Sydney, 15 June, 1882.

We have, &c.,

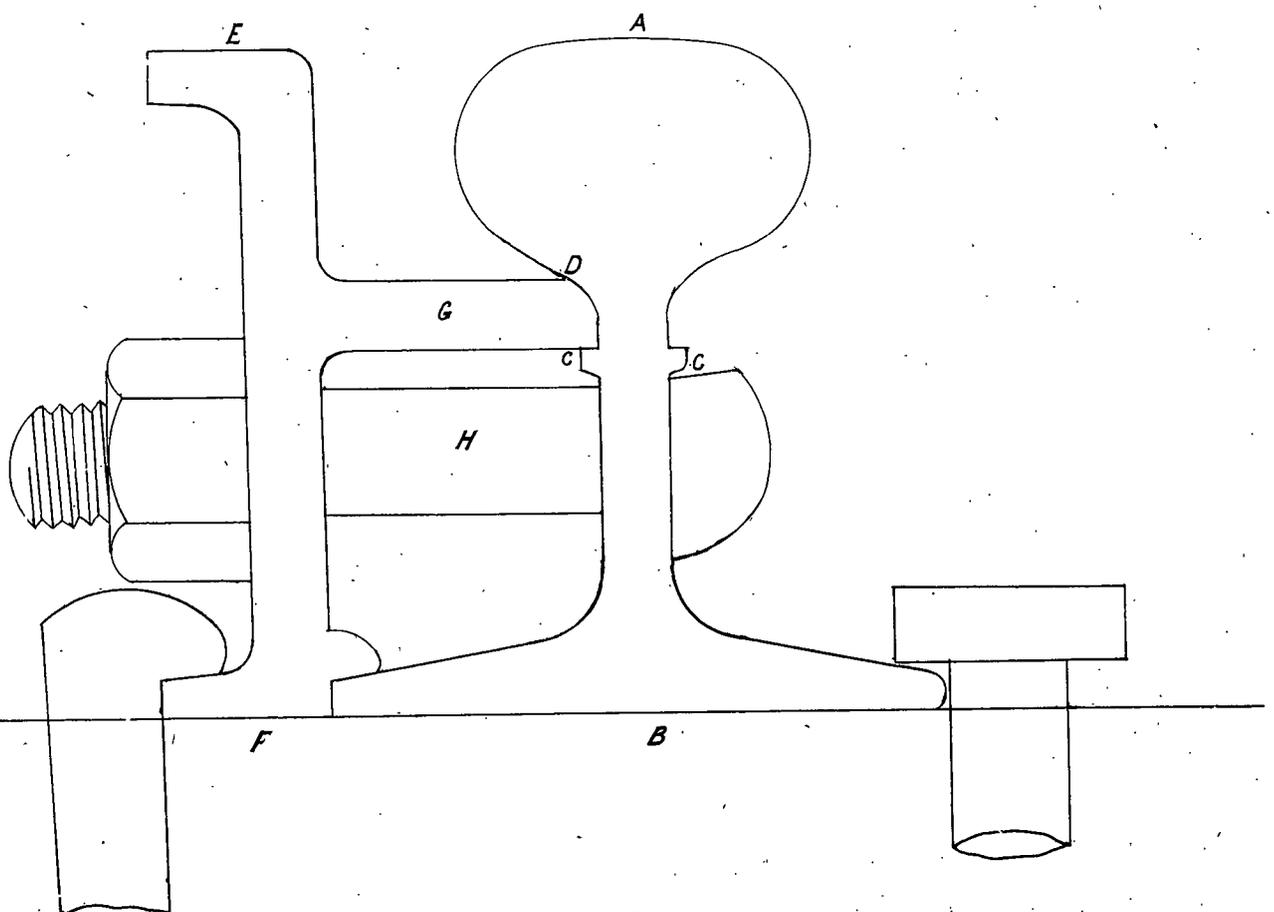
JOHN WHITTON.
E. O. MORIARTY.

[Drawing—one sheet.]

No. 1100.

[Assignment of No. 1036. See page 35.]

BLADEN'S IMPROVED RAIL AND GUARD FOR TRAMWAYS



*This is the Drawing referred to in the annexed
Letters of Registration granted to Thomas Bladen, this
first day of August, A.D. 1882.*

Augustus Loftus.



A.D. 1882, 10th August. No. 1101.

THE AUTOMATIC FRUIT EVAPORATOR.

LETTERS OF REGISTRATION to Frederick Arthur Pulleine, for an invention entitled "The Automatic Fruit Evaporator."

[Registered on the 11th day of August, 1882, 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 ARTHUR PULLEINE, of Kent Town, in the Province of South Australia, fruit preserver, 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 Automatic Fruit Evaporator," 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 Frederick Arthur Pulleine, 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 Arthur Pulleine, 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 Arthur Pulleine 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 August, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

The Automatic Fruit Evaporator.

SPECIFICATION.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, FREDERICK ARTHUR PULLEINE, of Kent Town, in the Province of South Australia, fruit preserver, send greeting :

WHEREAS I, the said Frederick Arthur Palleine, am the inventor of certain improvements in the preservation of fruit and other organic substances, known as "The Automatic Fruit Evaporator": Now know ye that I, the said Frederick Arthur Palleine, 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), which is a full, clear, and exact description, reference being had to the accompanying drawings and to the letters of reference marked thereon.

Figure 1 is a side elevation and partial section of a drier constructed and arranged in accordance with my invention ; and figure 2 is a front view, partly in section, of the apparatus illustrated in figure 1 ; figure 3 is a perspective view of one of the trays which form a part of the drier proper, the same being detached from the stack, and one section of its bottom being elevated from its seat, the better to show its general construction and arrangement ; and figure 4 is a like view, indicating the peculiar construction of an intermediate tray, in which a portion is made capable of being withdrawn for purposes of inspecting the fruit or meat thereon without disturbing the remaining trays in the stack ; figure 5 illustrates the base of the stack, with two trays having metal corners of peculiar construction, supported by a mechanical contrivance which couples or bears against the lowermost tray, while a third is inserted below it, which system is repeated till the stack is complete.

Like letters of reference in all the figures indicate corresponding parts.

My invention has relation to that class of machines intended for the drying of fruit, vegetables, meats, &c., by the application of artificial heat, and it consists essentially in an improved means of forcing or inducing a rapid flow of the heated air through the material upon the trays ; in a novel and useful construction of the main trays so that they may be more easily handled when loaded than heretofore ; in the provision of a sliding bottom, by use of which the material being operated upon may be conveniently inspected without disturbing any of the remaining trays ; and in certain peculiarities of construction and relative arrangements or combinations of parts, all of which will be hereinafter first fully described and then pointed out in the claims.

A is the base of the machine, supposed to rest upon a platform immediately surrounding it, and affording a standing place for the operators ; and B is a portion of a hot-air furnace below the platform or in other convenient locality, which furnishes the required amount of heated air. The air from this heater passes up through the stack of trays C, the rims or walls of which, when properly matched and located one upon the other, make up the outer walls of the drier, and at the same time the flue through which the heated air is compelled to pass, and in which the fruit or material, &c., is located.

In the drying of fruit and vegetables, it is found that as the air becomes charged with the moisture therefrom its upward movement becomes more and more sluggish, requiring an increased consumption of fuel in order to produce a degree of heat sufficient to force it through the material ; and in passing through the material on the trays this highly heated air shrivels and contracts the material, &c., in some lines more than in others, necessitating a careful watching of the contents of the drier so as to avoid uneven results—a feature to which my improved construction of trays has special reference.

To obviate this excessive consumption of fuel, and, in consequence, to render the drying more uniform and perfect, it becomes necessary to provide some means of increasing the draft through the drying-flue ; and to do this cheaply, effectively, and conveniently, I construct my apparatus as follows :—Over the stack of trays or over the flue I locate a hood, D, the lower mouth of which may be made of the proper size to envelope the upper extremity of the stack, and connect the upper mouth with the chimney E. This chimney is supported above the position of the stack of trays, which stack, as it is gradually increased in height, approaches the mouth of the chimney. This arrangement leaves a clear space beneath the chimney for manipulation of the trays, and the chimney is not supported upon any casing for the trays, such as immediately surrounds them in previous forms of driers, and prevents immediate access to them.

The timbers above the platform on which the workmen stand form the special points of support for the chimney, which may be made to depend therefrom by the application of suitable mechanical attachments, which will readily suggest themselves to the builder.

From the heater B the smoke-pipe F is carried up into the chimney E, just above the hood D, and out at the top of the chimney, or at least up into the region of the top. To secure the best advantages this smoke-pipe should be about centrally located within the chimney, and it should be so arranged as not to interfere with the convenient workings of the drier.

From this arrangement it will appear that the heat in the smoke-pipe, which would otherwise be wasted, will be imparted to the moisture-charged air above the drier, and this in turn will have a greater tendency to rise and pass off through the chimney, inducing a more rapid flow of air through the drying-flue, in accordance with well-known principles of pneumatics. The desired increased air-draft is thus economically produced, and the more thorough and uniform drying is accomplished. By increasing the draft in this manner,—that is, after the air leaves the contents of the trays,—the condensation of moisture upon the top tray is obviated.

Around that part of pipe F, between the first floor and its connection with the chimney, I propose to place a jacket, G, the purpose of which is to confine the heat which would otherwise be radiated therefrom, and to conduct this to the chimney, also thereby aiding the draft within the air-flue, and at the same time excluding the heat from the work-rooms, which are upon the first and second floors.

Around the hood is a canvas or other flexible curtain, H, hanging down sufficiently far to envelop some of the upper trays and to exclude air, which would otherwise enter the hood from the outside of the stack.

To remove a tray from the top the curtain may be easily drawn out of the way, and will immediately resume its place after the tray is detached from the stack. Since the hood remains stationary the curtain forms

The Automatic Fruit Evaporator.

forms a convenient prolongation thereof, useful at such times as before the stack reaches its ultimate height; and inasmuch as the curtain will immediately resume its proper place after having been disarranged, but little fresh air can enter to cool and check the draft through the stack.

The apparatus herein specially alluded to is generally of large size, and its economical use requires about twenty or twenty-five trays for drying peaches, and thirty or more for apples, &c.; though of course it may be made up of any desired number of trays.

The canvas curtain enables me to employ the same machine with varying numbers of trays. The trays are also of any desired size, but in the larger machines their exposed surfaces are of such extent as to render them inconvenient and difficult to handle; especially when loaded with fruit. For this reason I make the bottoms in two sections, as indicated in figure 3, and so arrange them that they may be removed from the main frame of the tray if desired.

The exterior rim *a a a* of the tray is provided with an interiorly-projecting ledge *b b*, upon which the removable bottoms *c c* find a support when in place; and to prevent disarrangement of the rim, the diagonal tie-rods *d d* are secured as shown beneath the proper position of the bottom sections. A central division strip, *e*, separates the tray into two nearly equal parts, and this strip is also provided with a projecting ledge similar to *b b*.

The perforated bottom *C* is mounted in a light frame-work, composed of an upper and an under strip, *g h*, of such size as to fit the compartment between walls *a a* and division strip *e*, and upon this frame are mounted the handles *f f*, by which the sectional bottom may be removed. If desired, also, the sectional bottoms may be provided with stiffening pieces *k k*, the purposes of which are apparent.

The walls of each of the trays in the system are of course suitably matched, so as to make a close joint with the one above and the one below.

After a tray has been removed from the top of the stack its contents may be easily handled by lifting out the sectional bottom, one section at a time, and the tray may be similarly charged with green fruit, its bottoms being loaded section by section. In extraordinarily large driers it may be found desirable to divide up the bottoms of the trays into three or even more sections, it being contemplated that any desired number shall be used. To provide an easy means of inspecting the condition of the fruit at different points of the drier I arrange some of the trays with sectional bottoms, so that one of the sections may be drawn out through a slot in the wall *a*, as indicated in figure 4, wherein the handle *f* is placed upon the end of the frame-work. It is obvious that under this construction the contents of this sliding section may be viewed without disturbing any other tray in the system—a decided advantage over any such arrangement as requires that the walls of the flue be broken in order to inspect the interior, since the breaking admits fresh air, which checks the drying process, besides being inconvenient and requiring considerable power to elevate the trays above the break. The one slot in the front wall *a* for the passage of the sectional bottom will not injuriously weaken the tray, and only one will generally be required, since the condition of one side of the tray is a good indication of that of the other side; but any number might be so made.

It is not intended nor deemed at all necessary to make all the trays with sliding sectional bottoms. About every fifth tray in the system should be one capable of permitting inspection of its contents; and if these be arranged as indicated, so that the sliding sections shall be on alternate sides of the drier, the purposes of this feature of the invention will be very well accomplished. A greater or less number of these trays will be introduced into the stack, and their use will enable the operator to judge of the most advantageous regulation and disposition of the fruit in accordance with the heat and other conditions necessary to be observed. The stack is elevated sufficiently for the introduction of a fresh tray, by means of the lever *L* and its connections, the catches *m m* automatically assuming their proper places beneath the projecting corners of the tray as soon as the carrier *O O* is lowered ready for the next adjustment.

Heretofore in this class of driers—that is, in such wherein the outer walls of the dry-house are made up of a series of interlocking tray-walls—no provision has been made for a prolongation of the drying-flue, without the necessity of adding more trays, though I am fully aware that a chimney has before been placed upon the ordinary stationary walls of a drier, and the trays located within these stationary walls. The omission of the outer stationary walls in this class of driers is a considerable improvement both in economy of construction and facility of handling the fruit. By the addition of the chimney I am enabled to use this class of machines with few or many trays, and thus to adapt it for drying materials of varying qualities requiring varying numbers of layers within the drying-flue.

Having now fully described my invention, what I claim as new and desire to secure by Letters Patent is,—

First—In combination with the walls of a series of fruit-drier trays matched together and forming the outer walls of the drier, a chimney suspended above the position of the stack of trays, free from the walls of the drier formed thereby, and provided with a hood at its lower mouth, to receive and fit upon the walls of the uppermost of the series of trays, substantially as shown and described.

Second—In combination with the walls of a series of fruit-drier trays matched together and forming the outer walls of the drier, a chimney suspended above the position of the stack of trays, free from the walls of the drier formed thereby, and forming an extension of the flue through the drier, substantially as shown and described.

Third—In combination with the walls of a series of fruit-drier trays matched together and forming the outer walls of the drier, a chimney suspended above the position of the stack of trays, free from the walls of the drier formed thereby, and forming an extension of the flue through the drier, and the smoke-pipe extending up through the chimney extension, substantially as and for the purposes set forth.

Fourth—In combination with the drying-flue formed by the walls of a series of matching trays, a chimney extending thereabove, and provided with a hood at its lower mouth, and a depending flexible curtain, the whole being arranged to operate substantially as shown and described.

Fifth—

The Automatic Fruit Evaporator.

Fifth—In an apparatus for drying fruit, &c., the combination of the hot-air furnace, the drying-flue located thereabove, the air-draft chimney, the smoke-pipe entering said chimney above the lower mouth thereof, and the casing for the smoke-pipe, substantially as shown and described.

Sixth—In a fruit-drier, in which the outer walls of the structure are made up of the interlocking tray walls, the combination with the walls of a fruit-drying tray slotted as explained, of the foraminated bottom plate made removable through the slot in the front tray wall, and the metal angle pieces and automatic clips and other mechanical contrivances, substantially as and for the purposes set forth, and in the construction of a hot-air tank having a system of ventilation, whereby the temperature of the chamber A can be perfectly controlled and regulated.

In witness whereof, I have hereunto set my hand and seal, this twelfth day of June, in the year of our Lord one thousand eight hundred and eighty-two.

F. A. PULLEINE.

Witness—ERNEST SCARFE.

This is the specification referred to in the annexed Letters of Registration granted to Frederick Arthur Pulleine, this tenth day of August, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

In the matter of the application of Mr. Frederick Arthur Pulleine for Letters of Registration for an invention entitled "The Automatic Fruit Evaporator," which has been referred to us, we have the honor to report that we have examined the specification and plan accompanying the same, and see no objection to the issue of Letters of Registration as prayed for.

Sydney, 29 June, 1882.

We have, &c.,
CHAS. WATT.
A. LEIBIUS.

The Under Secretary of Justice.

Drawings—one sheet.]

PLANS FOR THE PULLEINE AUTOMATIC EVAPORATOR.

PATENTED 1881.

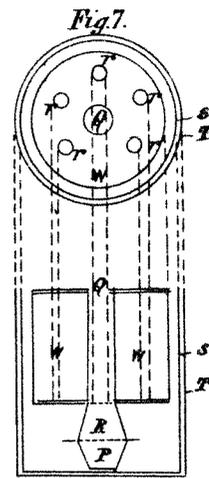
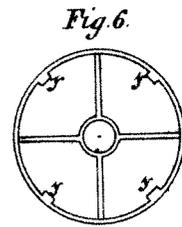
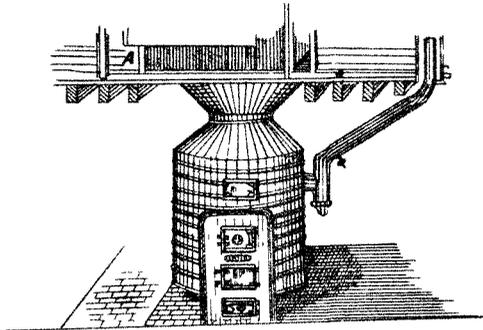
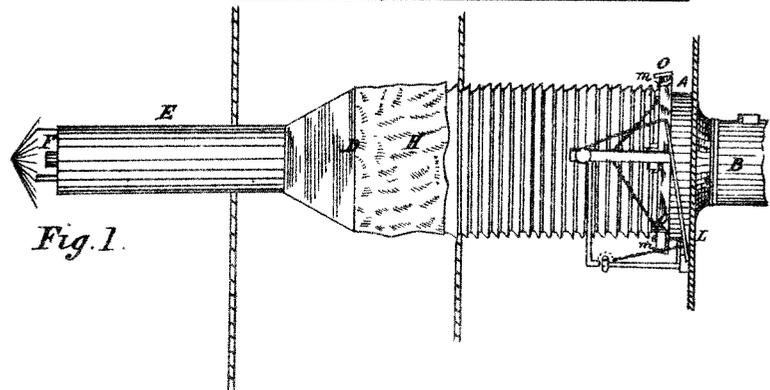
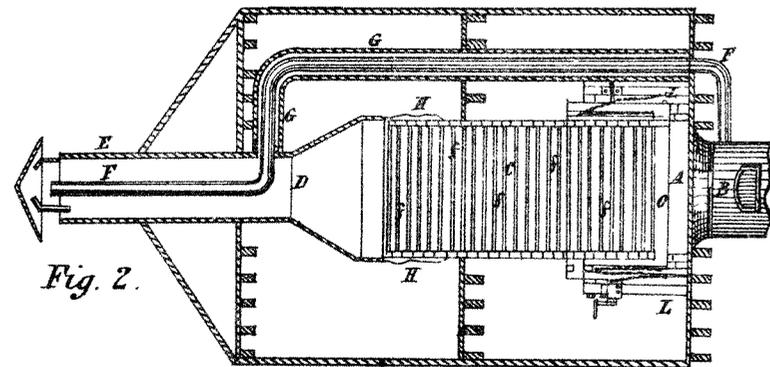
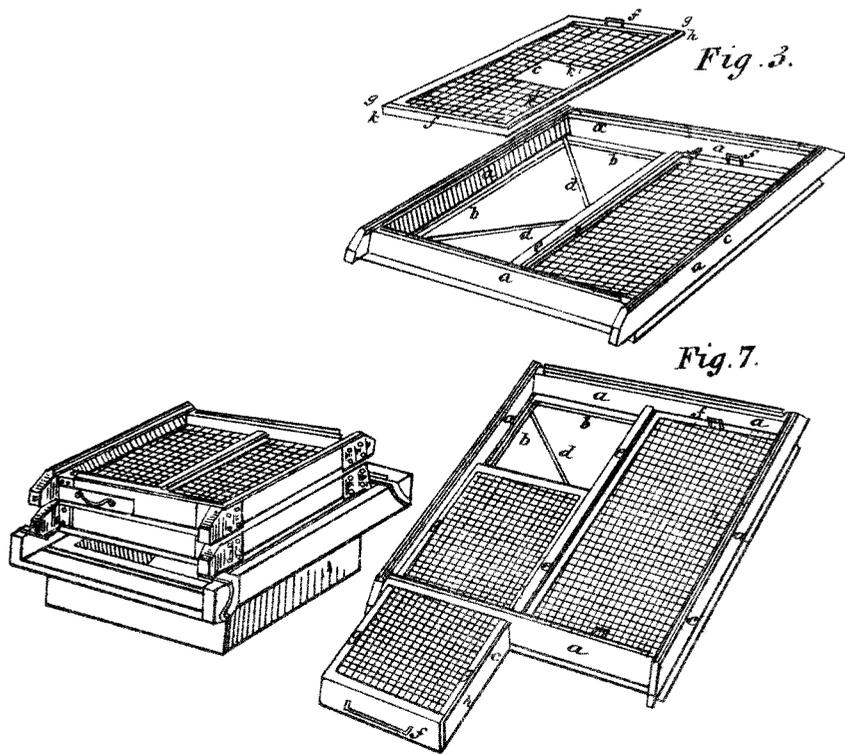
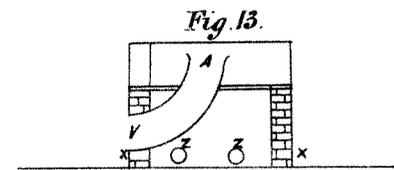
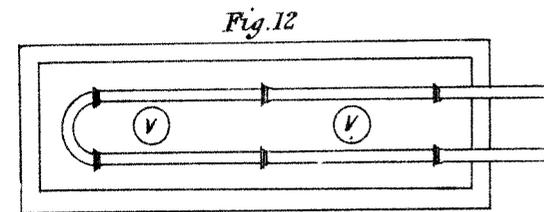
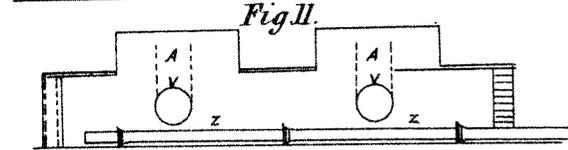
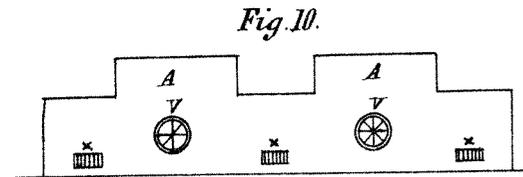


Fig. 8



This is the Sheet of Drawings referred to in the annexed
Letters of Registration granted to Frederick Arthur Pulleine,
this tenth day of August A. D. 1882.

Augustus Loftus.

Witness
Ernest Scarfe

F. A. Pulleine



A.D. 1882, 10th August. No. 1102.

**IMPROVEMENTS IN MACHINERY OR APPARATUS FOR TUNNELLING,
SHAFT-SINKING, AND EXCAVATING.**

LETTERS OF REGISTRATION to John Dickinson Brunton, for Improvements
in Machinery or Apparatus for tunnelling, shaft-sinking, and excavating.

[Registered on the 11th day of August, 1882, 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 Great George-street, in the city of Westminster, 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 Machinery or Apparatus for tunnelling, shaft-sinking, and excavating," 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 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 tenth day of August, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Machinery for tunnelling, shaft-sinking, and excavating.

A.

SPECIFICATION of JOHN DICKINSON BRUNTON, of Great George-street, in the city of Westminster, England, for "Improvements in Machinery or Apparatus for tunnelling, shaft-sinking, and excavating."

My invention has reference to improvements in tunnelling machinery of the type known as Brunton's tunnelling machine, and it consists, first, of an improved method of supporting the tunnelling machine in the tunnel so as to render it more steady; secondly, of an improved method of lubricating the chucks and parts adjacent thereto; thirdly, of an improved mode of or means for applying water when required to the face of the tunnel while excavating; fourthly, of certain improvements in details as hereinafter described.

According to the first part of this invention I substitute for the two side beams with their wheels (resting on rails or on the surface of the tunnel) as ordinarily employed in the class of apparatus hereinbefore referred to, two side beams supported by foot plates or feet, arranged and operated in the following manner:—

The side beams are each provided with two pairs of sliding pieces, held by and moving in guides in the said beams, and each sliding piece is raised or lowered to any desired position in the said beams, and held in that position by a screw or screws which can be actuated either by hand or automatically from the prime mover, and each pair of sliding pieces is connected to a foot capable of resting on the internal surface of the tunnel as hereinbefore described. I prefer to fix worm wheels upon the upper ends of the screws, and to operate each pair of slides (that is to say, the two slides which are in line with one another and which carry the same foot) by one shaft carrying corresponding worms, and to raise or lower the sliding pieces or slides of each corresponding pair on opposite sides of the main line simultaneously. The longitudinal foot at the lower part of each pair of slides is raised or lowered by means of the slides and screws, and from time to time rest on the interior surface of the tunnel. Each pair of slides is capable of sliding forwards upon guides formed upon the feet, and also carries a longitudinal screw working in a nut attached to the foot, by which the foot can be caused to slide forwards upon the corresponding pair of slides, or this longitudinal screw may be carried on the side beam and operate from thence on the foot. In order to facilitate the manipulation I prefer to make this nut in two parts, the upper part only being provided with a thread corresponding with the screw, which is provided with means for keeping the screw constantly rotating. When the upper part of the nut is raised out of gear, the rotation of this longitudinal screw has no practical effect either to advance the feet on the slides or to prevent the advance of the slides or of the feet.

The apparatus operates in the following manner:—

Assuming as an example that the tunnelling apparatus is provided with four feet, two feet (one on either side of the machine) are planted on the lower surface of the tunnel, and by turning the screws first mentioned the axis of the machine is brought into its proper central position, whilst the two other feet are raised so as not to touch the tunnel surface. When thus supported on two feet the machine is set in motion, and as it advances in its work it carries forward with it all the four pairs of slides, those of the feet which rest on the tunnel sliding forward upon the said feet, which remain stationary, whilst the two other pair of slides carry the raised pair of feet forward with them as the machine proceeds.

When the machine approaches the end of the distance intended to be accomplished while resting upon the lowered pair of feet, the half-nut corresponding to the raised pair of feet are brought down and caused to engage with the corresponding longitudinal screws, with the immediate result that the said pair of feet are carried forwards upon their slides to the requisite position in advance of the other pair of feet, and at the proper moment are screwed downwards by the screws just mentioned acting through the slides until the said feet bear upon the face of the tunnel and relieve the other pair of feet of the weight of the machine, and in their turn sustain this weight as the machine continues to advance. After the relieved pair of feet are raised, they are carried forward as described with regard to the other pair, and in their turn again take the weight of the machine, and so on alternately, the operation of the transference of the weight of the machine from one pair of feet to the other necessitating no interruption of the progress of the work.

In some cases only one pair of feet may be employed, either the outer or inner pair being dispensed with. In such cases I cast in or fix to the side of the side beam strong lugs, provided with screws carrying and resting on foot-plates. By means of the screws the weight of the machine is taken up (the foot-plates resting on the surface of the tunnel), and it is maintained in its place while the feet are raised and advanced as in the arrangement hereinbefore described. With such an arrangement, however, the working and advance of the machine is necessarily intermittent, as it must be stopped while advancing and readjusting the feet.

Instead of screws hereinbefore described, hydraulic presses may be employed for raising and lowering the slides and feet, and also for effecting the horizontal or longitudinal motions of these parts of the machine. By the employment of hydraulic presses the continuous forward motion of the machine is obtained with great facility in the following manner:—A set of inner perpendicular presses is employed to move the one pair of feet in a plane at right angles to the axis of the tunnel, and a corresponding set of outer perpendicular presses is employed to impart the same motion to the other pair of feet. A set of inner longitudinal pieces is employed to impart motion in a direction parallel with the axis of the tunnel to the one pair of feet, and a set of outer longitudinal presses imparts similar motion to the other pair of feet.

The slides or supports may be provided with rollers running on the upper surfaces of the feet or foot-plates, in order to reduce the friction.

For the purpose of lubricating the apparatus I use a solution of soap or soap and soda in water, and in order to convey it to the parts of the machine to be lubricated I surround the main central screw of the machine with a collar having a hollow space all round its interior. This collar does not revolve with the screw but is held stationary by any convenient attachment to the back carriage or frame of the machine, and is placed in communication with a reservoir containing the solution of soap and soda in water. Circular glands enclosing packing material are employed for the purpose of preventing leakage on each side of the collar.

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Improvements in Machinery for tunnelling, shaft-sinking, and excavating.

From the hollow space in the collar I carry a tube through a hole in the body of the main screw, and along the interior of the said screw to the cross-head, and thence through the centre of the chuck pivot to the interior of the chuck, which latter is filled or partly filled with the solution. From the interior of the chuck the solution is conducted by channels to the cutter spindle bearings and to the chuck pivot, which are the parts chiefly designed to be lubricated by this means.

In order to apply water to the face of the tunnel I employ the improved arrangement next herein-after described. Surrounding the main screw, and working against a face forming a watertight joint (being pressed against the said face by means of springs embedded in the frame of the machine), I place a ring which does not revolve, and which communicates with a reservoir of water. I hollow the face of the ring through an arc of (say) about one hundred and twenty degrees, and to each arm of the delivery drum, which revolves independently of the main screw, I attach a tube communicating by a hole through the boss of the drum or the wheel by which the drum is rotated with the water contained in the hollow space in the ring hereinbefore described. The ring is so placed that the hollow therein is at the upper part, and as each tube passes over the said hollow in the ring, water is forced through it and projected on to the upper part of the face of the tunnel whence the water descends over the whole face, but when the orifice leading to the tube has passed the hollow arc the supply of water is cut off. By this means, with the least quantity of water possible the surface of the rock is moistened continually and dust is avoided. The surfaces of the bearings of the chuck pivot are protected from dust by means of a strip of flexible material, such as leather, india-rubber, or felt, for example, attached to the frame of the machine and pressed against the hinder part of the chuck. Each cutter spindle may be similarly protected.

Scrapers are arranged between the cutters, for the purpose of removing irregularities in the sides of the tunnel and of throwing back the rubbish, in order to enable it to be shovelled up by the scoops of the delivery drum with greater facility.

When two cutting discs on one spindle are employed, a pointed piece of stout wire is attached to the chuck, and bent round so as to scrape or clean the angle between the cutting edges of the two discs and prevent it from becoming clogged with dust or fragments.

An arrangement for facilitating the exchange or removal of the cutters without moving the machine away from the face of the rock, consists in placing the cutters at the back of the chuck. The cutter spindles are provided at the rear end with a screwed flange in the form of a cap, on to which the cutting discs are secured by means of a ring screwed over the cap, and the forward end of the said spindles may be provided with a bevel wheel in gear with a bevel wheel fast on a shaft passing through the chuck pivot, in order to impart a positive motion to the cutter. A plate bolted to the front of the chuck serves to protect the gearing from dust, and dust is likewise excluded from the rear end of the cutter spindles, by means of packing interposed between the flange hereinbefore described and the back of the chuck.

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 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 longitudinal section, and figure 2 a transverse section of so much of a Brunton's tunnelling machine as is necessary to illustrate the application thereto of my improvements in accordance with the said first part of the invention. The parts not shown are or may be of the construction common to such machines. Figure 3 is a longitudinal section of one end of one of the parts of the framing, and the foot carried by it and its adjuncts. At each side of the framing of the machine, and fixed thereto or forming part thereof, are double castings, A, at either end of each of which is a sliding piece or block, B, capable of being raised and lowered in the said castings A by means of screws C engaging with screw boxes in the said sliding pieces; the upper ends of these screws are provided with worm wheels, D, with which worms E on the shaft F engage to give rotatory motion to the said screws, for raising and lowering the sliding pieces C. The lower part of the sliding pieces B is formed with slides, upon which take and slide feet G, there being a pair of such feet at each side of the machine, and each foot slides upon and is held by each pair (longitudinally considered of sliding pieces). There is a worm for each worm wheel and screw, but in order to enable one worm shaft to operate the worms for both the pairs of sliding pieces, on the one side of the machine the following arrangement is adopted:—The worm shaft F for each side of the machine is situated between the two pairs of sliding pieces, as shown clearly in figure 2. The worms, except as hereinafter stated, are capable of revolving on the said shaft. The worms are confined between lugs H from the framing. The worm wheels of the one longitudinal pair of sliding pieces which support the one foot are set out of the transverse plane of the worm wheels of the other pair of screws which support the other foot. At each of the parts of the shaft F which extend through the worm wheels, a feather is formed of the same length as or a little less than the space between two adjacent worms. In the said worms are corresponding grooves. The position of each of these feathers on the same shaft with relation to all of the pairs of worms with which they are used is the same, so that by sliding the said shaft into one position the feathers engage with all the worms of the screws which operate the sliding pieces of one of the feet, and on sliding the shaft into another position the feathers engage with all the other worms, viz., those of the screws which operate the sliding pieces of the other foot on the same side of the machine. It will be understood that this arrangement is the same with each pair of feet on either side of the machine, also that the arrangement (which I now proceed to describe with regard to one foot), for feeding forward to a new position the feet when raised is applied to each of the feet on both sides of the machine.

Turning in bearings in the frame A is a screwed shaft, I (See figure 3 and the left-hand side of figure 2). Upon the foot is a standard or bracket piece, K, between the horns of which the screw shaft passes. Above the said shaft is a half-nut, L, capable of being raised and lowered in or upon these horns, which constitute guides therefor. This raising and lowering is effected by any convenient means; for example, by levers attached to the shafts M turning in bearings in the frame, which shafts by the said levers are turned, and through arms N and connecting links are caused to effect the raising or lowering of the said half-nuts. The said arms N are attached to the shaft by a groove and feather, or equivalent means, so that they turn with the said shafts but are free to run thereupon; in order to follow the motion

of

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of the half-nuts. The screw shafts I receive motion of rotation from any convenient rotating part of the machine, they being provided with gearing or belt pulleys for receiving such motion.

Thus when the half-nut is lowered on to the screw, the said screw causes the said nut and the foot with which it is connected to be moved forward upon its guides on the sliding pieces B of the said foot.

When the machine is in operation, one of the feet on each side of the machine is in its lowered position to rest upon the sides of the tunnel and support the machine, the other of the feet on each side of the machine being held by its slides in a raised position. As the machine travels forward the sliding pieces B of the depressed feet slide on the said feet, the frame carrying forward with it the raised feet. When the machine has travelled forward the requisite distance upon the depressed feet, the half-nuts of the raised pair of feet are brought down upon their corresponding screws, so that the raised feet to which the said nuts are attached are moved forward in advance of the feet upon which the machine at this time is resting; the shafts F are then moved into such a position that their feathers engage with the worms of the screws which are upon the slides of the raised pair of feet, so that the said feet are lowered to bear upon the sides of the tunnel and relieve the other feet. The said shaft is then moved so that its feathers are disengaged from the said worms, and are engaged with the worms of the other pair of feet, which worms are thereby caused to so operate upon the worm wheels E of that pair as to cause the screws C to raise the said pair of feet. The machine then travels forward upon this depressed pair of feet, carrying with it the other raised pair, which are afterwards moved forward in advance of the depressed pair and then lowered to take the weight of the machine, the other pair then being raised and carried forward, and so on alternately; the said feet by acting in this step by step manner cause the machine to travel forward upon first one pair of feet and then upon the other pair of feet as it proceeds with the cutting of the tunnel. The shafts may be rotated by hand, or they may be connected by gearing and a clutch arrangement with a rotating part of the machine, so as to be operated therefrom at the required periods.

In order to facilitate the engagement of the feathers on the shaft F with the worms which it is necessary to operate at one time, the face of each worm on the side at which the feather enters has a spiral form, as shown in figure 3^a, where 15 shows the spiral face, and 16 the groove which receives the feather of the shaft, the side of which groove is in line or flush with the projecting end or tooth 17, formed by the highest part of the spiral. Thus, by turning the shaft in the direction of the arrow, all the feathers on the shaft are eventually brought up against all the teeth, 17, of the spiral faces of the worms, and in that position can readily enter the grooves 16.

In place of operating the worm wheels of both feet on the same side of the machine by a single shaft F placed between them, each foot may be operated upon by separate shafts, as indicated by dotted lines at F¹ F¹¹.

4 represents a modification wherein a single pair of feet only is employed, one foot at each side of the machine. The arrangement at one side only is shown, but it will be understood that a similar arrangement is provided at the other side also. The main body of the machine is omitted from this figure, but the beam A is part of or fixed to the framing of the machine, as before described. A strong lug, O, is cast on or fixed to the side beam, and in it runs a screw, P, carrying a foot-plate, Q. When the feet are to be raised and moved forward the action of the machine is stopped, and the screws on either side of the machine are turned so as to depress the plates Q against the sides of the tunnel and sustain the machine whilst the feet are being raised and moved forward for the further action of the machine. A strut or struts is or are provided to keep the machine from turning or canting up as its cutters act, the said strut or struts being provided with a screw as at R, for wedging it in position and releasing it as required. There may be any number of the lugs O, screws P, and plates Q in combination with each foot, and in place of the screw P for depressing the plate hydraulic pressure may be employed. Figure 5 is a transverse section of a sliding piece provided with a wheel or wheels as at S, to run upon the foot, to lessen friction.

Figure 6 is a similar section of a modified form of the apparatus, illustrating the application of hydraulic in place of screw power for raising and lowering the sliding pieces carrying the feet. Above each sliding piece B a hydraulic cylinder T is mounted, the ram of which is attached to the said sliding piece. Figure 7 illustrates a mode of applying hydraulic in place of screw power, for feeding forward the feet when they are in their raised position. U is a double-acting hydraulic cylinder affixed to the beam A, there being a similar arrangement for each foot. The ram or piston V of the cylinder is connected by its rod and block W with a slotted piece, X, firmly bolted to the foot G. A passage is provided for the acting water to one side of the ram, and another passage is provided for the exit of the exhaust water from the other side of the ram, the said passages communicating with a valve-chest, Y, having a sliding valve, the rod of which can be shifted into one or the other position by the lever Z, to admit the water from the supply pipe, a, and by the passage b to the one side of the ram of the cylinder, the exhaust water passing from the opposite side of the ram by the passage G, and passing from the cylinder through the valve and away from the apparatus by a pipe not shown.

The continuation of the rod of the ram is supported in a bracket piece, d, which is free to slide on the said rod. Thus, when the machine is travelling upon the feet which are down, the cylinder U slides over the ram V, and the bracket piece d slides over the rod e. When it is required to press the feet forward, water is admitted by the pipe b to the cylinder U, when the ram is pressed forward, and through its rod e and block W moves forward the foot G, the rod e sliding through the bracket-piece d. The slot in the piece X allows the foot to be raised with its sliding pieces. By admitting water by the passage c the foot can be moved in the opposite direction if required.

The valves which admit water to the various presses may be either acted upon by hand, or if desired they may be acted upon by projections from the machine, for example as follows:—

Assuming that the machine is at work and supported for the time being upon one pair of feet (one foot at each side of the machine), and has thus advanced a certain distance forwards, a tappet on one of the corresponding slides comes in contact with a lever, and thereby causes the elevated pair of feet to be brought to bear upon the surface of the tunnel by reversing the valves of the perpendicular presser in connection with that pair of feet. At this moment, the machine being on the point of reaching the limit

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of its forward motion upon the first-mentioned pair of feet, another tappet causes this pair of feet to be lifted off the surface of the tunnel by reversing the valves of the perpendicular presses in connection therewith, and the machine is then enabled to continue its forward motion without interruption upon the pair of feet which are bearing upon the tunnel.

By admitting water to the longitudinal presses in connection with the elevated feet, the said feet are brought forward in readiness to again support the machine as before, and so on in succession. Compressed air may be employed in the presses instead of water, or may be caused to impart the required pressure to the water, and in this case the pressure may be increased if necessary by employing pistons of differential area between the two fluids.

In figure 8 I have shown a longitudinal section of a portion of the main screw, showing the arrangement by which the apparatus is lubricated by soap and water or soap and soda and water.

The main screw is surrounded by a collar, *f*, having a space or channel, *k*, between its interior and the exterior of the screw *g*. This collar does not revolve with the screw, but is held stationary by being connected with any suitable part of the machine. Glands at *h* enclose packing and prevent leakage. This channel *k* is, by means of a tube, *i*, placed in communication with a reservoir containing the lubricant. From the space *k* the lubricant passes by the pipe *l* through and along the body of the main screw to the cross head, and thence through the centre of the chuck pivot to the interior of the chuck, by the branch passages *m* and *o*, which latter leads from a groove formed all round the bearing of the chuck into the space or interior of the chuck at *n* (shown at figure 9), which thus receives a supply of lubricant, which is conducted by the passages *o' o'* to the cutter spindle bearings. The chuck pivot receives lubricant from the groove formed, as before mentioned, around the chuck bearing.

In figure 1 I have shown the arrangement for supplying water to the upper part of the face of the tunnel. Surrounding the main screw *g* is a ring, *p*, shown detached in face view in figure 1^a, which does not revolve, and which has a recess, *q*, of the form of an arc, in the upper part of its side presented towards the face of the tunnel. A pipe, *r*, leading from a reservoir or source of water supply under pressure communicates with this space.

To each arm of the delivery drum S I attach a tube, *t*, secured at one end in a hole or passage through the toothed wheel *u* by which the drum receives its motion, each tube *t* terminating at its other end in a nozzle in proximity to the face of the tunnel. Although but two tubes are shown in the drawing, yet it will be understood that a greater number is or may be employed. As each opening *v* passes over or in front of the recess *q* water passes through it and through the pipe and nozzle, and is projected over the upper part of the face of the tunnel and descends over the whole face. When the openings have passed the recess *q* and come opposite the flat face of the ring *p* no water passes to the nozzles. The ring may be prevented from revolving by being connected with any convenient part of the machine, and it may be pressed firmly against the face of the wheel by means of springs, as at *w*.

The interior of the cross-head is enclosed, and the surfaces of the bearings of the chuck pivot thereby protected from dust, by means of a strip or annular piece, *x* (figure 9), of flexible material, such as india-rubber, leather, or felt, extending around the parts; the said strip being at one edge or side attached to the covering plate *y* of the cross-head by pins, as at *z*, the other side or edge being pressed all round by a spring (which may be a tubular india-rubber ring, as at *I*), against the hinder part of the chuck. Each cutter spindle is similarly protected by circular strips or rings of felt or other suitable substance surrounding their collars, as at *l* in figure 9.

Figure 10 is a front view of a part of a chuck, and figure 11 is a transverse section showing scrapers 2 arranged between the cutters 3, for removing irregularities on the sides of the tunnels, and throwing back the rubbish in order that it may be removed with greater facility; the said scrapers are skewed so as to throw back the rubbish. The position of the acting surface of these scrapers (of which there may be one between each two adjacent cutters) will be immediately to the rear of the path of the cutters.

4 in figure 9 represents a pointed piece of stout wire, which is attached to the chuck covering plate, and bent round into a position between the two cutter discs, so as to scrape or clean the angle between the cutting edges of the two discs and prevent it from becoming clogged. A similar cleaner will be used with each pair of cutter discs, or between all adjacent cutters where more than two cutters are used in the same spindle.

Figure 12 represents the arrangement for facilitating the exchange or removal of the cutters without moving the machine away from the face of the rock. The cutter spindle 5 has upon its rear end a cup-like termination 6, into which the boss 7 of the arm of the chuck takes. This cap piece is screwed on its exterior, and has around it a flange, 8. The cutters are placed at the back of the chuck over this cap piece and bear against the said flange; a wedge-shaped ring 9 is screwed upon the cap piece and firmly secures the cutters in place. To give a positive motion to the cutters, each cutter spindle carries a bevel pinion, 10, in gear with a bevel wheel or toothed ring, 11, fast upon the shaft 12 passing through the chuck pivot.

A plate as shown at 13 can be bolted over the front of the chuck to prevent access of dust, the said plate being of a disc form and affixed by screws or otherwise to the arms of the chuck, as shown with regard to one of them; a packing ring, 14^a is placed in an annular groove formed partly in the inner side of the cap piece 6 and partly in the back of the chuck, which will keep dust out from the cutter spindles.

It will be evident that certain of the hereinbefore described improvements are applicable to my shaft-sinking machine as well as to my tunnelling machine.

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—In machinery or apparatus for tunnelling, shaft-sinking, and excavating, the employment of feet upon which the machine rests, the said feet being raised and lowered relatively to the machine itself, substantially as and for the purpose hereinbefore described with reference to figures 1 to 7 of the accompanying drawings.

Improvements in Machinery for tunnelling, shaft-sinking, and excavating.

- Second—The combination of double pairs of feet for the machine to travel upon, so arranged and operated that the machine travels forward alternately upon one pair and the other as the said machine progresses with its work, substantially as described, and illustrated in figures 1, 2, and 3 of the accompanying drawings.
- Third—The combination of single feet for the machine to rest and travel forward upon, with rests or supports upon which the machine is supported whilst the feet are fed forward for the further operation of the machine, substantially as hereinbefore described with reference to figure 4 of the accompanying drawings.
- Fourth—The means for effecting the lubrication of the chuck pivot or axis and of the cutter spindle bearings, substantially as hereinbefore described, and illustrated in figures 8 and 9 of the accompanying drawings.
- Fifth—The means for applying water to the face of the tunnel, substantially as hereinbefore described and illustrated in figures 1 and 1^a of the accompanying drawings.
- Sixth—The means for protecting the bearings of the chuck on its pivot or axis, and of the cutter spindles from dust, substantially as hereinbefore described, and illustrated with regard to the protection of the chuck pivot in figure 9 of the accompanying drawings, and with regard to the protection of the cutter spindles in figures 9 and 12 of the accompanying drawings.
- Seventh—The combination with the chuck and cutters of scrapers (two), arranged and operating substantially as and for the purpose hereinbefore described, and illustrated in figures 10 and 11 of the accompanying drawings.
- Eighth—The combination with two or more cutters carried by one spindle of the scrapers or cleaners 4, as illustrated in figure 9 of the accompanying drawings, for the purpose described.
- Ninth—The means for enabling the cutters to be placed at the back of the chuck, substantially as and for the purpose described, and illustrated in figure 12 of the accompanying drawings.

In witness whereof, I the said John Dickinson Brunton have to this my specification set my hand and seal, this nineteenth day of April, one thousand eight hundred and eighty-two.

JOHN DICKINSON BRUNTON.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to John Dickinson Brunton, this tenth day of August, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 27 June, 1882.

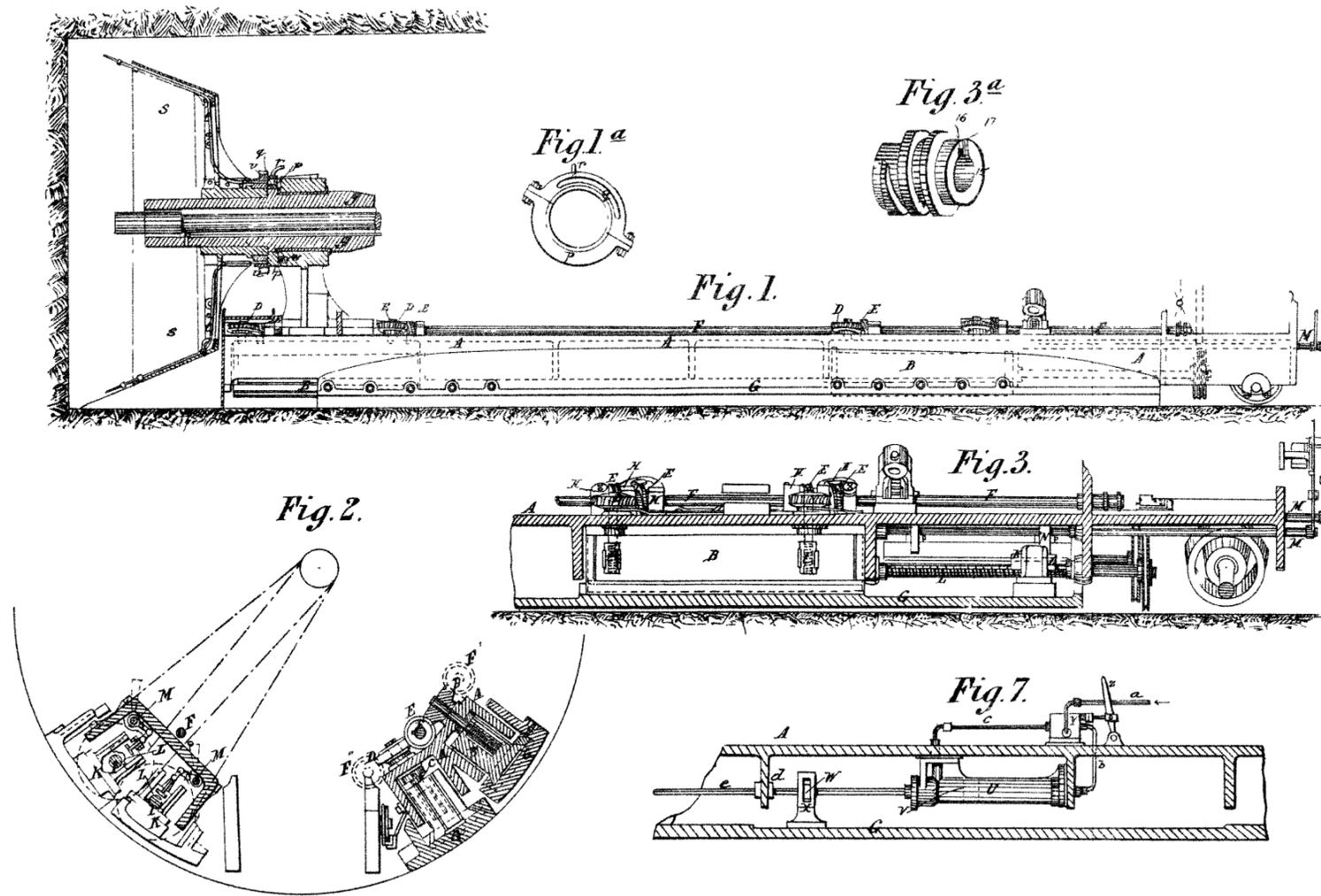
Having examined the specification and plans accompanying the Petition, we have the honor to recommend that Letters of Registration should be issued to John Dickinson Brunton, for an invention entitled "Improvements in Machinery or Apparatus for tunnelling, shaft-sinking, and excavating," as shown in the drawing and described in the specification attached to his Petition.

We have, &c.,

E. O. MORIARTY.

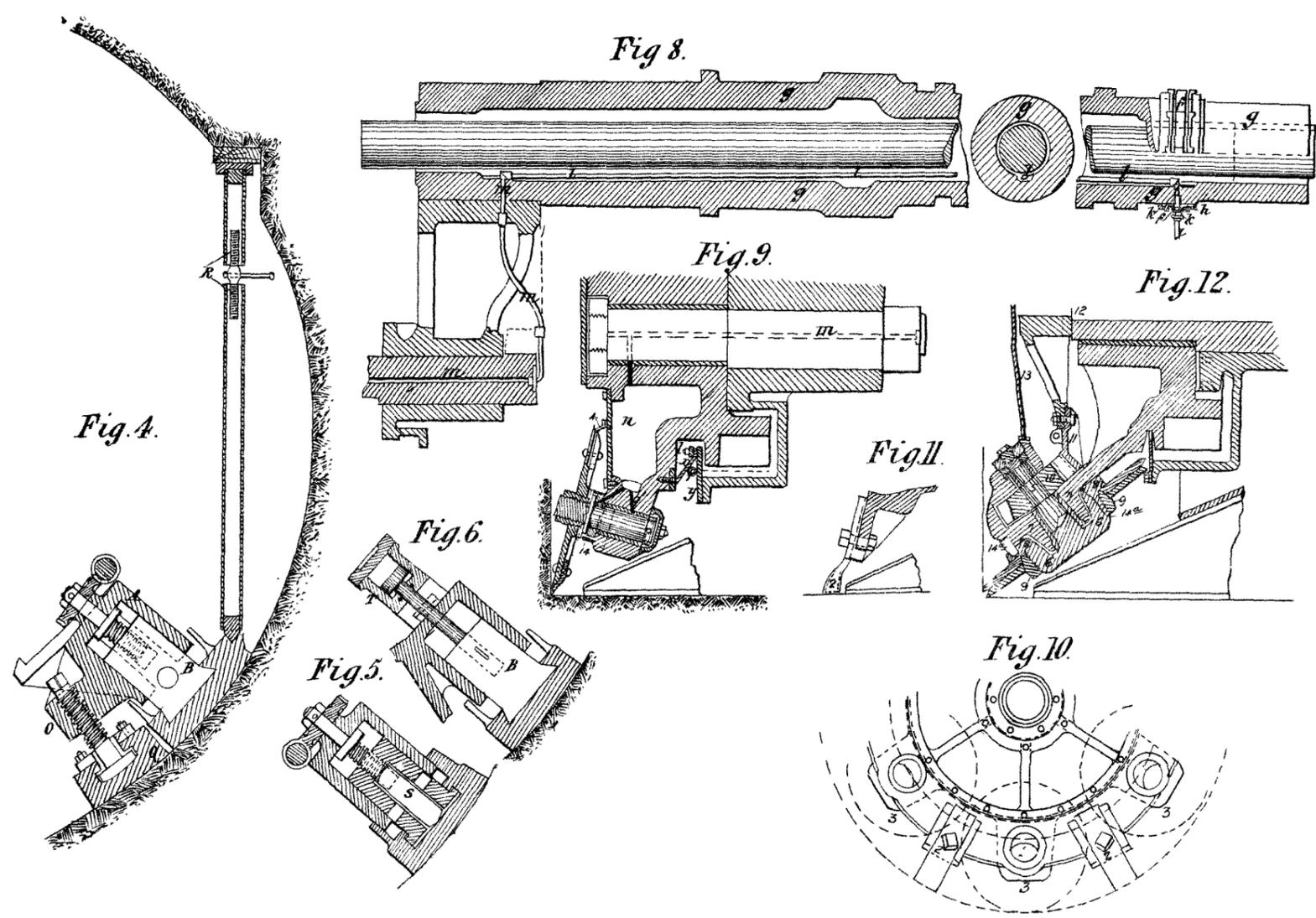
WILLIAM C. BENNETT.

The Under Secretary of Justice.



This is the Sheet of Drawings marked B. referred to in the annexed Letters of Registration granted to John Dickinson Branton, this tenth day of August A.D. 1887.

Augustus Loftus.



This is the Sheet of Drawings marked C. referred to in the annexed Letters of Registration granted to John Dickinson Brinton, this tenth day of August, A.D. 1882.
Augustus Loftus.



A.D. 1882, 10th August. No. 1103.

A COMPOSITION FOR PROTECTING THE BOTTOMS OF IRON VESSELS, &c.

LETTERS OF REGISTRATION to Nicholas Belfield Dennys, for a Composition for protecting the bottoms of iron vessels, metals, and wood from the action of sea-water, fouling, damp, and atmospheric influence.

[Registered on the 11th day of August, 1882, 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 NICHOLAS BELFIELD DENNYS, Magistrate and Justice of the Peace, of Singapore, in the Straits Settlements, 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 Composition for protecting the bottoms of iron vessels, metals, and wood from the action of sea-water, fouling, damp, and atmospheric influence," 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 Nicholas Belfield Dennys, 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 Nicholas Belfield Dennys, 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 Nicholas Belfield Dennys 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 August, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

A composition for protecting the bottoms of iron vessels, &c.

SPECIFICATION of NICHOLAS BELFIELD DENNYS, Magistrate and Justice of the Peace, of Singapore, in the Straits Settlements, for an invention entitled "A Composition for protecting the bottoms of iron vessels, metals, and wood from the action of sea-water, fouling, damp, and atmospheric influence."

THIS invention relates to an improved paint or composition or compound intended to be applied to ships' bottoms and other submerged surfaces, for the purpose of preventing fouling from the adhesion of barnacles or plants, or from other causes, and which is also applicable to the preservation of iron and wood and other matter from the effect of exposure to salt water, damp, or atmospheric influences.

I take ordinary zinc and suspend it in a semi-saturated solution of crystals of sulphate of copper, in the proportion of about one hundredweight of zinc to one hundredweight and a half of sulphate of copper. I collect the resulting deposit, and dry and pulverize, and sift and grind the same until it assumes the form of a fine greyish powder suitable for forming a paint. To the powder thus obtained I add a certain material well known in Chinese and other eastern ports, and which is prepared by the Chinese, as I believe, from the juice of the tree known as—" *Eleococcus vernicia*," and is commonly sold by them under the name of "Vah-ni-shi," and is well known under that name, and also under the name "Chinese Varnish," as an article of commerce by all persons or traders dealing with Chinese firms. The method of preparing this Vah-ni-shi or Chinese varnish ordinarily adopted is, to the best of my belief, as follows:—

The abovementioned juice is heated to a point slightly below the boiling-point, and then mixed with spirits of wine or other equivalent spirits, and when cooled it forms Vah-ni-shi or Chinese varnish. Other equivalent methods of preparing the Vah-ni-shi or Chinese varnish may be adopted. I add this Vah-ni-shi or Chinese varnish to the powder aforesaid in sufficient quantity to make a fair working paint, and the paint thus formed may then be applied in any ordinary way to the ships' bottoms or other surface to be coated.

I have stated the proportion of zinc and sulphate of copper which I have found to yield the best results, but the proportions may be varied. The degree of saturation of the solution of sulphate of copper may be also varied, but the less saturated the solution the slower will be the formation of the abovementioned resulting deposit. In cases in which I desire to hasten the formation of the abovementioned resulting deposit I add about one gallon, more or less, of sulphuric acid to the abovementioned solution, but this is only essential as a matter of hastening the process. For the purpose of increasing the bulk of the out-turn, I also heat zinc to redness, and immerse in it pieces of iron. This is kept stirred until cooled, when the zinc readily pulverizes, and may be used as the "metallic zinc" which forms one of the results of the first-mentioned process. A similar result is obtained by stirring melted zinc in an iron vessel heated to just short of redness, and pulverizing the friable out-turn. In either case the mixture of the powdered zinc so obtained, with the resulting deposit before described, increases its bulk without deteriorating its qualities to any material extent, provided the proportion of the zinc powder does not exceed one-third of the whole.

Having thus described the nature of the said invention and in what manner the same is to be performed, I declare that I claim—

The manufacture and use of a paint or composition substantially as and for the purposes herein set forth.

In witness whereof, I the said Nicholas Belfield Dennys have hereto set my hand and seal, this twenty-first day of June, one thousand eight hundred and eighty-two.

NICHOLAS B. DENNYS,
(By his duly authorized Attorney,
C. DENNYS, Junr.)

This is the specification referred to in the annexed Letters of Registration granted to Nicholas Belfield Dennys, this tenth day of August, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

In reply to your letter of the 22nd instant, we have the honor to report that we have examined Mr. Nicholas Belfield Dennys' application and specification for Letters of Registration for an invention entitled "A Composition for protecting the bottoms of iron vessels, &c.," and see no reason why his application should not be granted.

We have, &c.,
FRANCIS HIXSON.
H. BRODERICK.

The Under Secretary of Justice.

Sydney, 1 July, 1882.



A.D. 1882, 10th August. No. 1104.

NEW AUTOMATIC MULTICOLOUR PRINTING APPARATUS.

LETTERS OF REGISTRATION to Joseph Thomas Burton Gibbs, for a New Automatic Multicolour Printing Apparatus.

[Registered on the 11th day of August, 1882, 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 JOSEPH THOMAS BURTON GIBBS, of the firm of Gibbs, Shallard, of Pitt-street, in the City of Sydney and Colony of New South Wales, artist engraver, hath by his Petition humbly represented to me that he is the assignee of John Fitzallen Barrett, of Sydney aforesaid, printer, who is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "New Automatic Multicolour Printing 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 Joseph Thomas Burton Gibbs, 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 Joseph Thomas Burton Gibbs, 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 Joseph Thomas Burton Gibbs 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 August, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

New Automatic Multicolour Printing Apparatus.

TO ALL TO WHOM THESE PRESENTS SHALL COME: I, JOSEPH THOMAS BURTON GIBBS, of the firm of Gibbs, Shallard, of Pitt-street, in the City of Sydney and Colony of New South Wales, artist engraver, assignee of John Fitzallen Barrett, also of Pitt-street, Sydney aforesaid, printer, send greeting:

WHEREAS I am desirous, as said assignee, 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 shall at any time agree with, and no others, shall and lawfully may, from time to time, 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, in Sydney, make, use, exercise, and vend, within the said Colony of New South Wales, an invention of a "New Automatic Multicolour Printing Apparatus, applicable to all typographic and lithographic machines," as more particularly described and shown in the following specification and accompanying plans, that is to say:—

SPECIFICATION.

This invention relates to multicoloured automatic printing by single impression, and to the means and apparatus used therein, and which may be applied to any typographic or lithographic machines. It is of such a construction that from two to twenty, or indeed any number of colours, varying in tone, may be printed in parallel lines in one impression, and without any possibility of the lines, although they approach almost to contact, blending the colours so as to produce confusion or indistinctness, while the speed of the operation is the speed of the machinery with which the apparatus is connected.

The usual plan of printing in various colours is to have the lines of type for each imposed separately, and then to work off one forme, and perfect the sheet by successive printings, each colour requiring a distinct impression. In such procedure is involved expenditure of time in imposing a separate forme for each colour. Great care is required in adjusting the spaces corresponding to the lines in subsequent printings; difficulty arises in securing accuracy of register, which is of course affected by shrinkage or expansion of the sheet, by defective laying or imperfect pointing, &c. Great delay and loss of time occur at the machine in making ready so many formes and in repeated cleanings up of colour; and lastly, the increased number of impressions renders great wear and tear of machine necessary to complete the work. These defects are all obviated in the automatic multicolour printing apparatus, the advantages of which are contained in the converse of the above-described disadvantages. The features of this apparatus, as exhibited by numbers on the different figures of the diagram, are,—

FIG. A.

1. Receiving drum for all colours, from which colour is conveyed in bands, by means of type rollers, on to forme or stone.
2. Composition rollers, conveying colour from ink-rims (No. 3) on to receiving drum No. 1.
3. Rim-roller, which receives ink from composition roller No. 4 in one colour, or as many colours as there are ducts to the section.
4. Composition roller, which conveys distributed colours from iron roller No. 5 on to rim-roller No. 3.
5. Iron drum, on which distributing rollers Nos. 6 and 7 distribute their colour in sections, as required.
- 6 and 7. Composition distributing rollers, which are cut into sections for placing colours on drum No. 5.

The purpose served by these sectional rollers is to secure perfect side distribution of colours.

8. Composition duct roller, conveying ink from cylinder No. 9 to No. 7.
9. Motion for working iron ductors.
10. Sectional ducts.
11. Cam on main cylinder, for working separate ductors.
12. Rod connection between Nos. 13 and 9.
13. Cam on main cylinder, for working duct roller No. 9.
14. Rod connection between Nos. 13 and 9.
15. Cam and motion for working composition sectional rollers Nos. 6 and 7.

FIG. B.

End view. (See explanation of fig. A.)

FIG. C.

Set-box, for putting rims, &c., in position relative to desired forme:—

1. Base or stand on which frame of box is fixed.
2. Frame into which the chase containing forme exactly fits.
3. Type forme, in chase, placed in position in set-box.
4. Rim-roller of iron.
5. Bearings at each end, into which rim-roller fits.
6. Space-washers of iron. These act as spaces between the ink-rims.
7. Ink-rims of iron.
8. Nuts for tightening up and holding in position ink-rims.

FIG. D.

End view of set-box. (See explanation, fig. C.)

FIG. E.

6. End view of space-washer.
7. " ink-rim.
8. " tightening-nut.
9. " extending ink-rim; to be used for widening inking rims.
10. " combined colour-rim, for working close patterns.

Having

New Automatic Multicolour Printing Apparatus.

Having referred to the advantages of the invention, and described the several parts, I proceed to detail the action of the apparatus, or the particular *modus operandi* :—

1. It works in harmony with the ordinary motion of the printing machine to which it is attached, and which is no way affected by such attachment.
2. The apparatus may be placed in position when it has to do the special work required of it, or it may be retained when it is desired to have more perfect control over the supply ; as is necessary, for example, when matter of small type have to be printed with heavy lines, requiring large supplies of ink ; and when the ordinary one-colour work of the machine is required, the apparatus may be thrown out of gear or detached altogether.
3. The arrangement consists, first, of a duplicate frame of iron, which fits the bed of the ordinary printing machine ; in the frame is fixed the forme, set in the usual way, as though for one colour (see figure C).
4. The frame (or sides) of the apparatus is fitted with the system of rollers of soft composition and cylinders of iron, arranged alternately for the reception and distribution of the colours. One of these shafts or spindles is furnished with a series of disc-like rims, which slide freely along it, and admit between them washers of various widths, which correspond to the desired spaces between the lines. The spindle bearing these rims and washers is placed in juxtaposition to the forme, and they are adjusted to the lines and spaces by means of a nut working along its square-threaded surface, which binds the whole securely together. This is then placed in its position.
5. When so adjusted, and the ducts charged with the required colours, the machine is started, the motion being as follows :—The geared cylinders and rollers revolve ; the ink-ductor A takes its supply of various colours from the cylinders of the ink-ducts B, conveys it to the two sectional, vibrating, soft composition rollers C C, which place it on the distributing drum D, then in turn conveys it, uniformly distributed, to the composition roller E ; from this roller the colour rims (corresponding to the various lines of type in the forme), which are arranged to the square-threaded spindle F before described, receive their portions of the various inks and convey them to the composition roller G, which, coming in contact with the main receiving drum H, communicates to it the several bands of colour perfectly distributed. From this drum the colours are transferred to the ordinary type rollers of the printing-machine, and thence to forme. The whole motion of the apparatus is communicated by the printing-machine to which it is applied, and I claim the automatic multicolour printing apparatus in its parts and in its entirety, as particularly herein described and set forth, and its application to ordinary typographic printing and lithographic machines for multicolour printing by single impressions, as also herein stated and set forth.

JOSEPH THOS. BURTON GIBBS,
(By his Agent, HENRY HALLORAN).

15, Wentworth Court, Sydney, 13 June, 1882.

This is the specification referred to in the annexed Letters of Registration granted to Joseph Thomas Burton Gibbs, this tenth day of August, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

The application of Joseph Thomas Burton Gibbs (assignee of John Fitzallen Barrett) for Letters of Registration for an invention of a "New Multicolour Printing Apparatus" 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, 16 June, 1882.
We have, &c.,
THOS. RICHARDS.
ARCH. C. FRASER.

The Under Secretary of Justice.

[Drawings—one sheet.]

DIAGRAM OF NEW MULTI-COLOUR APPARATUS,
 APPLICABLE TO TYPOGRAPHIC AND LITHOGRAPHIC PRINTING MACHINES.
 (SHOWN HERE AS ADAPTED TO DAWSON'S "MITRE" MACHINE.)

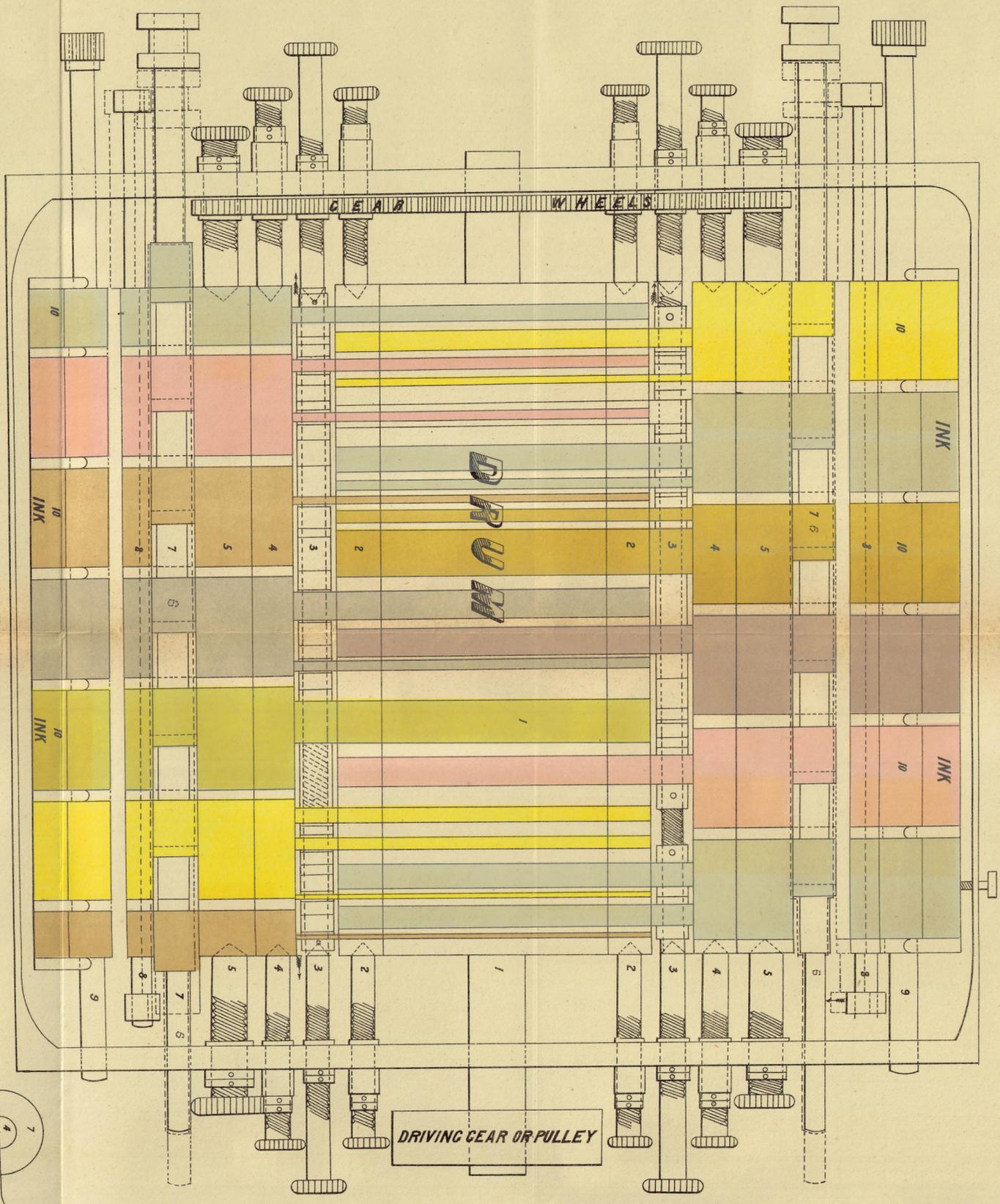


FIG A 1

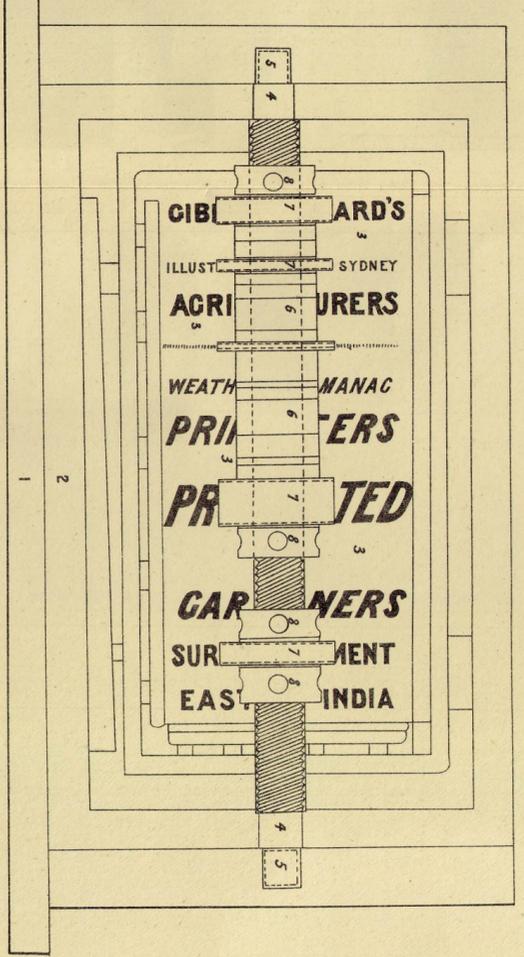
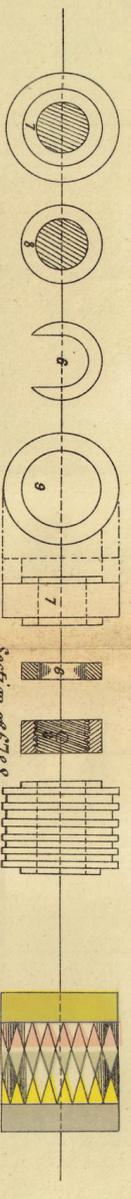


FIG C.



Plan of 6728

Extension of 6728

Section of 6728

Combined Color Bars

Sketch of the form, representing gradations of one color

FIG E

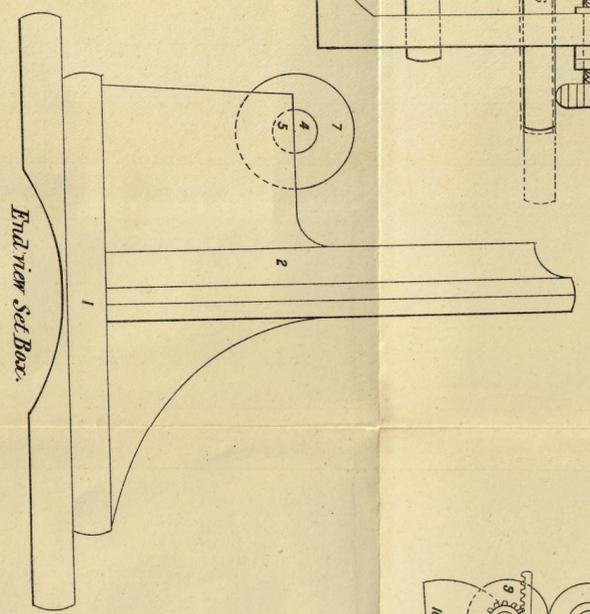
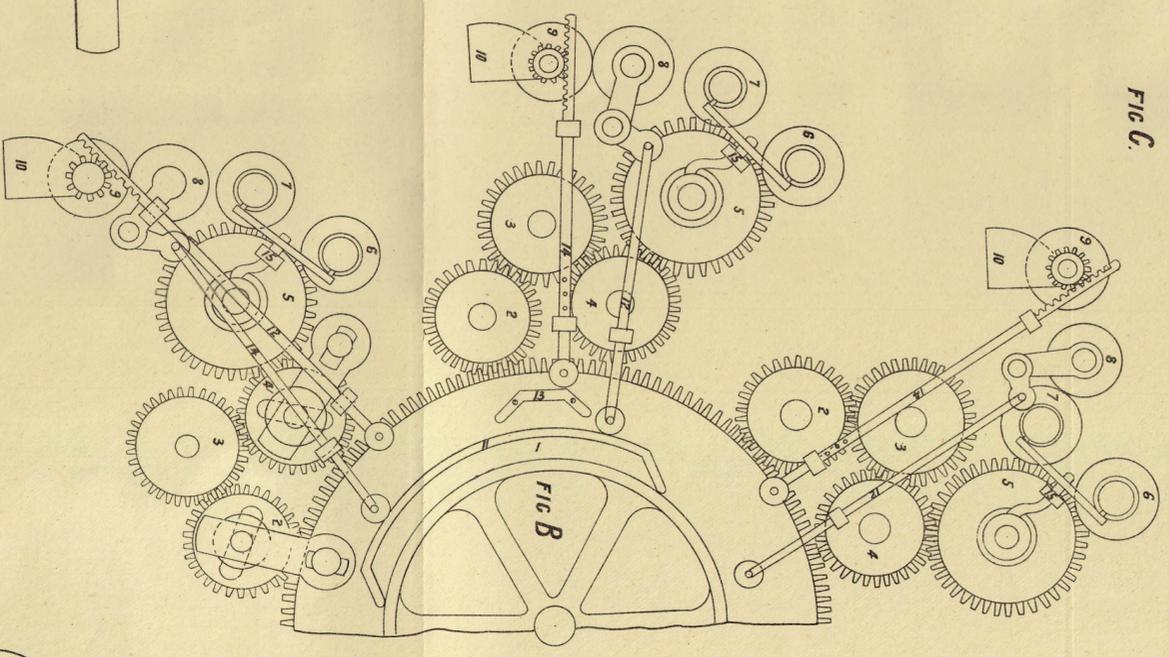


FIG D



This is the Sheet of Drawings referred to in the annexed Letters of Request - granted to Joseph Thomas Burton. It has this tenth day of August A.D. 1887.
 PHOTO-LITHOGRAPHED BY NEWBERRY, LONDON.
 AUGUSTUS LOFFELUS.



A.D. 1882, 10th August. No. 1105.

A NEW OR IMPROVED ELECTRIC METER.

LETTERS OF REGISTRATION to Charles Vernon Boys, for a new or improved Electric Meter or Apparatus for measuring and registering the quantity of Electricity passed through a conductor.

[Registered on the 11th day of August, 1882, 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 VERNON BOYS, of Wing, near Oakham, in the county of Rutland, England, physical demonstrator, 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 new or improved Electric Meter or Apparatus for measuring and registering the quantity of Electricity passed through a conductor," 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 Charles Vernon Boys, 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 Vernon Boys, 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 Vernon Boys 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 August, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

A new or improved Electric Meter.

A.

SPECIFICATION of CHARLES VERNON BOYS, of Wing, near Oakham, in the county of Rutland, England, physical demonstrator, for an invention entitled "A new or improved Electric Meter or Apparatus for measuring and registering the quantity of electricity passed through a conductor."

As the number of oscillations made in a given time by the balance of a watch depends on the strength of the balance spring, so by substituting electro-magnetic force for the force of the spring, or by applying electro-magnetism to determine the strength of the spring, I am enabled, according to my invention, by means of a counter worked from a balance so regulated, to measure and register the electricity which is employed to govern the oscillations of the balance. The apparatus for this purpose may be constructed and arranged in various ways. According to one arrangement, the balance may be worked by an escapement driven by clock-work, and an electro-magnet being substituted for the usual balance-spring. The number of oscillations of the balance will be a measure of the electricity passed through the coils of the electro-magnet. According to another method the clock-work may be dispensed with, the electro-magnet or equivalent solenoids being used to determine the speed of oscillation of the balance. According to a third method, an electro-magnet or solenoid may be employed to determine the length and, consequently, the strength of a torsion spring connected to the balance. In all these cases additional means are applied to maintain the oscillations of the balance, which, unless they are maintained, would be gradually reduced and finally stopped by the effects of friction and other resistances. Thus, when clock-work is employed, an electro-magnet may be applied to work remontoir apparatus so as to maintain the driving power of the clock-work, or when the balance is worked without clock-work it may be made to receive an occasional impulse from an electro-magnet or solenoid, such impulses being arranged to recur regularly or when the oscillations of the balance become to a certain extent reduced. I will describe several forms of electric meter arranged according to the above methods, referring to the accompanying drawings and to the figures and letters marked thereon. Fig. 1 is a front view; fig. 2 is a side view; fig. 3, a plan looking from above; and fig. 4, a plan looking from below of an electric meter, according to my invention, in which the balance is driven by clock-work maintained by remontoir apparatus, and the oscillations of the balance are determined by an electro-magnet.

On a base, A, I fix the two limbs BB of an electro-magnet having its coil in the circuit the electricity in which is to be measured. These limbs terminate in polar extension pieces *b b*, between which an oscillating armature, C, is mounted on a vertical axis, *c*. The lower part of the axis *c* constitutes the cylinder of an escapement engaging with an escapement wheel, D, which is connected by suitable gearing, *d*, to an arbor, E, driven by clock-work. The clock-work may be worked by a weight or spring wound up from time to time by hand. I prefer, however, as stated above, to wind it up by remontoir apparatus worked by the electricity itself, as I will now describe. On a fixed axis, *f*, projecting from the base A are mounted free to revolve the following parts:—First, a toothed wheel, F, which gears with a pinion, *e*, on the arbor E, and which has a groove in its circumference to receive a driving band; secondly, a barrel, G, containing a volute spring, this spring having one of its ends attached to the interior of the barrel, and the other to the pin *f*; thirdly, a ratchet wheel, H, grooved like F to receive the same driving band which passes over guide pulleys, *g g*, mounted on spring brackets projecting from the barrel G; and fourthly, an armature, K, which can oscillate between the poles M M of an electro-magnet fixed to the base A; this armature is drawn by a spring, *k*, against a stop pin, *k'*, and it carries a spring pawl, *h*, engaging the teeth of the ratchet wheel H, with which also engages a pawl, *h'*, to prevent the wheel from turning backwards. The coils of the electro-magnet M M are in a by-pass circuit, *m m*, branching off from the main circuit L L' at the connecting posts N N'. These posts are usually connected by a spring, *n*, bearing against a contact screw, *n'*, and in that case the main current passes direct from L through N to N', and by the wires *ll* through the coils of the electro-magnet BB to L', the magnet M M being then excited too feebly to effect displacement of the armature K. When, however, the spring barrel G turns to such a position that a stud, *g'*, projecting from it presses the spring *n* away from the screw *n'*, then, the direct connection between N and N' being thus broken, the current must pass through the coils of the magnet M M. The armature K is then attracted in the direction of the arrow, fig. 4, and by its pawl *h* it turns the ratchet wheel H partly round. A small portion of this movement of H is communicated by the band to the wheel F, but the principal portion tends by means of the pulleys *g g* to turn the spring barrel G, winding up the spring enclosed in it, and at the same time releasing the spring *n*, which thereupon makes contact again with *n'* short-circuiting the current. The magnet M M being thus rendered comparatively inert, the armature K is drawn back by its spring *k*, ready to act again as described. The partial winding up of the spring in the barrel G thus effected is sufficient to maintain for a time the movement of the escapement wheel D, which is thus by the intermittent winding action of the armature K kept in motion while an electrical current passes along the conductor L L'. The velocity of the motion of D manifestly depends on the rate at which the armature C is made to oscillate, and this rate is determined by the attraction of the magnet BB, that is to say, by the electric force passing through its coils. If, therefore, a counter of any known kind be connected by gearing to the arbor E, the indication given by this counter after a certain time of action being proportional to the number of oscillations of the armature C, will be a measure of the electricity that has passed during that time along the conductor L L'. The period of oscillation of the armature C, subject to a given electrical current, may be varied by loading it more or less by weight on arms projecting from it as shown.

I will now describe an arrangement of the apparatus wherein solenoid coils acting on cores are substituted for the electro-magnetic poles acting on an armature, and wherein the remontoir, instead of being applied to wind up the spring which drives the balance, gives direct impulse to the balance itself. Fig. 5 is a side view; fig. 6 is a plan on X X; fig. 7, a plan on Y Y; fig. 8, a plan on Z Z; and fig. 9 is a plan of the counter which registers the number of oscillations. An axis, A, has two arms, *a a*, to which are attached segmental pieces of iron, BB, that can move freely through coils C C of insulated wire, and through smaller coils D D at the sides of these. On the axis A is a projecting stud, E, which, as the axis turns in the direction of the arrow meets a light spring, F, and bends it so as to make momentary contact with a pin, G, the stud E then escaping the spring F. There is also on the axis A a spring pawl, H, which engages

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engages with the teeth of a ratchet wheel, I, and turns it one tooth round at each reciprocation of the axis. Another spring pawl J prevents the wheel I from turning backwards. The axis of the wheel I works an index of a counter, K, and by suitable gearing works other indices of the counter so as to register by units, tens, hundreds, &c., the number of oscillations of the axis A. The conductors L L' of the circuit to which the instrument is applied are always in connection with the wire of the two larger coils C C, and one of the conductors L is always in connection by a branch with one end of the wire of the smaller coils D D, the other L' being connected to the spring F, whilst the other end of the wire of the small coils D D is connected to the contact pin G. The apparatus works as follows:—A current of electricity passing through the circuit L L' excites the coils C C, and the segments B B are then in the condition of the balance of a watch, oscillating to and fro within the coils with a velocity greater or less according as there is more or less electricity passing through the coils C C. If there were no friction or other resistance, the segments B B, if once caused to oscillate, would go on oscillating as long as the coils C C remained excited, but as the friction and other resistances would in time stop their movement, the smaller coils D D serve to give the segments an impulse in every to and fro oscillation, and thus to maintain their motion. For this purpose the stud E on the axis A is so arranged relatively to the contact spring F that when the segments B B are about the middle of their stroke in one direction, the spring F is caused to make contact with the pin G, so that a portion of the electrical current is transmitted for a moment through the smaller coils D D, and this gives the segments B B an impulse in the direction in which they are moving. Obviously there might be other smaller coils such as D D on the other side of the larger coils C C, and another contact pin such as G on the other side of the spring F, so that the segments B B might receive an impulse in both directions of their motion. The oscillating axis A, by means of the pawl J, gives at every oscillation a motion to the ratchet wheel I, and the counter K records the number of oscillations performed in a given time, this number being greater or less according as a greater or less quantity of electricity has during the time passed through the conductors L L'. By means of weights M, adjustable on the arms *aa*, the period of oscillation under a given electrical force may be regulated. Instead of arranging the connections to the small coils D so that they give the balance an impulse at every oscillation, they may be arranged so as to give the impulses only when the oscillations have become to a certain extent decreased so as to require fresh impulse to increase them. Fig. 10 shows to an enlarged scale an arrangement for this purpose, A being the axis of the balance. I fix upon its side a stud, K, having on its upper surface an inclined notch. N N' are two springs adjustable by screws, and having at their ends contact points at a small distance apart. One of these springs is connected to the main wire of the instrument, the other to the wire of the coils D, so that these coils receive a current only when the contacts of the springs N N' come together. From the lower spring N hangs freely a tongue, *n*, which, when the stud K makes a considerable stroke enough to carry it quite past *n*, has no effect; but when the stroke made by K in one direction is so far lessened that its notch does not pass the end of the tongue *n*, then in the return stroke of K the tongue remaining in the notch is lifted, and thus the spring N is raised to make contact with N', whereupon the small coils D receiving part of the electric current give an impulse to the balance so as to increase the extent of its oscillation. When the instrument is arranged so that the axis A lies horizontally, the stud K may be arranged to act on *n*, as shown in fig. 11. According to a modified arrangement an electro-magnet may be substituted for the small coils D, as shown in fig. 12. In this case an electro-magnet, P, is excited when the springs N N' come in contact, and it attracts an armature, Q, fixed on the balance axis A, thereby giving the required impulse.

According to another arrangement, shown in fig. 13, two armatures, R R, of electro-magnets may be connected by a flexible spring, S, passed through a slit of the balance axis A, so that when the armatures are attracted they, by their effort to straighten the spring S, give rotatory impulse to the axis A. As stated above, the electricity to be measured, instead of acting directly on the balance in the manner of a spring determining by its strength the period of oscillation, may be applied to vary the strength of the balance spring. Fig. 14 is a side view; fig. 15, a back view; and fig. 16, a plan of an electric meter arranged to act in this way. In this case a balance-wheel, A, is suspended by a long flat spring, B, which passes through a slit in a lever arm, C, pivoted at *c*, and counter-balanced by a weight, C', and drawn upwards by an adjustable spring, C². On this arm near its pivot is fixed a cylindrical armature, D, near the poles of an electro-magnet, E, whose coils are in the main circuit. According as a greater or less electrical current passes through the coils of E, the armature D is more or less attracted, the arm C, being thus more or less depressed, shortening to a greater or less extent the length of spring B below the slit of C in which it is engaged, and thus more or less accelerating the oscillations of the balance A. Thus the number of oscillations of A in a given time, as indicated by a counter worked from the axis of A, will measure the quantity of electricity that has in that time passed through the coils of E. For the purpose of giving occasional impulse to the balance A, I fix across it an iron bar, Q, constituting an armature to the electro-magnet P, whose coils are brought momentarily into circuit by the arrangement of contact springs N N', tongue *n*, and notched stud K, as already explained with reference to fig. 10. I also provide that the instrument shall start when it is put in circuit by the following arrangement:—A detent lever, F, carries at its upper end an armature, G, and at its lower end it is pressed by a spring so as to engage a ratchet stud, H, projecting from the rim of the balance-wheel, this stud being so placed that it is engaged by F when the balance-wheel is at or near the limit of its oscillation. When the instrument is put in circuit the electro-magnet E attracts the armature G so as to withdraw the detent from H, leaving the balance A free to make its oscillations; but if the current should cease, so that the armature G is no longer attracted, the detent lever F engages the stud H, and so keeps the balance held at one limit of its oscillation ready to start into movement when the magnet E becomes again excited.

Having thus described the nature of my invention, and also described several ways in which my invention can be put into practical operation, I claim—

First—The herein-described method of measuring and registering the quantity of electricity passed through a conductor by counting the oscillations of armatures or cores operating as a balance-wheel, governed by the attraction of electro-magnets or solenoids, having their coils in the circuit of the conductor.

Second—

A new or improved Electric Meter.

Second—The herein-described method of measuring and registering the quantity of electricity passed through a conductor by counting the oscillations of a balance-wheel, governed by a torsion spring, the operative length of which is determined by an electro-magnet, having its coils in the circuit of the conductor.

Third—An electric meter consisting of a balance-wheel, or its equivalent, having its oscillations governed by the electric force, in combination with a counter registering the number of oscillations, substantially as herein described.

Fourth—The combination of the balance of an electric meter with electric remontoir or impulse apparatus, substantially as herein described.

Fifth—The construction of electric meter, substantially as herein described with reference to figs. 1 to 4 inclusive.

Sixth—The modified construction of electric meter, substantially as herein described with reference to figs. 5 to 13 inclusive.

Seventh—The construction of electric meter, substantially as herein described with reference to figs. 14, 15, and 16.

In witness whereof, I the said Charles Vernon Boys have hereunto set my hand and seal, this fourth day of May, in the year of our Lord one thousand eight hundred and eighty-two.

CHARLES VERNON BOYS.

Witness—

G. W. WESTLEY, 17, Gracechurch-street, London.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to Charles Vernon Boys, this tenth day of August, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 27 June, 1882.

We do ourselves the honor to report, in reply to your blank cover communication of the 20th instant, No. 7,049, transmitting Mr. Charles Vernon Boys' application for the registration of an invention entitled "A new and improved Electric Meter or Apparatus for measuring and registering the quantity of electricity passed through a conductor," that we are of opinion the prayer of Mr. Boys' 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.]

No. 1106.

[Assignment of No. 843. See Letters of Registration for 1880, page 173.]

No. 1107.

[Assignment of No. 995. See Letters of Registration for 1881, page 333.]

Fig: 14.

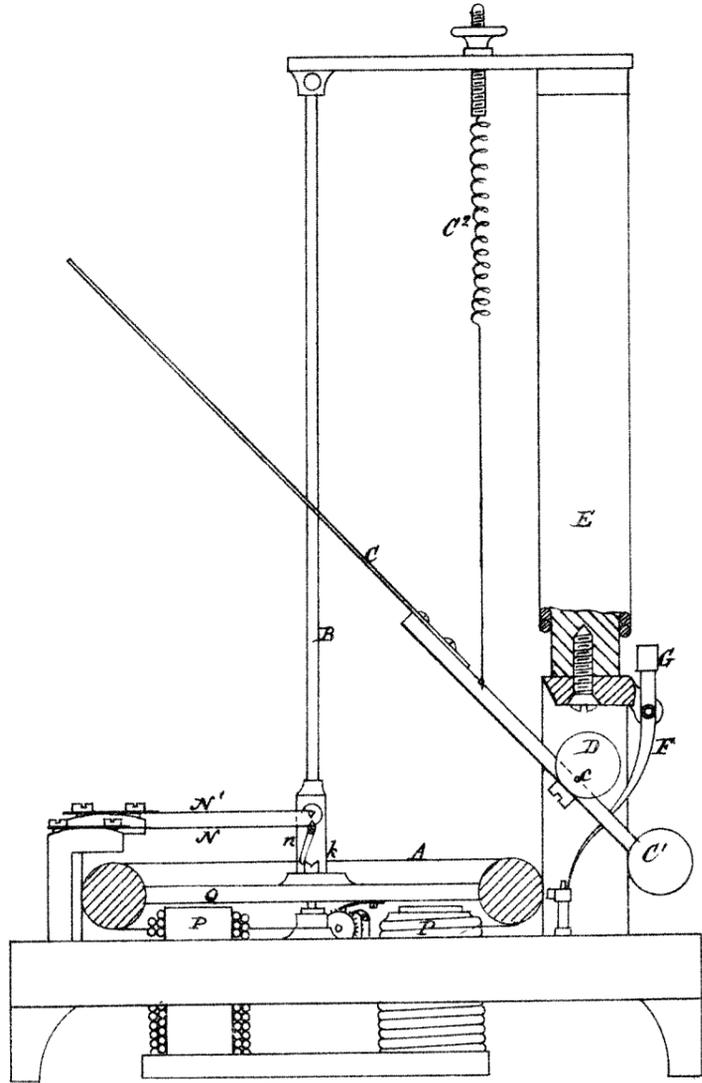


Fig: 15.

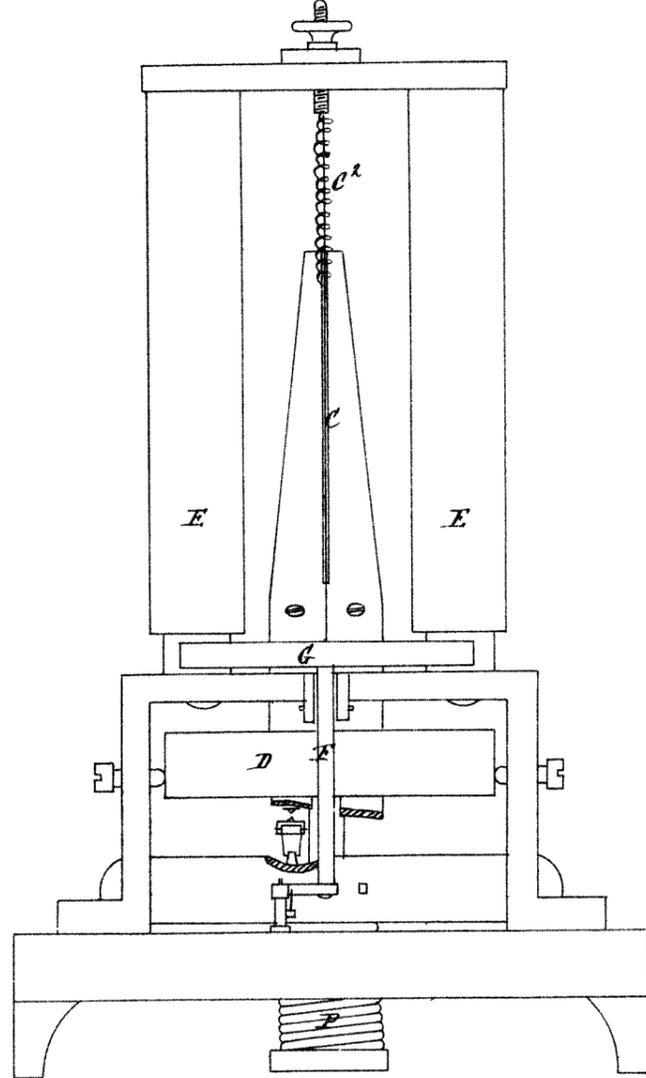


Fig: 16.

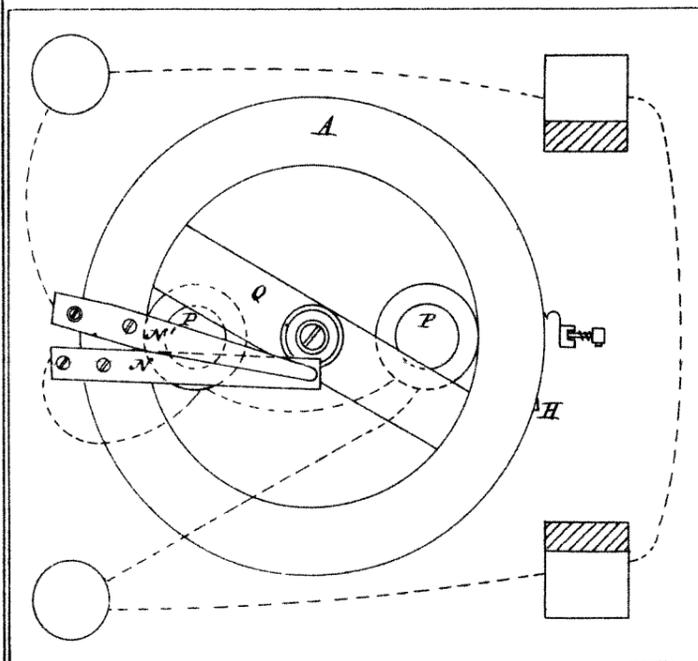


Fig: 10.

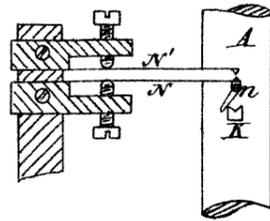


Fig: 12.

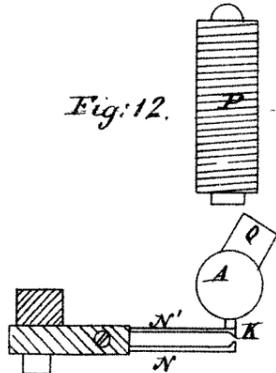


Fig: 11.

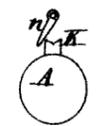
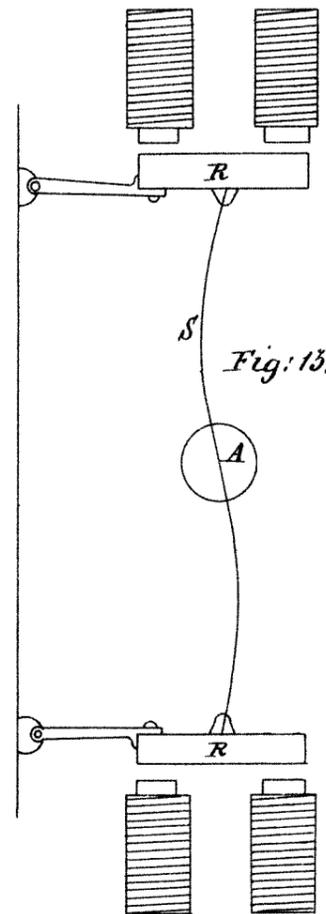


Fig: 13.



This is the Sheet of Drawings marked C referred to in the annexed Letters of Registration granted to Charles Vernon Boys, this tenth day of August, A.D. 1882.

Augustus Loftus.



A.D. 1882, 21st August. No. 1108.

IMPROVEMENTS IN VALVES FOR THE AIR-PUMPS OF STEAM-ENGINES.

LETTERS OF REGISTRATION to James Richard Thomson, for Improvements in Valves for the Air-pumps of Steam-engines.

[Registered on the 21st day of August, 1882, 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 RICHARD THOMSON, of 20, Pitt-street, Bonnington, Edinburgh, Scotland, 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 Valves for the Air-pumps of Steam-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 James Richard Thomson, 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 Richard Thomson, 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 Richard Thomson 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 August, in the year of our Lord one thousand eight hundred and eighty-two.

[L.s.]

AUGUSTUS LOFTUS.

Improvements in Valves for the Air-pumps of Steam-engines.

A.

TO ALL WHOM IT MAY CONCERN: BE it known, that I, JAMES RICHARD THOMSON, of 20, Pitt-street, Bonnington, Edinburgh, Scotland, have invented certain improvements in the manufacture of Valves for the Air-pumps of Steam-engines, of which the following is a complete description.

THIS invention has for its object to improve the action and increase the durability of the air-pump valves of steam-engines, and its application is specially of advantage in the case of large engines driven at comparatively quick speeds, such as those employed for marine propulsion.

The invention consists mainly in employing groups of comparatively small metallic valves, of an improved construction, instead of either the single large metallic valves formerly used for the purpose, or the smaller rubber valves, which have been more recently used, but which, whilst admitting of increased speeds, have involved great expenditure for renewals, on account of their very deficient durability. The improved valves are simple rigid lift valves, opening and closing by the action of the currents or pressures caused by their pumping action, their closing action being assisted by springs when they are arranged to open otherwise than upwards. The valves consist, according to the present invention, of flat or convex discs of brass or other suitable metal or metals, and are mounted or guided upon fixed central spindles; and in order that the said invention and the manner of performing the same may be properly understood, I have hereunto appended two sheets of explanatory drawings, to be hereinafter referred to, and representing various modifications of the improved valves.

Figure 1, on sheet 1 of the accompanying drawings, is a vertical section of a steam-engine air-pump as fitted with a modification of the improved valves, these valves being arranged to open upwards, in this sample the pump being of the single-acting valved bucket class.

Figures 2, 3, and 4, on sheet 2 of the drawings, are enlarged sections of various modifications of the valves, those shown in figure 2 being the kind fitted to the pump shown in figure 1. In carrying out the invention, the air-pump, figure 1, instead of as formerly having a single large metallic discharge valve at the top, is fitted with a group of small rigid metallic valves, 5, and in a similar way the bucket 6 is fitted with a group of small rigid metallic valves, 6, whilst the foot valves 7 are also a group of small rigid metallic valves. The valve shown in figure 2, which is made of brass or other suitable metal or alloy, is of a circular form, with an annular concavity on its underside. It is held in position and guided in its movement by a central spindle or stud, 8, fixed in the centre of the valve grating.

The modification of valve shown in figure 3, which is also made of brass or other suitable metal or alloy, is of a circular form, and with or without, as may be preferred, a narrow flat bearing surface round its edge, and at the centre to close upon a flat metallic seat. It is held in position and guided in its movement by central spindle or stud, 8, fixed in the centre of the valve grating.

The modification of valve shown in figure 4, which is made of cast or rolled sheet brass, or other suitable metal or alloy, is of a circular form and flat. It is held in position and guided in its movement by a central spindle or stud, 8, fixed in the centre of the valve grating, and the lift of the valve is regulated by a flat brass guard of a circular form.

The valves may be further modified by having, in place of the centre spindle or stud 8, a tripod or circulating guard.

Having thus particularly described the said invention and the manner of performing the same, I have to state that I do not restrict myself to the precise details herein described or delineated, but that which I believe to be novel and original, and claim as the invention secured to me by and in terms of the hereinbefore in part recited Letters Patent:—

- 1—The fitting of rigid metallic valves, such as are hereinbefore described, to or in connection with the air-pumps of steam-engines.
- 2—The making and fitting of air-pump valves in any of the modes hereinbefore described, with reference to figures 2, 3, and 4, irrespective of the modes of guiding such valves.

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-two.

Witness—

M. J. FITZPATRICK,
Agent, Post Office Chambers.

JAMES RICHARD THOMSON,
(By his lawful Attorney, A. L. McCREDIE).

This is the specification, marked A, referred to in the annexed Letters of Registration granted to James Richard Thomson, this twenty-first day of August, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 6 July, 1882.

In reference to your B.C. minute of the 22nd ultimo, forwarding the application of James Richard Thomson, of Bonnington, Edinburgh, for Letters of Registration for "Improvements in Valves for Air-pumps for Steam-engines," we have the honor to state that we see no reason why the Letters applied for should not be issued.

We have, &c.,
E. O. MORIARTY.
WILLIAM C. BENNETT.

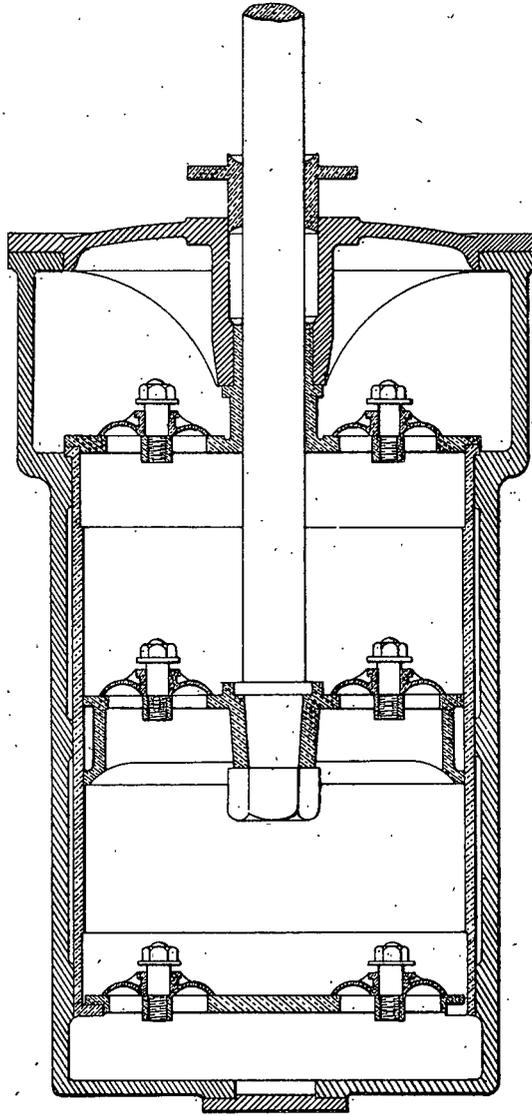
The Under Secretary of Justice.

[Drawings—two sheets.]

No. 1109.

[Assignment of No. 1073. See page 183.]

FIG. I.



This is the Sheet of Drawings marked B referred to in the annexed Letters of Registration granted to James Richard Thomson, this twenty-first day of August, A.D. 1882.

Augustus Loftus.

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

FIG. 2.

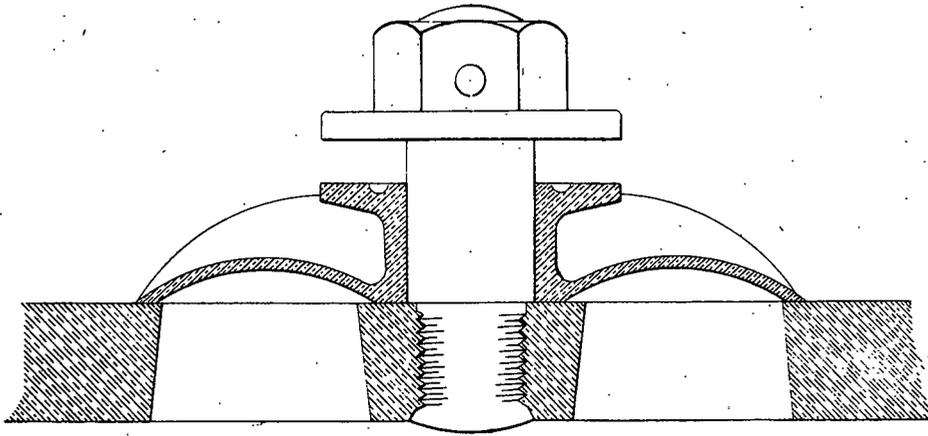


FIG. 3.

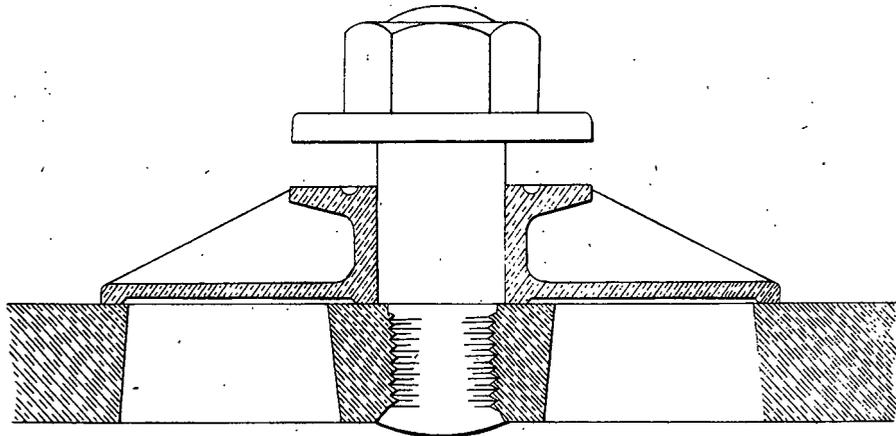
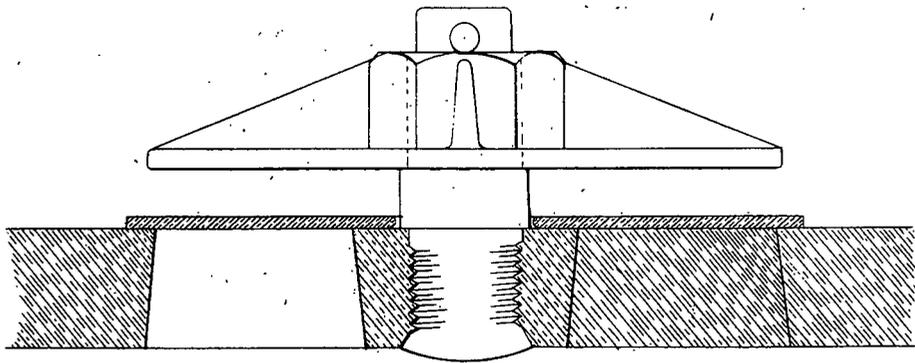


FIG. 4.



This is the Sheet of Drawings marked C referred to in the annexed Letters of Registration granted to James Richard Thomson, this twenty-first day of August, A.D. 1882.

Augustus Loftus.



A.D. 1882, 26th August. No. 1110.

IMPROVEMENTS IN FURNACES FOR REDUCING AND SMELTING.

LETTERS OF REGISTRATION to James Cosmo Newbery, John Lister Morley, and Barry Cleveland, for Improvements in Furnaces for reducing and smelting certain descriptions of ores.

[Registered on the 26th day of August, 1882, 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 COSMO NEWBERY, analytical chemist, JOHN LISTER MORLEY, gentleman, and BARRY CLEVELAND, gentleman, all of Melbourne, in the Colony of Victoria, 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 Furnaces for reducing and smelting certain descriptions of ores," 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 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 Cosmo Newbery, John Lister Morley, and Barry Cleveland, 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 Cosmo Newbery, John Lister Morley, and Barry Cleveland, 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 Cosmo Newbery, John Lister Morley, and Barry Cleveland, 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 August, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Furnaces for reducing and smelting.

SPECIFICATION of JAMES COSMO NEWBERY, analytical chemist, JOHN LISTER MORLEY, gentleman, and BARRY CLEVELAND, gentleman, all of Melbourne, in the Colony of Victoria, for an invention entitled "Improvements in Furnaces for reducing and smelting certain descriptions of ores."

OUR invention consists of certain improvements in furnaces for reducing and smelting metallic ores, especially those which form oxides or compounds that may be reduced by heated charcoal, such as ores of antimony, bismuth, copper, tin, and zinc.

One part of our invention (relating to the production of oxides from sulphides, arsenides, and other oxidizable ores) consists of a hearth on which the raw ore is treated. When the ore is easily fusible, such as sulphide of antimony, the method of treatment differs from that of ores not readily fused. In the case of sulphide of antimony the hearths in use usually consist of a solid surface with a tap-hole in some convenient position for drawing off the fused sulphide, which is then smelted in a crucible or a furnace. Now according to our invention the hearth is not solid, but has holes or perforations all over it, which allow the fused sulphide to pass through on to a solid bed underneath, where the sulphide is converted into oxide or if required for any purpose may be drawn off as crude. When the ores do not fuse readily the oxide may be made in any of the ordinary ways now in use.

Another part of our invention is the conversion into metal of the oxides, whether natural or artificial. This we accomplish by smelting them in a furnace so constructed as that the draught is downward through the oxides in process of smelting, and through the carbon material used in such process.

Our furnaces may be so constructed and arranged as that the heat from one fire is utilized for liquating the ore, perfecting the oxidation, and producing the metal.

In order, however, that our invention may be clearly understood, we will now refer to the drawings hereto attached, in which figure 1 shows longitudinal section of our furnace; figure 2, plan; figure 3, cross section of the reducing part of the furnace on the line *a a* in figure 2, and figure 4, cross section of the liquating or oxidizing part of our furnace on the line *b b* in figure 2. A is the fireplace, and A¹ the fire-bridge. B B are tubes or cylindrical chambers made of fire-clay, and closed with caps, B¹ B¹. B² is the bed of this part of the furnace. B³ is the flue from the bottom of reducing part of the furnace into the precipitating chamber or flues, and B⁴ the entrance into the oxidizing chamber. C is the perforated hearth of the liquating chamber, and D the solid bed underneath. C¹ C¹ are feeding doors, and C² cleaning-out doors. D¹ is also a cleaning-out door, and D² the escape flue to the precipitating flues or chambers.

The mode of operation is as follows:—The fire having been lighted in A, and the necessary heat having been attained, the hearth C is supplied through doors C¹ C¹ with the ore to be treated and the doors are closed. The tubes or cylindrical chambers B are then charged with the oxide to be smelted, and with the carbon necessary for the purpose, in substantially the following way:—First, there must be a thick layer, say 1 foot, of the carbon material (such as wood charcoal) at the bottom, then a layer of (say) 6 inches of oxide, and then another layer of (say) 2 inches of carbon, and so on until the tube is filled, so as to provide sufficient carbon to reduce the oxide to metal, as is well understood. As the contents descend they are replaced by fresh oxide and carbon in similar proportions, the caps of the tubes being left off until there is no more material to treat, when they are put on, so as to prevent the possible escape of injurious gases, and to prevent unnecessary waste of material. The heat from the fire A plays around said tubes, then passes through B⁴ into the liquating chamber, and when fusible sulphides are being treated it fuses them, and they run through the perforations of the hearth C on to the solid bed D. The heat then passes over such solid bed, and finally is conducted through escape flue D² to the precipitating flues or chambers, not shown. As the heated current passes over the solid bed D it carries with it the oxide that has been formed thereon, and in order to facilitate the production of this oxide the door D¹ is opened sufficiently and as often as may be required, or heated air may be supplied to the bed D through pipes.

The oxide in the tubes B becomes heated to such an extent as to be reduced, and passing through the carbon at the bottom is discharged as metal on to solid bed B², from whence it runs through tap-hole B³ into a proper receiver. Combustible gases or liquids, such as hydro-carbon, hydrogen, or carbonic oxide may be used, more or less, as a substitute for the solid carbon in the tubes, so long as a thick layer of carbon remains in the bottom of each.

Having thus described the nature of our invention and the manner of performing same, we would have it understood that what we believe to be new, and therefore claim as our improvements in furnaces for reducing and smelting metallic ores, especially those which form oxides or compounds that may be reduced by heated charcoal, is—

First—Constructing the hearth on which the ore is first treated with holes or perforations in it, so as to allow the fused ore to fall through, substantially as herein described and explained.

Second—Combining with such hearth a solid bed underneath, on which the fused ore is oxidized, substantially as herein described and explained.

Third—Constructing the reducing chambers with a downward draught through the material under treatment, and preferably in the form of tubes or cylinders, substantially as herein described and explained.

Fourth—Combining and arranging our liquating and reducing chambers in the manner substantially as herein set forth and described, and as illustrated in our drawings.

In witness whereof, we, the said James Cosmo Newbery, John Lister Morley, and Barry Cleveland, have hereto set our hands and seals this twenty-eighth day of June, one thousand eight hundred and eighty-two.

Witness—

EDWD. WATERS,
Melbourne, Patent Agent.

J. COSMO NEWBERY.
J. L. MORLEY.
BARRY CLEVELAND.

This is the specification referred to in the annexed Letters of Registration granted to James Cosmo Newbery, John Lister Morley, and Barry Cleveland, this 26th day of August, A.D. 1882.

AUGUSTUS LOFTUS.
REPORT.

Improvements in Furnaces for reducing and smelting.

REPORT.

Sir,

The application of Messrs. James Cosmo Newbery, John Lister Morley, and Barry Cleveland, for Letters of Registration for "Improvements in Furnaces for reducing and smelting certain descriptions of ores" having been referred to us, we have examined the specification and drawings accompanying the application, and now have the honor to report that we see no objection to the issue of Letters of Registration as prayed for.

We have, &c.,

A. LEIBIUS.

E. O. MORIARTY.

The Under Secretary of Justice.

[Drawings—one sheet.]

NEWBERY, MORLEY, & CLEVELAND'S
PATENT.

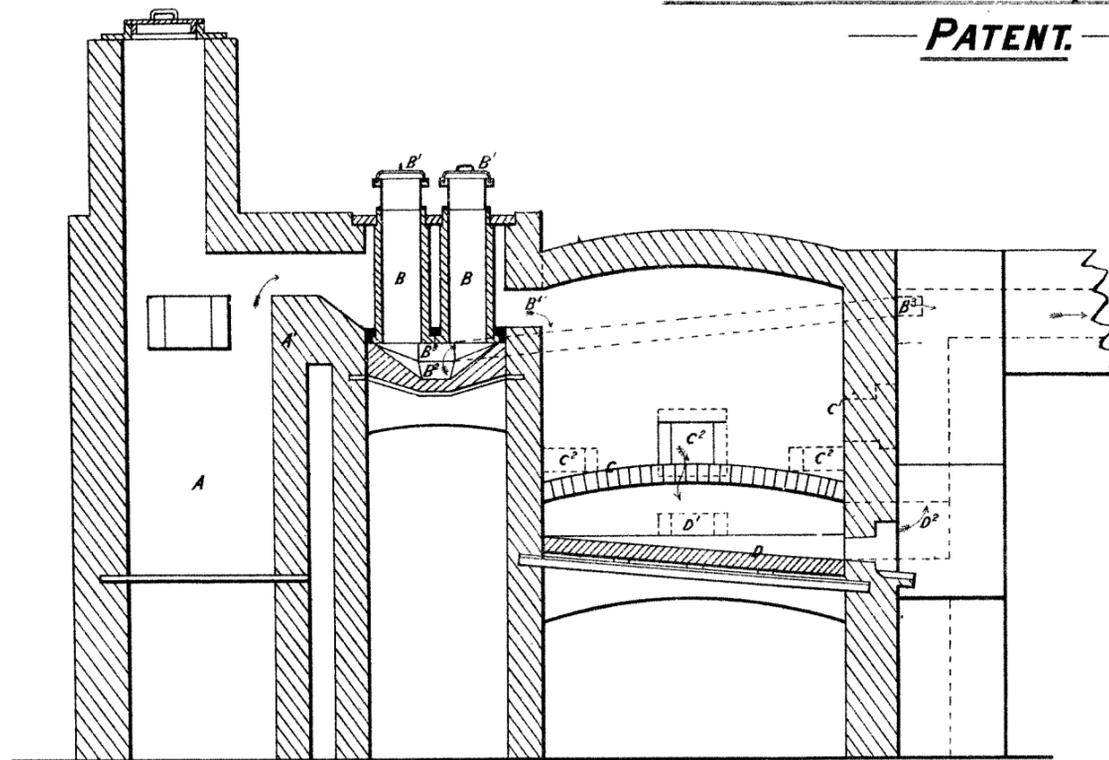


Fig. 1.

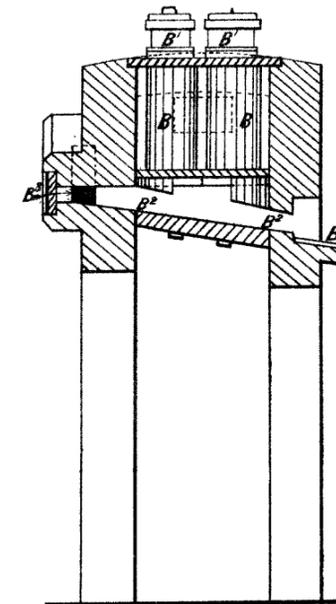


Fig. 3.

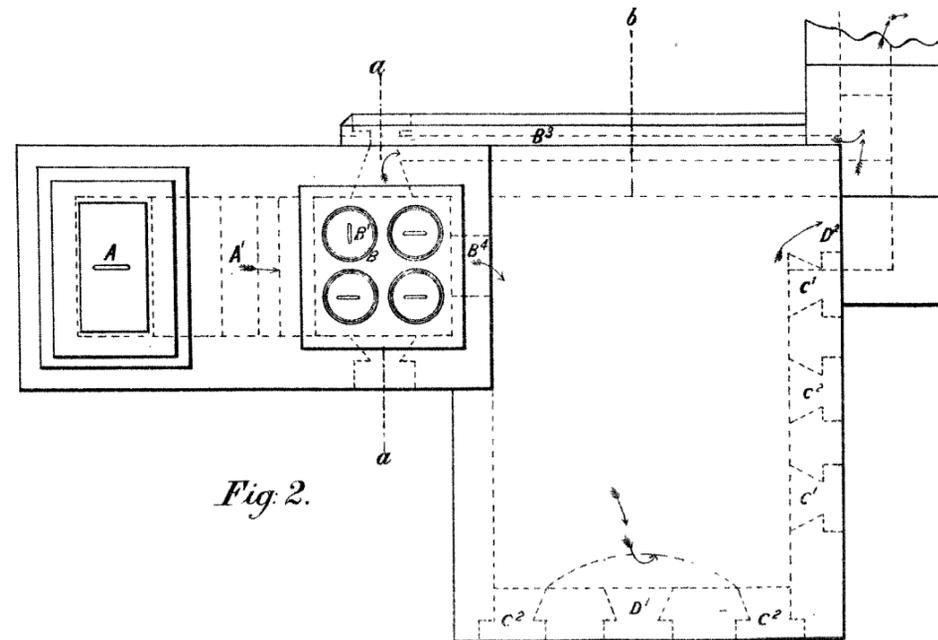


Fig. 2.

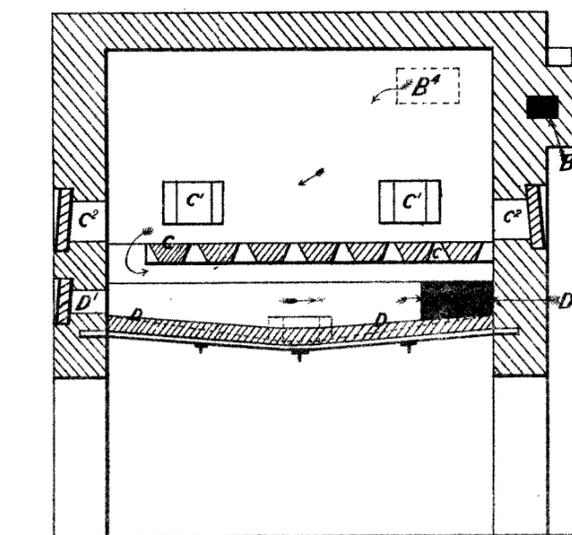


Fig. 4.

*This is the Sheet of Drawings referred to in the annexed
Letters of Registration granted to James Cosmo Newbery,
John Lister Morley and Barry Cleveland, this 26th day of August
A.D. 1882.*

Augustus Loftus.

Sig. 32



A.D. 1882, 26th August. No. 1111.

AN IMPROVED METHOD OF AND APPARATUS FOR MINING, QUARRYING, OR
TUNNELLING OPERATIONS.

LETTERS OF REGISTRATION to Charles Sebastian Smith and Thomas Moore,
for an improved method of and apparatus for breaking down or getting coal
and other minerals, in mining, quarrying, or tunnelling operations.

[Registered on the 26th day of August, 1882, 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 SEBASTIAN SMITH, of Leicester, in the county of Leicester, England, land agent and solicitor, and THOMAS MOORE, of Shipley, in the county of Derby, England, colliery under-viewer, 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 method of and apparatus for breaking down or getting coal and other minerals, in mining, quarrying, or tunnelling operations," 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 Charles Sebastian Smith and Thomas Moore, 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 Charles Sebastian Smith and Thomas Moore, 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 Charles Sebastian Smith and Thomas Moore 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 August, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

An improved method of and apparatus for mining, quarrying, or tunnelling.

SPECIFICATION of CHARLES SEBASTIAN SMITH, of Leicester, in the county of Leicester, England, land agent and solicitor, and THOMAS MOORE, of Shipley, in the county of Derby, England, colliery underviewer, for an invention entitled "An improved method of and apparatus for breaking down or getting coal and other minerals, in mining, quarrying, or tunnelling operations."

ACCORDING to our present invention, we effect the breaking down or "getting" of coal and other minerals in mines, quarries, or tunnels, by means of caustic lime introduced into bore-holes in the said minerals and then brought into contact in a confined condition with water, so that by the expansion of the lime in becoming slaked, and by the pressure of steam generated, considerable force is produced, sufficient to effect the breaking down of the mineral. By this means, in the case of coal-mines, the double advantage is gained of effecting the breaking down of the coal without danger of explosion of fire-damp, and with the production of a greatly reduced proportion of small coal as compared with the ordinary blasting operation.

Our invention may be carried into practice in a variety of ways; but according to the arrangement and mode of operating by preference employed by us, the caustic lime is ground fine and then consolidated by pressure into cartridge form, each cartridge having a groove on the side, which cartridges are enclosed in waterproof casings or packed into air-tight boxes, or both, to protect them from damp. An iron tube provided with perforations, and having a covering of cotton or other fibrous material, and also fitted with a tap or automatic check-valve or other means of closing it, is first inserted along the whole length of the bore-hole, the cartridges are then introduced, the surface of the groove being next to the tube, and they are rammed so as to insure their filling the bore-hole. After the cartridge or cartridges have been enclosed, either by tamping with clay or other suitable material, or by a bung or otherwise, a force-pump is connected with the said tube and the water is so conveyed to the lime; when the water has been forced in, the pipe connecting the pump or other power with the said tube is detached, and the tube is closed, so as to prevent the escape of the steam generated by the action of the water on the lime.

In order to facilitate the passage of the water from the tube to the lime, we, by preference, form a groove along the greater part of the length of the tube, such groove being indented thereon by rolling, and we form notches in the open inner end of the tube, from which the water passes into the said groove and thence flows on to the lime.

In cases where the material operated upon is so dense as not to allow the escape through it of the air when the water is being forced in, we form on the before-described tube a very small external channel, sufficient to allow the air to escape gradually as the water is forced in, but too small to allow any appreciable quantity of steam to escape afterwards.

In order to cause the whole mass of the cartridge or cartridges to be subjected more or less simultaneously to the action of the water, so as to bring about a rapid and energetic action, the cartridge may either have a groove, as before mentioned, formed along its side, or it may be formed with a hole through its centre, along which groove or hole the said tube for conveying the water is placed, or the tube may merely enter the front end thereof, so that the water is forced along the whole length of the cartridge or cartridges. Or a solid rod or needle may first be inserted into the bore-hole, and after the cartridges have been inserted and enclosed by tamping, or a bung, or otherwise, the needle may be withdrawn and a tube inserted in its place, which tube is fitted with a tap or other means of closing it, and through this tube the water may be conveyed to the lime. The lime we prefer to use is made from mountain limestone.

Although we prefer to employ the lime in the form of consolidated cartridges, as described, yet it may also be rammed into the bore-holes in an unprepared condition, the tube for conveying the water being first introduced into the bore-hole at the side or centre thereof; or a solid rod or "needle" may be introduced in the first instance, as aforesaid, and after withdrawing the same the tube for the water supply may be inserted in its place. If desired, other fluids, such as diluted sulphuric acid, may be employed, or the water may be used hot to accelerate the expansive action of the lime, and other substances may be mixed with the lime for the same purpose.

Having thus described the nature of our invention, and in what manner the same is to be performed, we wish it to be understood that we do not claim generally the use of caustic lime for breaking down coal, as we are aware that various unsuccessful attempts have from time to time been made to use caustic lime for this purpose; but we claim—

First—The method of breaking down or getting coals and other minerals by the introduction into bore-holes of caustic lime, which, after compression and confining by tamping or otherwise, is brought into contact with water or other suitable liquid along the entire or greater part of the length of the charge, so that by the expansion of the lime and pressure of the steam generated to produce sufficient force for breaking down the mineral, substantially as herein described.

Second—The use for breaking down or getting coal of cartridges formed of compressed caustic lime, having one or more longitudinal grooves or passages to serve as channels for the introduction of water.

Third—The use, in combination with cartridges, of charges of caustic lime, of a perforated, or slotted, or permeable tube placed along the side or through the body thereof, and serving to bring water into intimate contact therewith, substantially as herein described.

Fourth—Constructing tubes for supplying water to lime cartridges, with a longitudinal groove indented thereon by rolling.

In witness whereof, we, the said Charles Sebastian Smith and Thomas Moore, have hereunto set our hands and seals, this sixteenth day of May, in the year of our Lord one thousand eight hundred and eighty-two.

Witness—HENRY POLLARD.

CHARLES SEBASTIAN SMITH.
THOMAS MOORE.

This is the specification referred to in the annexed Letters of Registration granted to Charles Sebastian Smith and Thomas Moore, this twenty-sixth day of August, A.D. 1882.

AUGUSTUS LOFTUS.

An improved method of and apparatus for mining, quarrying, or tunnelling.

REPORT.

Sir,

Sydney, 14 July, 1882.

With reference to your B.C. minute of 4th July, enclosing application of Messrs. Smith and Moore for Letters of Registration for an invention entitled "An improved method of and apparatus for breaking down or getting coal and other minerals, in mining, quarrying, or tunnelling operations," we have to report that we see no reason why the Letters applied for should not be issued.

We have, &c.,

JAMES BARNET.

WILLIAM C. BENNETT.

The Under Secretary of Justice.



A.D. 1882, 26th August. No. 1112.

IMPROVED ANTISEPTIC, PRESERVATIVE, CURATIVE, & CLEANSING COMPOUNDS.

LETTERS OF REGISTRATION to John Jeyes, for improved antiseptic, preservative, curative, and cleansing compounds, for sanitary and other purposes.

[Registered on the 26th day of August, 1882, 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 JEYES, of Plaistow, in the county of Essex, England, 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 "Improved antiseptic, preservative, curative, and cleansing compounds, for sanitary and other purposes," 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 John Jeyes, 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 Jeyes, 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 Jeyes 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 August, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improved antiseptic, preservative, curative, and cleansing compounds.

SPECIFICATION of JOHN JEXES, of Plaistow, in the county of Essex, England, chemist, for an invention entitled "Improved antiseptic, preservative, curative, and cleansing compounds, for sanitary and other purposes."

My invention relates to improved compounds or mixtures which possess antiseptic, preservative, curative, and cleansing properties to a very high degree, and are specially advantageous for general sanitary purposes.

My improved compounds may be used for a variety of purposes, such, for instance, as the "pickling" of wood or timber to prevent decay thereof; the coating of iron, wood, or other materials, as a substitute for paint; also as a wash for sheep, oxen, or other animals, to destroy parasites and the like; moreover, if combined with the ordinary ingredients of soap, my said compounds may be used for the cure of skin diseases of the human body, and for general detergent purposes.

I will first describe a compound or mixture made according to my said invention, and specially applicable for the pickling of wood or timber to prevent decay, this compound being partly designed to supersede, with considerable advantage, the use of common creosote for treating railway sleepers, fences, buildings, and the like. It may also be used as a preservative for window-frames, doors, floorings, and any similar parts of dwelling-houses or other structures.

Wood treated by my invention before the application of paint or varnish will be preserved, and the paint and varnish will dry freely, and do not discolour as is the case when creosote is used. This compound or composition is composed of the following ingredients, and is prepared in the manner hereinafter set forth, that is to say:—I take eight (8) hundredweight of naphthaline, that is to say, the substance which is ordinarily termed "salt" in tar-distilling yards, and I liquefy the same by heat, either in an ordinary open pan or in a jacket pan, or in any other suitable manner. When this naphthaline has been reduced to the liquid form I add thereto one half hundredweight of resin. By preference I employ black resin, although pale resin will practically serve the same purpose. In some cases I add coal or other pitch, the proportion being one half hundredweight, in which case the resin may be dispensed with or may be retained as desired. These ingredients are to be well mixed together whilst in a liquid form, and with a small quantity (say about two gallons) of caustic soda or potash of 30° Baumé, or the same quantity of a mixture of both these substances.

The soda or potash is to be thoroughly mixed with the other ingredients by agitation. The whole is then allowed to cool, and when cold forms a solid mass, which can be conveniently transported to any distance as may be required for use. The mass or block may be broken up into smaller pieces if desired. When it is desired to make use of the compound or mass so manufactured, supposing one hundredweight of the same is required, I take this quantity thereof and place the same in a suitable quantity of water (say from three (3) to nine (9) hundredweight, in a suitable iron or other vessel, to which heat is applied in any desirable manner, and the whole mass is heated until it becomes thoroughly dissolved and blended. This will ordinarily require about an hour, more or less. The quantity of water relatively to that of the compound will depend upon the purpose for which the solution is to be used, that is to say, whether it is required to be more or less strong. The said solution whilst hot may be applied to the wood in any desirable manner, such as by means of a brush or by dipping the wood in the solution, or otherwise, and the durability of the said wood will be considerably increased thereby. If the timber or wood so to be impregnated be boiled in the said pickle or solution for a period of four (4) or six (6) hours the fibre thereof becomes toughened and the interstices filled with the said composition, moisture is excluded, and every vestige of decaying matter which may be present is destroyed. When the composition is applied to the wood or timber by immersing the latter in the solution I prefer that it should remain therein until the whole is cold, as a more complete absorption is thus ensured than would otherwise take place. After this treatment the wood should be dried naturally, and it will then resist the ordinary process of decay.

The compound made as above described will, if combined with the necessary ingredients for producing soap, be of great value for the treatment of all or most skin diseases, whether of human beings or animals, and for all detergent purposes, especially for the removal of grease, pitch, tar, or the like from any article from which it is desirable to remove it.

For washing or treating sheep or other animals to destroy or get rid of parasites or insects of all kinds, and for the prevention and cure of scale, foot-rot, and other diseases to which animals are peculiarly liable, I vary my composition as follows, that is to say, I make a solution of resin by the aid of heat in combination with crude petroleum, or instead of the crude petroleum I may use the latter distillates of shale or coal tar, or anthracine salts and oils, or other hydro-carbon products having similar properties, as will be readily understood, the proportions being two (2) parts by weight of resin to four (4) parts by weight of petroleum or other equivalent hydro-carbon. To this solution I add one (1) part by weight of caustic soda in solution, strength 25° Baumé, also one-sixteenth (1/16th) part by weight of a solution of silicate of soda, and one-sixteenth (1/16th) part by weight of a solution of sulphate of soda, both at a strength of 30° Baumé. The whole of these ingredients should be thoroughly shaken or mixed in any suitable vessel, and the composition is then ready for use when diluted with the proper quantity of water. The proportion should be about eighty (80) gallons of soft or river water to every one (1) gallon of the above described composition. Large animals may be washed with this diluted preparation by saturating their coats therewith and then allowing them to dry naturally, and the smaller animals, such as sheep, may be dipped therein. Other water than river water may be employed, although I prefer river water. By the use of this preparation the wool of sheep is considerably improved with respect to softness, cleanliness, and weight. The action of the silicate of soda upon the wool is highly beneficial for softening the same and increasing its weight, and the sulphate of soda in combination with the tar oil or equivalent substance is exceedingly repulsive to all insects, and especially to those which infest and are injurious to animals.

I desire it to be understood that all the proportions above given are such as will, according to my experience, give the best results, but I do not confine myself strictly to these proportions or to the strength indicated, as they may be somewhat varied according to special circumstances, as will be readily understood by all persons conversant with the subject.

CLAIM.

Improved antiseptic, preservative, curative, and cleansing compounds.

CLAIM.

The antiseptic, preservative, curative, and cleansing compounds or compositions prepared with or of the ingredients or substances above specified, substantially in the manner and for the purposes set forth.

In witness whereof, I the said John Jeyes have hereto set my hand and seal, this nineteenth day of May, 1882.

JOHN JEYES.

Witness—

J. T. KNOWLES.

This is the specification referred to in the annexed Letters of Registration granted to John Jeyes, this twenty-sixth day of August, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

The application of Mr. John Jeyes for Letters of Registration for an invention entitled "Improved antiseptic, preservative, curative, and cleansing compounds, for sanitary and other purposes" having been submitted to us, we have the honor to report that we see no objection to the issue of Letters of Registration as prayed for.

Sydney, 13 July, 1882.

We have, &c.,

A. LEIBIUS.
CHAS. WATT.

The Under Secretary of Justice.



A.D. 1882, 26th August. No. 1113.

IMPROVEMENTS IN ELECTRIC LAMPS.

LETTERS OF REGISTRATION to James Fyfe, for Improvements in Electric Lamps.

[Registered on the 26th day of August, 1882, 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 FYFE, of London, in the county of Middlesex, England, 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 "Improvements in Electric Lamps," 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 Fyfe, 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 Fyfe, 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 Fyfe 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 August, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Electric Lamps.

SPECIFICATION of JAMES FYFE, of London, in the county of Middlesex, England, merchant, for an invention entitled "Improvements in Electric Lamps."

My invention relates to the construction and arrangement of electric lamps in such a manner that, while the carbons are fed forward as they are consumed, the light is automatically regulated in a simple manner, without the intervention of clockwork or such like mechanical apparatus. In one form of lamp, according to my invention, of which figure 1 represents a vertical section, there is a stationary carbon block, E, against which a carbon pencil, *e*, is pressed by a weight, W, suspended by cords passing round pulleys, R, the illumination being produced at the small end of the pencil *e*, where it presses against the block E. In order to prevent the pencil being pressed with too great force against the block, I provide at the mouth of the tube through which the pencil is pressed a pair of jaws, J, attached by springs J¹ to the end of the tube. A collar, P¹, rests on arms projecting inwardly from these jaws, and this collar is connected by a tube, P, to an iron collar, S¹, to which the upper pulleys R are attached. Thus the weight W, whilst it tends to press upwards the carbon *e*, at the same time, by straining down the collar P¹, causes the jaws J to clamp the carbon and so to impede or prevent its advance. In the body of the lamp I fix a tubular electro-magnet, S, to which the collar S¹ acts as an armature, and I connect the coil of insulated wire of the magnet S, which is a coil of high resistance, to the conductors leading to and from the lamp, so as to form a by-pass circuit of great resistance. As long as the point of the carbon pencil *e* is close up to the block E the main current passes through the carbons, producing light, and only a small part of the current can pass through the coil of S, insufficient to cause attraction of its armature S¹; but when the point of the pencil *e* is consumed the resistance of the lamp is so much increased that a larger portion of the current passes through the coil of S, and the armature S¹ being attracted rises, leaving the upper collar P¹ free to rise and the jaws J to open, releasing the carbon *e*, which is thereupon fed forward by the action of the weight W. The resistance of the lamp being thus diminished, the magnet S loses power to sustain the armature S¹, which descends, causing the jaws J again to clamp the carbon. Such a lamp as I have described is of a character intermediate between those of the incandescent kind and those of the arc kind.

The arc lamp, according to my invention, is arranged either with the carbons horizontal or with the carbons vertical, the former arrangement being the more simple, as it requires no counterbalancing of the ascending and descending parts. I will first, therefore, describe the horizontal lamp, referring to figure 2, which is a side view of it. One of the carbons is fixed in the end of a tube, C, which, resting on contact rollers, *rr*, is free to move to and from through the middle of two solenoid coils, M M¹, which surround the tube. The other carbon is carried by a round rod, D, which is passed through sockets, *dd*, so that it can be turned round therein for adjusting the carbon point to point, or for turning the one out of the way to give convenient access for placing or removing the carbons. Within the tube C is fixed an iron core, fitting the tube at its middle but tapering to a point at each end. This core is acted on by the coils M M¹ in the following manner:—The coil M, being of low resistance, forming part of the lamp circuit, and the coil M¹, being of high resistance, forming part of a by-pass circuit connecting the conductors to and from the lamp, whenever the carbons are too far apart, making the resistances of the lamp excessive, the coil M loses and the coil M¹ gains power, so that the core in C is attracted forwards, causing the one carbon to approach the other; and when the carbons are too near each other so that the resistance of the lamp is too small, the coil M gains and the coil M¹ loses power, so that the core in C is attracted backwards, further separating the carbons. Thus, by the reciprocal action of the two coils M M¹ on the tapered iron core within the tube C, the distance between the carbons is automatically regulated and their consumption allowed for. When the carbons are vertical the regulation is effected in a similar manner, as I will describe, referring to figure 3, which is an external elevation of the vertical lamp, and to figure 4, which is a diagrammatic section showing the various parts spread out, in order better to illustrate their action. As before, the tube C holding the upper carbon is free to move up or down through two coils, M M¹, being counterbalanced by a weight, W, and the lower carbon and its holder H, from which cords pass over pulleys, R R¹, to the tube. Within the tube C is the iron core, which is tapered both ways, and is acted on by the coils M M¹, as previously described. The electrical connections, as shown in figure 4, are as follows:—The + wire goes direct to the outer tube, in which slides the tube C, and thus to the upper carbon; the — wire divides into two branches; one passes by an adjusting contact, S, which will be presently described, to the upper coil M, and thence again dividing, one branch of it passes through the coil A of an electro-magnet to one side-rod, D¹, and by the one contact roller *r* to the holder H of the lower carbon; the other branch passing through a resistance E to the other side-rod D and other contact roller *r* to the lower carbon-holder H. The second branch of the — wire passes through a resistance, G, and first through a coil of fine wire, then back through a coil of coarse wire, both these constituting M¹, to the outer tube. When the resistance to the arc is normal, only a small portion of the current flows by the by-pass through G and M¹, but through the branch A D¹ there is enough to make A attract its armature in opposition to a weight, so that contact is broken at *n*, and the by-pass current must therefore pass through both coils of M¹, offering great resistance. When the carbons are so far consumed that one of the rollers *r* comes on a piece of insulating material I let into the rod D¹, then the current through A to H is stopped, and the armature of A being no longer attracted, contact is made at *n*, so that the by-pass current from G can flow directly through the larger coil of M¹, thus short-circuiting the by-pass and throwing the lamp out of circuit. The contact S, previously referred to, gives the means of adjusting the power of the upper coil M. When this coil has been wound, the insulating material covering its wires is scraped off along a strip, and the spring S can be set to bear against this exposed strip at a higher or lower point, thus introducing into the circuit a greater or less number of the convolutions of M. In order to prevent sudden movements of the carbons one of the pulleys R¹, figure 3, is serrated on the edge with fine teeth, in which engages a small loaded pawl, P, which serves to retard the movement.

I have mentioned the form of the regulating iron core within the tube C as being one that tapers from the middle to a point at each end, as shown separately at figure 5. It is not necessary that there should be a regular taper, as the core might be reduced by steps, as shown at figure 6. It might also be made of uniform diameter externally, with taper holes bored into it from each end, as shown at figure 7; or the holes, instead of being regularly tapered, might decrease by steps towards the middle, as shown at figure 8; or, according to another construction, it might consist of a number of pieces of iron placed end

Improvements in Electric Lamps.

to end, with intervening pieces of non-magnetic material such as brass, the iron pieces becoming smaller and smaller towards each end, as shown at figure 9. Generally, it is to be understood that the core may be made in any way to fulfil the condition that towards each end the mass of iron shall become less and less, as it is this condition which gives it the required property of being subject to uniform action from the two coils M M', notwithstanding changes of its position in relation to the two coils.

Having thus described the nature of my invention and in what manner the same is to be performed, I claim as my invention—

First—An electric lamp in which a carbon pencil pressed towards a carbon block is restrained by clamp, which is released by the action of an electro-magnet in a by-pass circuit, substantially as described with reference to figure 1.

Second—An electric lamp wherein the distance of the carbons is automatically regulated by the action of two solenoid coils upon an iron core having its mass lessened towards its extremities, substantially as herein described with reference to figures 2 to 9 inclusive.

Third—The construction and arrangement of horizontal carbon lamp, substantially as described with reference to figure 2.

Fourth—The construction and arrangement of vertical carbon lamp, substantially as described with reference to figures 3 and 4.

In witness whereof, I the said James Fyfe have hereunto set my hand and seal, this nineteenth day of May, in the year of our Lord one thousand eight hundred and eighty-two.

JAMES FYFE.

Witness—OLIVER IMRAY.

This is the specification referred to in the annexed Letters of Registration granted to James Fyfe, this twenty-sixth day of August, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

We do ourselves the honor to report, in reply to your blank cover communication of the 3rd instant, No. 7,596, that we are of opinion the Petition of Mr. James Fyfe, for Letters of Registration for an invention entitled "Improvements in Electric Lamps," may be granted, in terms of the specification, drawings, and claim.

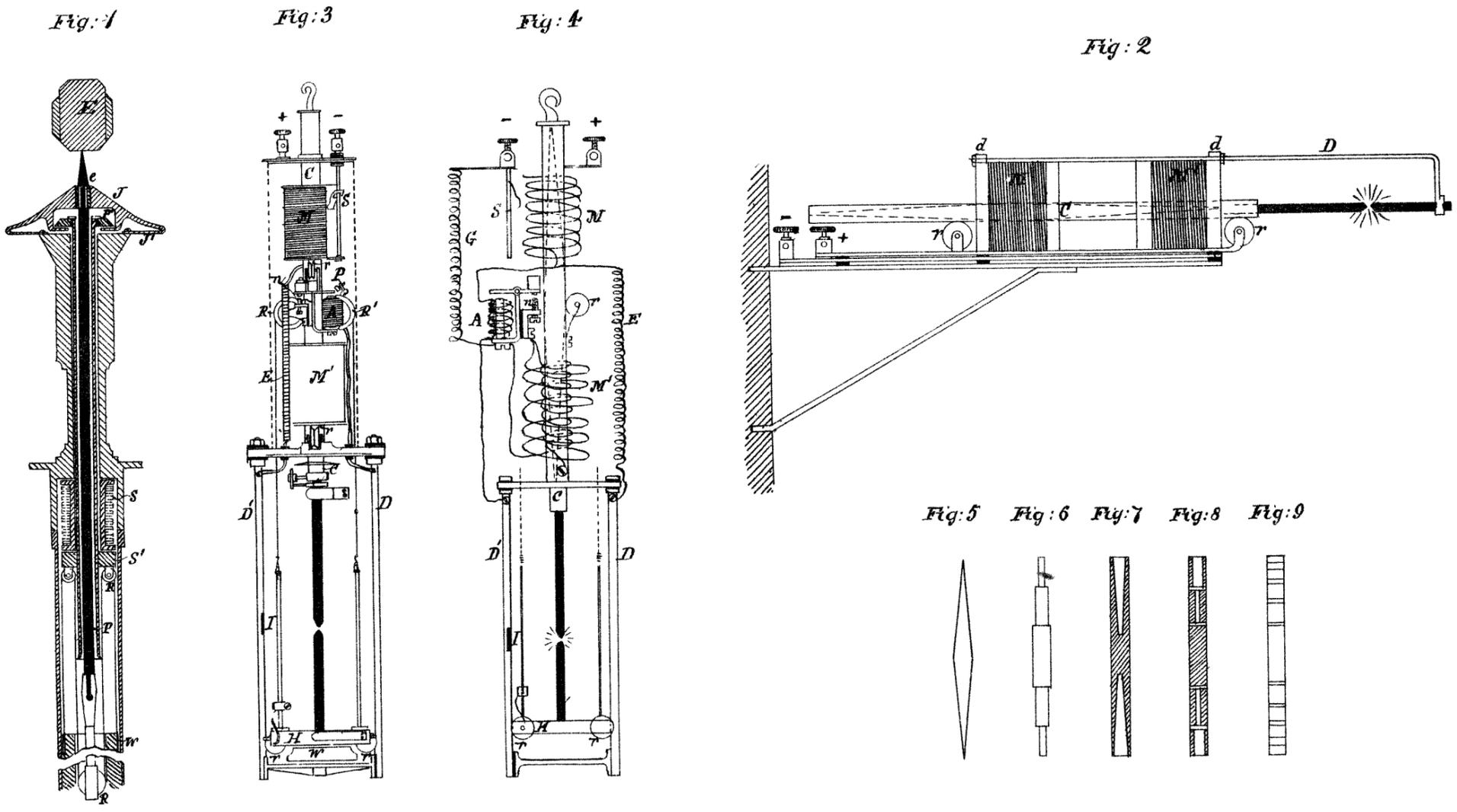
The Under Secretary of Justice.

Sydney, 20 July, 1882.

We have, &c.,

E. C. CRACKNELL.
GOTHER K. MANN.

[Drawings—one sheet.]



*This is the Sheet of Drawings referred to in the annexed
 Letters of Registration granted to James Fyfe, this twenty-
 sixth day of August, A.D. 1882.*

Augustus Loftus.

(Sig. 32.)



A.D. 1882, 26th August. No. 1114.

IMPROVEMENTS IN EARTH-SCOOPS.

LETTERS OF REGISTRATION to Robert Savage and Frederick York Wolseley,
for Improvements in Earth-scoops.

[Registered on the 26th day of August, 1882, 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 SAVAGE, of Herbert-street, Emerald Hill, in the Colony of Victoria, gentleman, and FREDERICK YORK WOLSELEY, of Walgett, in the Colony of New South Wales, gentleman, have by their Petition humbly represented to me that the said Robert Savage is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in Earth-scoops," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed; and that the said Frederick York Wolseley is the assignee of the said Robert Savage of one half share of and in the said invention in and for the Colony of New South Wales; 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 Robert Savage and Frederick York Wolseley, 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 Robert Savage and Frederick York Wolseley, 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 Robert Savage and Frederick York Wolseley 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 August, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Earth-scoops.

SPECIFICATION of ROBERT SAVAGE, of Herbert-street, Emerald Hill, in the Colony of Victoria, gentleman, for an invention entitled "Improvements in Earth-scoops."

My invention has been devised for the purpose of producing a lighter, more durable, more effective, and more easily manageable earth-scoop than any now in use. I make my earth-scoop proper with a bottom and sides only, the front edge of the bottom cutting or shovelling the earth into itself. This is then tilted up and discharged at the back at the proper time. To prevent its discharge until this time I provide a temporary back end to such scoop, that is to say, I provide a back end which is a permanent part of the machine as a whole and is rigidly connected to the framework thereof, but only acts as a back end to the scoop proper when such scoop is tilted into the position required for carrying or transporting its contents from one place to another. To allow of this tilting I pivot it in some convenient place and connect it by some suitable lifting contrivance within reach of the driver of the machine. This scoop proper is supported between two large draught-wheels, between which the driver sits, and its cutting edge is flared out on the near side, so as to clear a way for the near side wheel. It is desirable to provide a chain-stay reaching from such flare to one of the shafts of the machine, so as to assist in supporting it.

In order that my invention may be clearly understood I will now refer to the accompanying drawings, which illustrate the best method I know of carrying it into effect. Figure 1 shows a side elevation, with the near side wheel removed, of an earth-scoop embodying my improvements; figure 2 shows front view; and figure 3, a plan of the same.

A is the main frame; B, the draught wheels; B¹, their axle; C is the scoop proper; and C¹, its temporary, although fixed back; C² are its pivots; C³, its lifting and lowering and tilting chain, which passes over guide pulley C⁴, and winds on winch barrel D, having handle, D¹, and ratchet, D², with spring pawl, D³, and its releasing gear D⁴. Said scoop C is attached to the frame by links C⁵, and has shackle, C⁶, riding upon fixed guides, C⁷. C⁸ is its flaring part or share in front of the near side wheel; C⁹ is stay to fixed back; C¹, D², and D³ are respectively front and back stays or standards for the winch D; E is driver's seat; and E¹, driver's platform across the frame.

The mode of operation is as follows:—While scooping up earth, &c., to be removed, the scoop proper is lowered into the position shown in full lines, and as it advances it fills. When sufficiently loaded the driver turns handle D¹ and winds up chain C³ until the scoop proper is in its second position, shown by dotted lines in figure 1, at which position alone the back C¹ is of any service, as it then prevents the contents of the scoop from falling out behind. When required to discharge its load the driver winds up chain C⁵ again, and so raises the scoop into its third position (see dotted lines, figure 1), when the contents will fall out.

I desire it to be understood that I do not confine myself to the particular arrangement of mechanical contrivances just described for carrying my invention into effect, so long as the nature of my invention be retained, because other mechanical equivalents might be substituted therefor; as, for instance, a lever might be used instead of the hand winch for raising the scoop proper.

In the arrangement shown the horses draw the machine like a common cart, but for heavy work I prefer that the scoop proper should have a share for clearing a track for both wheels, and the horses be harnessed to shafts projecting behind the machine, so that there would be firm ground for both horses and machine to travel on.

Having thus described the nature of my said 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 earth-scoops, is—

First—Constructing the scoop proper with a bottom and two sides only, and suspending it from and below a carriage or frame in such a manner as to admit of its tilting either way, and to which frame its temporary back end is firmly attached.

Second—Tilting or lifting the scoop proper upon a centre behind the load.

Third—The combination and arrangement with a pivoted scoop, C, and its hanging links, C⁵, of the bent guides C⁷ bent to the circle of travel, and upon which the shackles C⁶ ride, substantially as herein described and explained, and as illustrated in my drawings.

Fourth—The particular combination and arrangement of the whole of the mechanical parts forming my improved earth-scoop, substantially as herein described and explained, and as illustrated in my drawings.

In witness whereof, I, the said Robert Savage, have hereunto set my hand and seal, this thirtieth day of June, one thousand eight hundred and eighty-two.

Witness—

EDWD. WATERS, Melbourne, Patent Agent.

ROBT. SAVAGE.

This is the specification referred to in the annexed Letters of Registration granted to Robert Savage and Frederick York Wolseley, this twenty-sixth day of August, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 17 July, 1882.

The application of Messrs. Robert Savage and Frederick York Wolseley for Letters of Registration for an invention entitled "Improvements in Earth-scoops" having been referred to us, we have examined the plans and 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 have, &c.,

JAMES BARNET.

WILLIAM C. BENNETT.

The Under Secretary of Justice.

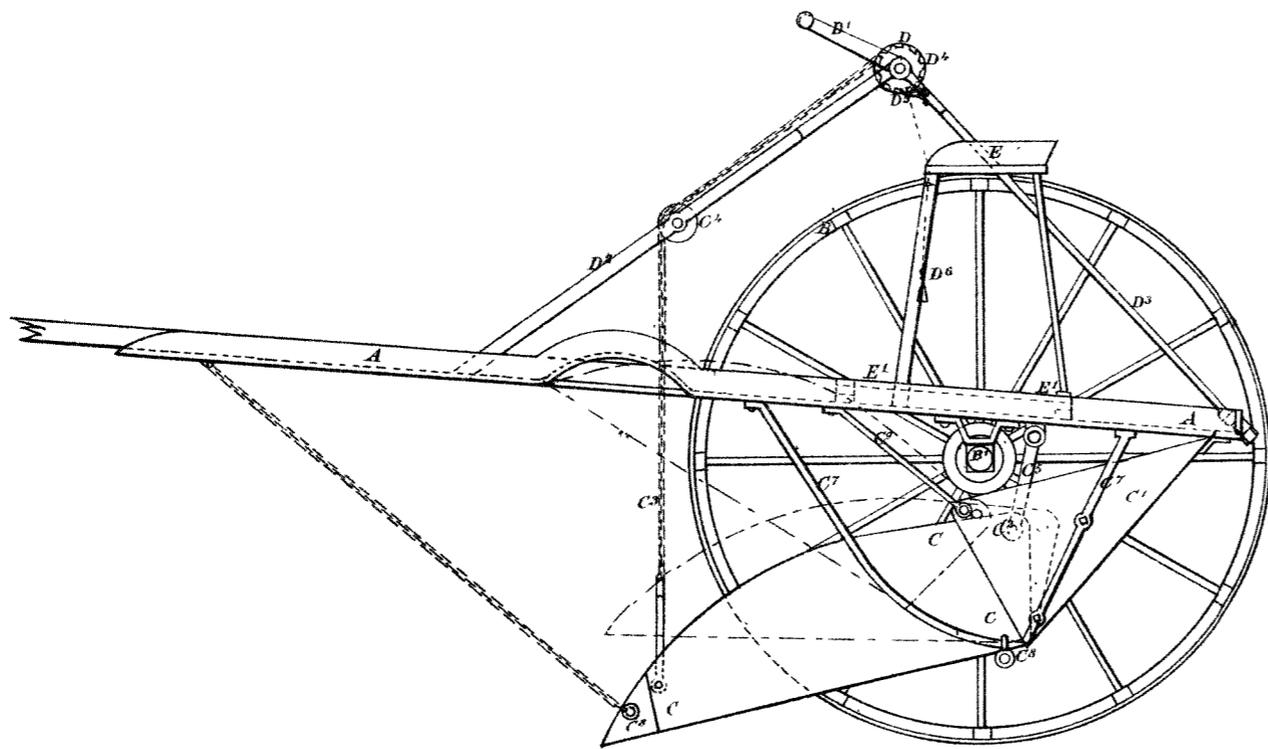


Fig. 1.

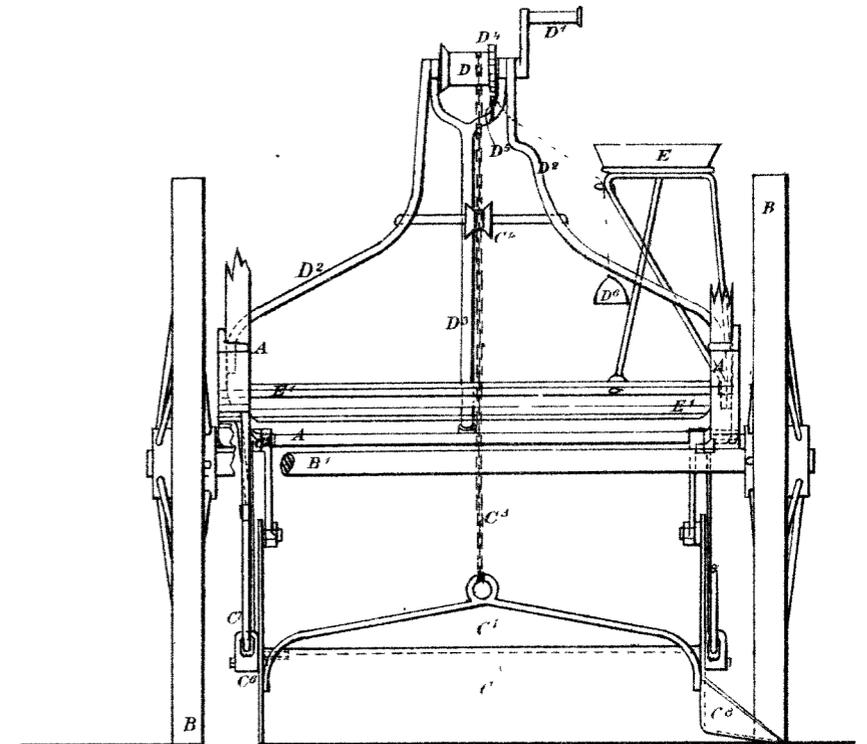


Fig. 2.

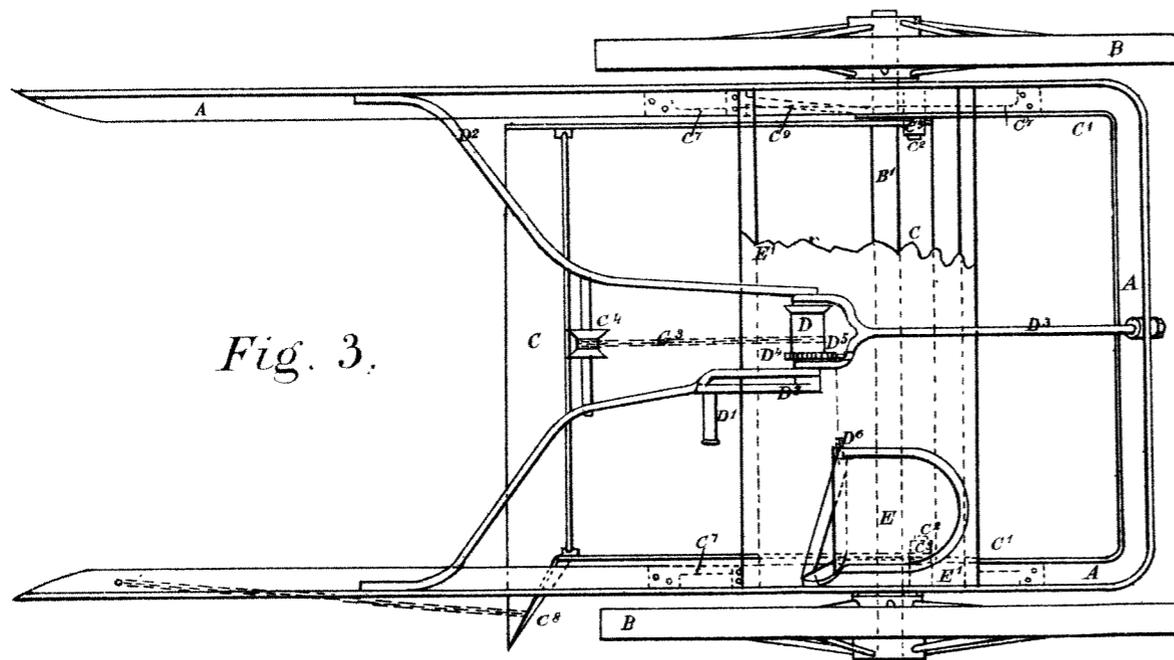


Fig. 3.

— SAVAGE & WOLSELEY'S PATENT. —

*This is the Sheet of Drawings referred to in the annexed
 Letters of Registration granted to Robert Savage and
 Frederick York Wolseley, this 26th day of August, A.D. 1882.
 Augustus Loftus.*

(Sig. 32.)



A.D. 1882, 26th August. No. 1115.

IMPROVEMENTS IN MINING AND DEEP LIFT PUMPS.

LETTERS OF REGISTRATION to William Watson, for Improvements in Mining
and Deep Lift Pumps.

[Registered on the 26th day of August, 1882, 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 WATSON, of No. 53, Windermere-street, Ballarat, in the Colony of Victoria, 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 Mining and Deep Lift Pumps," 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 William Watson, 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 Watson, 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 Watson 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 August, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Mining and Deep Lift Pumps.

A.

SPECIFICATION of WILLIAM WATSON, of No. 53, Windermere-street, Ballarat, in the Colony of Victoria, mechanical engineer, for an invention entitled "Improvements in Mining and Deep Lift Pumps."

My invention consists of several improvements in the construction and method of working double-acting pumps, by which means I am enabled successfully to pump and lift a constant stream of water from depths almost unlimited, and in which others have failed. In practice, I have pumped, with the greatest ease, from 500 feet in depth.

A principal feature in my pump is the facility with which I make use of the atmospheric air or its equivalent pressure, placing it under the direct control of the attendant of the pump, by which I compel its elasticity to do the work. To provide the means for this purpose I alter and adapt an ordinary mining pump to my requirements—do away with portions, and make additions where necessary; all the appliances being simple in construction and manipulation and effective in action.

The ordinary telescopic sliding wind-bore and section-pipe I make so as to form an air-vessel on the suction side, by enlarging and lengthening the former, and utilizing the clear space all round the latter; for the said purpose, I hang this sliding wind-bore by chains from the fixed portion of the pump above, and make it adjustable by such chains, so as to allow for sinking.

I use a special construction of clack and bucket valves of my own design, which will be hereinafter fully described. I adapt the body and make of the working-barrel of ordinary pumps to my purpose by making an annular air-vessel on the delivery side, similar to that before described as being on the suction side in the sliding wind-bore. On this barrel I cast brackets, to rest on good strong wood bearers, and these support all the works below the pump. At the head of this air-vessel I insert a snift-valve and air-plug, which enable me to govern the action of the air with the greatest nicety. I insert in the delivery clack-chamber a moderator-plug, hereafter described.

Another noticeable feature of my invention is a peculiar air-vessel which I call the "superior air-vessel." This is placed above the delivery clack-valve, which is simply a larger pipe enclosing a smaller one telescopically, the annular space between the two forming the air-vessel, and the water ascending through the inner one, on which the delivery-pipe is bolted. This contrivance avoids the objectionable features of the ordinary pump, occupies far less space, and, being telescopic, may be lengthened or shortened to adapt the length of the delivery-pipe to any error of measurement or in fixing the wood bearers, should such occur.

For greater depths than 600 feet I introduce (where required by the weight of the column of water) additional air-vessels of the same construction as the one just described, and with clack or retention valves, thus dividing the discharging column working in conjunction each with the original one, and taking a share of the burden similar to a succession of lifts, less the trouble and expense. I use only the one air-vessel for a lift of 600 feet, but add an additional one for a depth between that and 1,000 feet.

In use at such great depths it is obvious that a strong construction of supports for such a length of piping must be provided, and also that the pump rods or spears must be either of larger size or stronger than those ordinarily in use; so I cast strong brackets or flanges on the piping at intervals where it is necessary—upon one pipe, in every hundred feet, for a 5-inch delivery, I find to be sufficient (for a larger size they would be required at shorter intervals), and have strong bearers across the shaft, to which these brackets are bolted. The column of pipes is thus self-supporting, and should any burst or get broken it or they can be easily replaced without disturbing any of the others. The pump rods or spears I make with butt-joints and only single strapping, but with clinch-bolts, hereinafter fully described; and at intervals I have guides for the spears or pump rods formed of wood bearers, and immediately above these bearers, but with clearance for the stroke, I place stops on the spears, so that in case of any accident, either in the shaft or to the surface gearing, the spears, or any portions of them, will remain supported by these bearers and stop-cleats. The want of this provision has caused many serious accidents in mining.

By means of the combined arrangements—namely, the working barrel strongly supported on wood bearers, the sliding wind-bore suspended by an adjustable chain, the whole column of pipes self-supporting, and the spears with their stop-cleats—the pump and lower parts may be lowered a stage equal to the length of one spear-rod with the greatest facility, and the lengths of delivery-pipes (say two) to make up can be added and adjusted, the time occupied in doing so being no more than is usually taken in putting in one length of pipe in an ordinary pump.

My proportions of suction and delivery pipes are a great departure from the ordinary rules. By the old system the delivery pipes are generally made larger in diameter than the suction-pipes and working-barrel, but I make my plunger-pole (sectional area), suction-pipe, and delivery-pipe each just equal in area to half that of the working barrel; so for a 7-inch diameter working-barrel I have but a 5-inch (instead of a 11-inch, as under the old rules) delivery; and the same rule holds good for all sizes of pumps made on the same principle. This enables me to support a higher pressure than would be practicable if a larger delivery had to be used.

I find with my pump that there is a vast saving of power compared with an ordinary pump of the same size—that there is practically no limit to the depth from which it will pump. It pumps a continuous stream of water, no difference being made in the flow by any foreign substances such as mud, sand, or drift being contained in the water, my special valves allowing all such to pass without detriment to themselves; also, that in a question of first cost my pump is considerably cheaper, and that the working expenses are much less, when a comparison is made with the pump required to do the same amount of pumping as one of mine will do; and also, that from whatever depths I have to pump, or whatever quantity of water there is to contend with, where I fix but one of my pumps of the required size, with the ordinary pumping gear, I should have to fix two plungers and a draw-lift-pump, together with cisterns, chambers, and extra working parts; therefore the use of my pump admits of a smaller shaft than would otherwise be required. I intend to pump from (say) 1,000 feet deep with the present appliances and material, after which depth I mean to employ Bessemer steel, both in working-columns and all the other lower portions; with this substitution of a stronger metal I propose to raise water from a depth of (say) 2,000 feet.

Referring

Improvements in Mining and Deep Lift Pumps.

Referring to the drawings herewith,—figure 1 is a section of a mining shaft in which one of my pumps is seen, also in section; figure 2 is a side elevation of the pump in the same shaft; figure 3 is an edge view of portion of the spears or pump-rods, showing my method of joining the different lengths; figure 4 is a side view of figure 3; figures 5 and 6 are side view and section of my air-plug which I insert in the air-vessel above the pump-bucket, and in which is also inserted the snift-valve shown in figure 7; figure 8 is an elevation partly in section of my pump-bucket, showing method of packing and connections; figure 9 is face view of bucket-valve; figure 10 shows my method of ring-packing; figures 11 and 12 are views of the clack-valve and connections, easily understood; figures 13 and 14 are side view and section of my moderator-plug inserted in the clack-valve chamber. The same letters refer to same parts wherever they occur.

A is the sliding wind-bore, which is enlarged in diameter to make annular air-vessel on the suction side A¹ around suction-pipe B, outside of which it slides down when required, by means of the gland above, and is suspended and kept in position by means of short chains, A², fastened to lugs A³, cast solid. These chains hook into large links at short intervals in the chain A⁴, hanging from lugs on the clack-valve chamber B¹, in which is the suction-valve B², consisting of (see figure 11) a seat, *b*, with a perforated face (see figure 1²), through which is inserted a pin, *b*¹, which carries one of my combined leather (*b*²) and vulcanized india-rubber (*b*³) valves and a guard, *b*⁴. These are most effective in action, allowing all sorts of sand and drift to pass without detriment, and require very little attention and less frequent renewal than ordinary valves.

C is the working-barrel, which is lengthened above the delivery outlet, and enlarged to form my annular air-vessel on the delivery side C¹, in which I insert snift-valve C², shown on enlarged section in figure 7, which is simply a high-pressure water-tap; but I may use other kinds of pressure valves here, as one with a regulated spring, &c., and an air-plug, C³, which is turned out of some approved metal, screwed and drilled, as shown in figures 5 and 6, and when inserted in the tapped hole in said air-vessel I can regulate the outlet *d*, figures 5 and 6, to any required size. On this barrel I have strong pocket-brackets, C⁴, to bolt it to wooden blocks on bearers C⁵ across the shaft, and it is so supported until sinking makes it necessary to lower it to a further stage. C⁶ is the pump-bucket, attached to plunger-pole C⁷. This bucket (see figures 8, 9, and 10) consists of one of my leather (*c*²) and vulcanized india-rubber (*c*³) valves, below a guard, *c*⁴, and over a face or bucket, *c*. This is again modified by the insertion and use of an annular ring of packing which I have introduced, instead of the pressed leathers ordinarily used; it consists of three rings of leather, *c*⁵, with the edge, not the side, against the barrel, to form a piston the size of the pump, kept in place by annulus *c*⁶ screwed on the bucket. This kind of packing lasts much longer than any other hitherto in use.

The plunger-pole C⁷, which I prefer to make of wrought iron, ends in a knuckle-joint, where a rod, C⁸, is jointed, and at its other end finishes in a clutch-joint, C⁹, for the purpose of being easily taken apart for repairs to pump, &c. This joint is formed by the two ends, the one of rod C⁸ and lower end of rod C⁹, being serrated to fit each other, and a ring being forced over the joint and fastened there. The upper end of C⁹ opens into jaws to embrace the spears or pump-rods E, and below the strap or spear-bolts I introduce clinch-bolts, E¹, consisting of a rivet with a washer at each end through the grain of the wood, at right-angles to the spear-bolts, to prevent said strapper spear-bolt from cutting away the wood. At a joint of two pump or spear rods I put these clinch-bolts, in direct opposition to the strain, viz., on the upper rod below the other bolts, and on the lower one above them, as shown in figures 3 and 4, and I only need to use single strapping by doing so.

D is the delivery outlet in working-barrel leading into clack-valve chamber D¹, which is lengthened so as to rest on same blocks as the pump itself. In this chamber is the delivery clack-valve, of the same construction as the suction-valve (see figures 11 and 12), and marked D². In the cover near the centre and top of the clack-valve chamber I insert a moderator-plug (see figures 13 and 14) of same construction as the air-plug, so that when there not being enough water to keep the pump going, the pump (being a fixture to the engine) plays a column of air up and down. The load may be reduced by opening said moderator-plug. It would also be convenient to attach a hose and branch to the moderator-plug, should a fire take place below. Above and bolted to said chamber D¹ is my superior air-vessel D³, consisting of a larger pipe, D⁴, surrounding one, the delivery-pipe, size D⁵, which slides through a gland, and may be lengthened or shortened for the purpose hereinbefore mentioned. To this telescopic pipe is bolted the delivery-pipes F, and these may extend upwards any length, and one or more of my superior air-vessels introduced if required; and they are made self-supporting, giving none of their weight to the pump supports, by means of brackets, F¹, cast on to the pipes where necessary, reference being made to the weight such brackets F¹ and the wooden bearers F² will carry.

The spears work through guides in wood bearers F², and, where I think it necessary in reference to the weight of spears or pump-rods, I introduce the stop-cleats E² just above clearance of the stroke, for the purpose before stated.

The mode of working is as follows:—Reciprocatory motion from any source, and in any convenient way, is given to the whole length of spears or pump-rods, and upon the up-stroke, the pump bucket-valve C⁶ being closed, water rushes in through small holes in the bottom of sliding wind-bore and follows the bucket up the pump, and the air that is in combination, being more elastic, insinuates itself into the air-vessel on the suction side, A¹, where it becomes an active agent, assisting the air-pressure on the surface of the well in the expulsion of the water in the suction-pipe, and accumulating, by repetition, becomes more and more compressed, until it attains its maximum, when a portion escapes with the water to the circular air-vessel on delivery side C¹, where it again collects and cushions the water below the delivery clack-valve D², and where it can be dealt with by the snift-valve C² and air-plug C³, as by opening both or either of them the pressure is reduced, and they can be so regulated as to very seldom require altering. On further accumulation the air again escapes with the water still another stage to the superior air-vessel D³, where it separates and cushions the whole of the vertical column in pipes F, water passing freely all the time when an equilibrium has been established.

Upon the return stroke the pump bucket-valve C⁶ opens, the water which previously followed it up passing through it, and is forced away through only opening, D, by means of plunger-pole C⁷ and the elasticity of the air in the air-vessel on delivery side C¹ to delivery clack-valve, where the combined efforts of

Improvements in Mining and Deep Lift Pumps.

of the two former powers and the new one brought now into play, the elasticity of the air in the superior air-vessel D³ compels it to join in the equilibrium and go up the delivery-pipes F. During this time the air-vessel on the suction side A¹ has forced water to the under side of the suction-valve B², and it is ready to follow up the bucket-valve C⁶ on its second up-stroke, and this valve carries up on its upper side the annular ring of water represented by the difference of area between the plunger-pole and the working-barrel, and, in conjunction with same parts, does the same with it as the plunger-pole did with the quantity it forced out in such way, my pump being double-action, and this motion goes on continuously while there is any water to pump, and should there be none the pump will pump air, and the load may be reduced by the moderator-plug mentioned before.

As the shaft is sunk lower the sliding wind-bore is lowered also, by means of the hook-chain A² and hanging-chain A⁴, until the suction-pipe B is nearly out of it, when it is necessary to lower the pump one stage further. This stage should be equal to one length of spears or pump-rods, and to two lengths of delivery-pipes. This is done by putting in at the required depth new bearers, C⁵, across the shaft, and lowering the pump with the blocks on to it, and should it be an inch or two longer or shorter the telescopic pipe E⁵ may be altered to suit.

Having fully described the nature of my invention and the manner of performing same, what I claim is—

First—The introduction of an air-vessel on the suction side in mining and deep lift pumps, as herein described and explained.

Second—The construction of such air-vessel, by enlarging and lengthening the sliding wind-bore A of ordinary mining pumps, and using the annular space between that and the suction-pipe B as such air-vessel, substantially as herein described and explained.

Third—In mining pumps, introducing an air-vessel below the clack-valves on the delivery side, with means for regulating the elasticity of the air, such as the snift-valve C² and air-plug C³, substantially as herein described and explained.

Fourth—The peculiar construction and arrangement of the discharge-pipe D⁵ and air-vessel D⁴, the former being made of less diameter than the latter, so as to produce an annular air-chamber, D³, between the two, substantially as herein described, and as specially shown in figure 1.

Fifth—The combination and arrangement of the pocket-brackets F¹ and wood bearers F² to each length of delivery-piping, so that each length is supported independently of the others, and the whole independently of the pump, substantially as described.

Sixth—The combination and arrangement of single strapping with clutch-bolts E¹, the spear E, and spear-bolts, to prevent the latter from cutting away the body of the spear, substantially as described.

Seventh—The combination of the safety stop-cleats E² with the spear E and the wood bearer F², substantially as described.

Eighth—The combination and arrangement of adjustable chains A² and A⁴ and sliding wind-bore A, for the purpose of adjusting the latter, substantially as herein described and explained.

Ninth—The peculiar construction of leather washers, C⁵, in which the grain of the leather is edgewise instead of lengthwise to the working face, and their combination with the parts marked *c* and *c*⁶ in the construction of the pump-bucket, as specially shown in figures 8 and 10.

Tenth—The combination and arrangement of the moderator-plug (see figures 13 and 14) passing through the door into the clack-valve chamber, in the manner and for the purpose substantially as herein described and explained.

In witness whereof, I the said William Watson have hereto set my hand and seal, this twenty-ninth day of June, one thousand eight hundred and eighty-two.

WILLIAM WATSON.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to William Watson, this twenty-sixth day of August, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

The application of Mr. W. Watson for Letters of Registration for "Improvements in Mining and Deep Lift Pumps" 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, 20 July, 1882.

We have, &c.,

A. LEIBIUS.

JAMES BARNET.

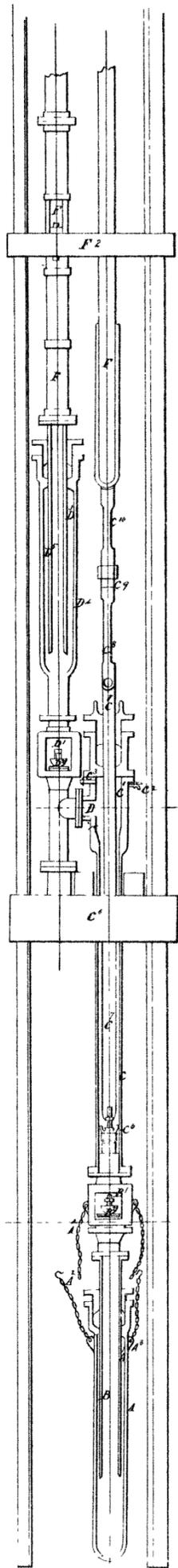


Fig. 1.

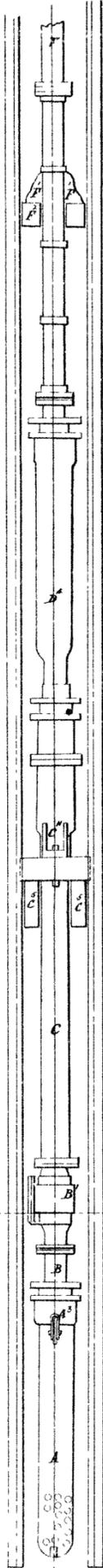


Fig. 2.

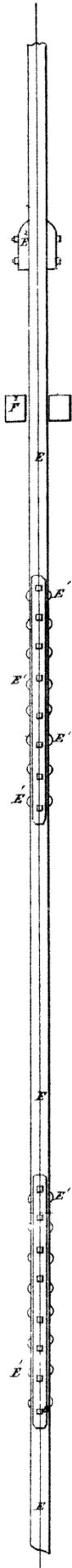


Fig. 3.

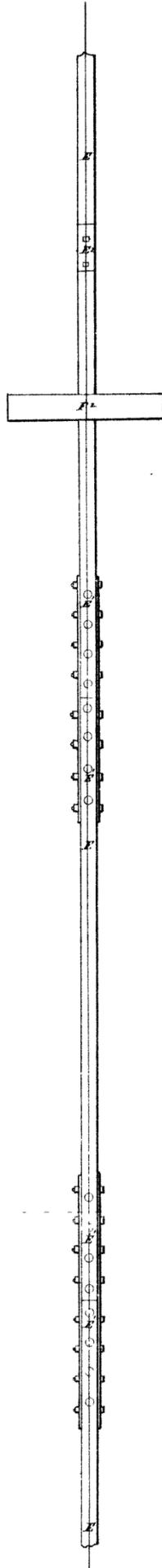


Fig. 4.

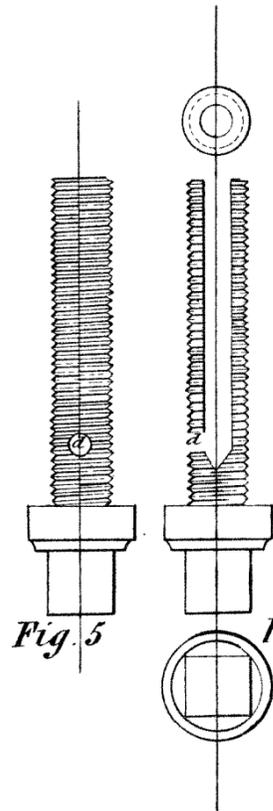
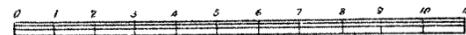


Fig. 5.

Fig. 6.

This is the Sheet of Drawings marked B referred to in the annexed Letters of Registration, granted to William Watson, this 26th day of August A.D. 1882.

Augustus Loftus.



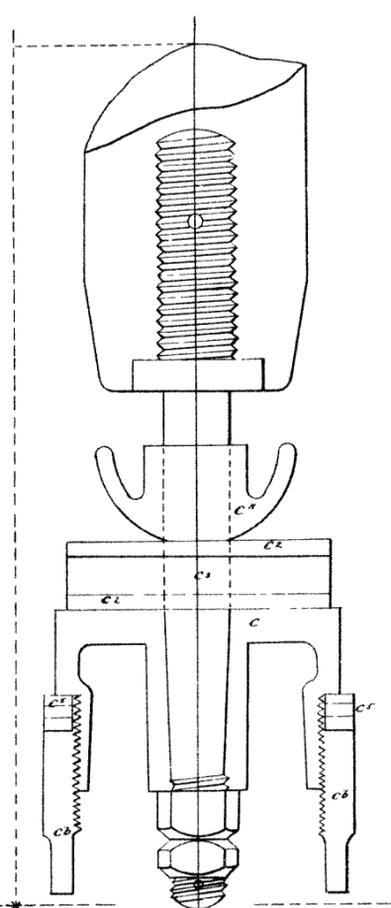


Fig. 8.

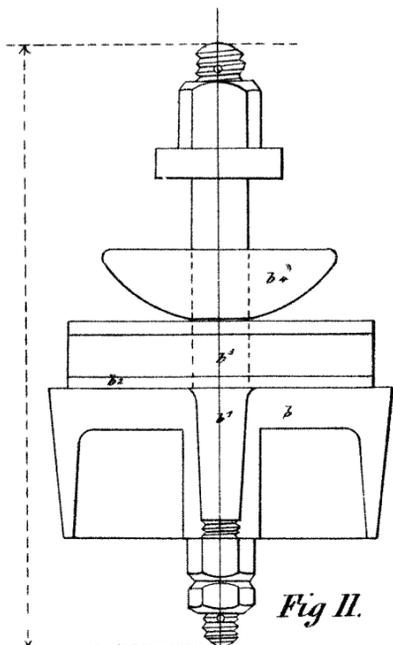


Fig. 11.

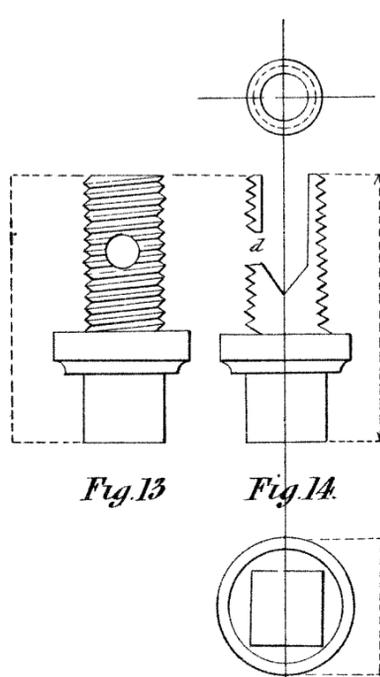


Fig. 13.

Fig. 14.

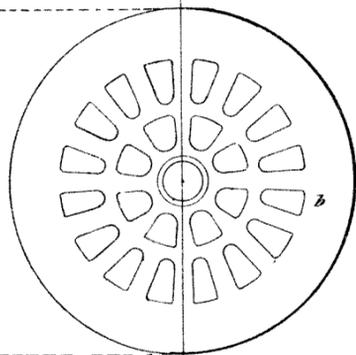


Fig. 12.

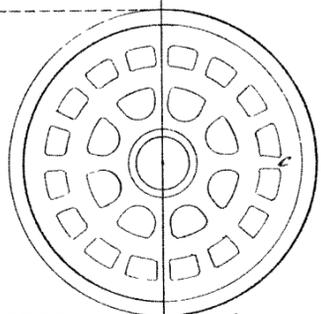


Fig. 9.

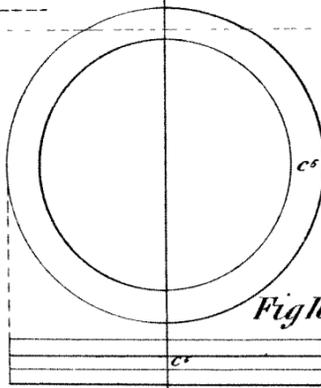


Fig. 10.

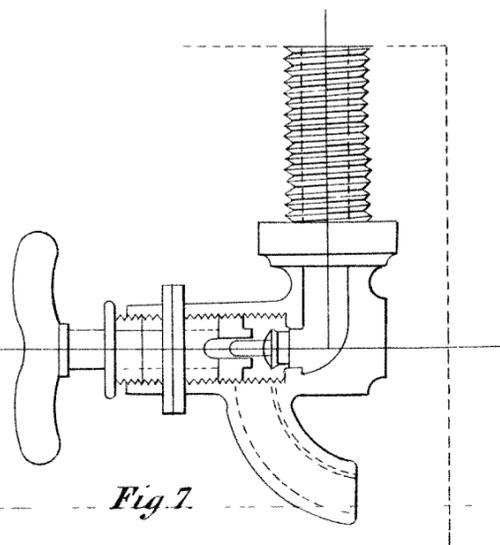
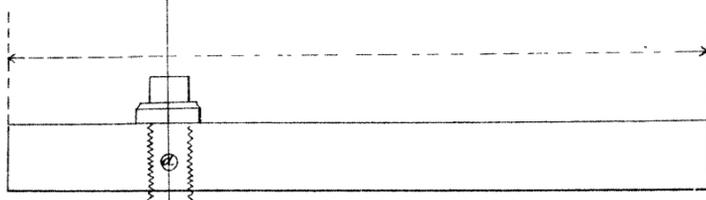


Fig. 7.



This is the Sheet of Drawings marked C referred to in the annexed Letters of Registration granted to William Watson, this 26th day of August A.D. 1882.

Augustus Loftus.



A.D. 1882, 26th August. No. 1116.

IMPROVEMENTS IN APPARATUS FOR OBTAINING AND APPLYING COLD AIR.

LETTERS OF REGISTRATION to Joseph James Coleman, for Improvements in Apparatus for obtaining and applying cold air.

[Registered on the 26th day of August, 1882, 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 JOSEPH JAMES COLEMAN, of Glasgow, Scotland, 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 obtaining and applying cold air," 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 Joseph James 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 Joseph James 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 Joseph James 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 twenty-sixth day of August, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Apparatus for obtaining and applying cold air.

A.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, JOSEPH JAMES COLEMAN, of Glasgow, Scotland, send greeting :

WHEREAS I am desirous of obtaining Letters of Registration for the Colony of New South Wales, 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 next and immediately after the date of the said Letters of Registration, make, use, exercise, and vend, within the said Colony of New South Wales, an invention for "Improvements in Apparatus for obtaining and applying cold air."

And whereas, in order to obtain such Letters of Registration, I must by an instrument or specification 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: 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 in writing, reference being had to the accompanying drawings, that is to say:—

This invention has for one of its objects to arrange or combine the parts of apparatus for mechanically cooling air in a simple, convenient, and advantageous manner, so that motive power derived directly from combustible gas or vapour may be employed to work the machine. Another object of the invention is to provide arrangements of apparatus for refrigerating or cooling carriages or trucks during transit on railways, for the purpose of preserving meat or other perishable goods, or for maintaining an agreeable or suitable temperature for passengers and live stock, or for other similar purposes. The apparatus to be used in carrying out this part of the invention operates to a great extent according to what is now well known as the Bell-Coleman dry cold-air refrigerating system, but the parts are arranged or combined in a novel manner and so as to be conveniently locomotive, being carried on a framing on wheels adapted for forming part of a railway train. Such locomotive refrigerating apparatus may however also be used with advantage otherwise than in running trains; as, for example, for cooling sheds or stores at railway stations, or at any places accessible by a machine on wheels. The apparatus constituting the present invention also comprises some improvements which are applicable to or in connection with stationary refrigerating apparatus or refrigerating apparatus fitted on board ship, and also improved apparatus for applying the cold air for making ice.

And in order that the said invention and the manner of performing the same may be properly understood there are hereunto appended five sheets of explanatory drawings, to be hereinafter referred to, and representing the improved apparatus. Figures 1 and 2 on sheets 1 and 2 are respectively a plan and a side elevation of a machine for mechanically cooling air as constructed for being driven by means of combustible gas or vapour. Figure 3 on sheet 3 is a side elevation of one modification of the locomotive refrigerating apparatus, and figures 4 and 5 are respectively an enlarged side elevation and a sectional end elevation of the principal part of the machinery. Figures 6 and 7 on sheet 4 are respectively a sectional side elevation and a horizontal section of a second modification of the locomotive refrigerating apparatus, figure 8 being a transverse vertical section of a part of the apparatus. Figures 9 and 10 on sheet 5 are horizontal and vertical sections of the apparatus for making ice by means of the cold air. In all the drawings the same reference numerals are used to mark the same or like parts wherever they are repeated.

In the modification of mechanical air-cooling apparatus shown on sheets 1 and 2 of the accompanying drawings the motor details are of the well-known Otto gas-engine type, but other suitable gas-motor details may be combined with the other parts if preferred. The parts of the improved apparatus are carried on and in a bed-frame, 11, the greater part of which is of an approximately oblong rectangular contour. Within the bed-frame 11 there are fitted a number of horizontal pipes, as indicated by dotted lines 12, in figure 2, to be used for the passage of the air from the compressing cylinder 13 to the re-expanding cylinder 14, such pipes being cooled either by water circulating outside of them in a casing or chamber formed in the bed-frame, or by air cooled by the machine itself. The compressing cylinder 13 is placed on the top of the bed-frame 11, and a gas-motor cylinder, 15, is placed in the same line as the compressing cylinder at one end of the bed-frame, which it preferably overhangs, as shown, whilst the crank shaft 16 is placed at the other end of the bed-frame. The piston or plunger of the gas-motor cylinder 15 is on the same rod as the piston of the compressing cylinder 13, and this rod is connected to a crank on the shaft 16 by a connecting rod, 17. On one end of the crank shaft 16 there is a fly-wheel, 18, and on the other end there is a crank or a disc fitted with a crank pin (but not shown in the drawings), which is placed relatively to the main crank at an angle suitable for equalizing the strains as much as conveniently possible. In practice the cranks are generally placed so that the strokes of the re-expansion cylinder commences at about the middle of the stroke of the motor cylinder. The re-expansion cylinder 14 is arranged to act on the end crank, and is fixed in a vertical position to a part, 19, of the bed-frame, and projecting laterally therefrom at the crank-shaft end.

The passages and valves and other parts of and in connection with the gas-motor cylinder 15 may be constructed and arranged in any suitable manner, but as represented in figures 1 and 2 the parts are essentially the same as in the Otto gas-engine, and do not require to be minutely described. The gas-motor valve shaft 20 is driven by means of bevel wheels 21, one of which is on the crank shaft 16 between the main crank and the crank or crank pin connected to the re-expansion cylinder 14, and between the main crank and the fly-wheel 18 there is an eccentric, 22, for working a pump, indicated by dotted lines, which supplies water for being injected into the compressing cylinder 13 to cool the air whilst being compressed, and which water is afterwards led through the jacket of the gas-motor cylinder 15. An inlet pipe, 23, is shown as connected to the casing or chamber containing the pipes 12 and formed within the bed-frame 11 for the waste or return cold air from the room or space in which the cold air is applied; and the air passes from the chamber by a pipe, 24, leading it to the inlet valves of the compression cylinder 13. From the outlet valves of the compression cylinder 13 the air passes by a pipe, 25, to a casing or chamber, 26, at the gas-motor end of the bed-frame 11. This casing, 26, is by a vertical partition

Improvements in Apparatus for obtaining and applying cold air.

partition divided into two compartments, and the outermost of these, into the bottom of which the air is first led, sprays of water are injected for cooling the compressed air. The air passes over the top of the partition into the second compartment, and after parting with most of its water passes thence through the pipes 12 to a collecting casing, 27, at the other end of them, and thence by a pipe, 28, to the re-expansion cylinder 14. The re-expansion cylinder 14 is enclosed in a wooden box, 29, formed with non-conducting walls, and the re-expanded air issuing from the exhaust passage of the re-expansion cylinder 14 in an intensely cold state passes through the box 29 and proceeds thence by a duct, 30, to the cold room or space where it is to be applied. The water which separates from the compressed air in the casing 26 and in the pipes 12 collects in the bottoms of the compartments of the casing 26 and proceeds thence by a pipe, 31, to a vessel, 32, fitted with trap-valves arranged to discharge it without allowing the air to escape.

With reference to the improved locomotive refrigerating apparatus, it may be observed that Bell-Coleman machines or others for mechanically cooling air might be made of small sizes suitable for being put each into an ordinary railway truck or carriage, and for being worked off the axles of the truck or carriage. Not only however are small machines less economical than large ones, but also each such machine would require a separate attendant or attendants, and would on many accounts be quite unsuitable for trains composed of ten, twenty, or more trucks or carriages. Such an arrangement would necessitate an inconvenient number of attendants, and would abstract too much of the power employed to draw the train.

According to the present invention, the machinery for producing cold air for several trucks or carriages or for an entire train is carried, as shown, for example, in figure 3 on sheet 3 of the accompanying drawings, on a separate frame, 41, on wheels 42, and comprises a steam boiler, 43, and a steam cylinder or cylinders, 44, for supplying the driving power required. The boiler 43, with its fire-box and tubes and accessories, may very conveniently be like those of an ordinary railway locomotive, and be mounted on a wrought-iron framing, 41, like that of a locomotive. There may be a tender, 45, or separate framing on wheels, as shown, to carry fuel and water; or, if convenient, the receptacles for these may be on the main framing 41. In one modification shown in figures 6 and 7 on sheet 4 of the drawings the cylinders forming the principal part of the air-cooling machinery are arranged along each side of the main framing 41, there being at each side a steam cylinder, 44, and a compressing cylinder, 13, which are connected to cranks at right-angles to each other on a transverse shaft, 46, this arrangement dispensing with the heavy fly-wheel otherwise required. There may be a single re-expansion cylinder, 14, for the compressed air in line with the steam and compressing cylinders 44, 13, on one side as shown in figure 7, or there may be a re-expansion cylinder, 14, on each side. In another modification, shown in figures 3, 4, and 5, there are two re-expansion cylinders, 14, placed vertically at what may be termed the front end of the locomotive, being connected to cranks or eccentrics on the transverse shaft 46, which is placed beneath them, and has also connected to it the piston rods of the steam and compression cylinders 44, 13. The arrangement of the various cylinders is also susceptible of further modification to suit various circumstances and requirements, and any of the cylinders may be placed horizontally, vertically, or obliquely.

The cooled air from the re-expansion cylinder or cylinders 14 is conveyed to the carriages or trucks 47 by means of ducts or trunks, 30, provided with flexible or jointed connections between the carriages or trucks, there being by preference a single main trunk, 30, arranged along either the tops or bottoms of the carriages or trucks, such trunk being provided with suitable valves and openings or branch pipes in connection with each carriage or truck for the proper distribution of the cold air therein.

In connection with the refrigerating machinery the provision for cooling the compressed air consists by preference of a pump, 48, for injecting a small quantity of water into the air whilst being compressed and trap-valves for withdrawing the water from the casings 26, into which the air passes from the compressing cylinders 13. And the water thus used, or other water, is distributed in thin films or spray on the external surfaces of a series of pipes, 12, through which the compressed air passes on its way to the re-expansion cylinder or cylinders 14. The pipes 12, which are best shown in figures 6, 7, and 8, are exposed to external currents of air, to promote evaporation of the water from their surfaces, and so that the great cooling action due to such evaporation may be availed of for further cooling the compressed air; and to still further promote the evaporation, the pipes may be coated with fibrous or porous substances which will absorb the water and present it on enlarged surfaces to the evaporating action. As shown in figure 8, the water is supplied to a shallow trough, 49, the bottom of which is formed with grooves perforated along their bottoms and running along above the pipes 12. This improved arrangement or apparatus for cooling the compressed air is advantageously applicable wherever water is scarce or when it is inconvenient to carry large quantities of it. Where the supply of cold water is sufficiently abundant, it may be applied in jackets or casings surrounding the compressing cylinders 13 and pipes 12 or passages through which the compressed air is passed, but the method or apparatus that has been described will in many cases be found more economical and generally preferable.

In the apparatus for applying the cold air for making ice, and shown in figures 9 and 10 on sheet 5 of the accompanying drawings, the cold air is made to act on the outsides of metal moulds or boxes, 51, containing the water or other liquid to be frozen. The moulds 51, which are by preference of a tapering form, to facilitate the removal of the blocks of ice formed in them, are placed in a number of separate chambers, 52*a*, 52*b*, &c., being supported therein by flanges on the moulds resting on flanges or ribs formed or fixed on the sides of the chambers. The chambers 52*a*, *b*, &c., are arranged in a series in such a way that the cold air may be passed through them successively, and passages 53 and valves 54, 55, 56 are formed and fitted in connection with the chambers in such a way that each chamber may in its turn be made the first of the series through which the air passes. The freezing is brought to its complete stage in the chamber (52*a*, for example) into which the cold air coming direct from the refrigerating machinery by the duct 30 and passage 53 is first admitted, and the freezing is less and less advanced in the chambers (52*b*, *c*, &c.) through which the air successively passes, so that as the air gradually becomes warmer by abstracting heat it has warmer moulds to act upon, and its cooling power is thus used to the best advantage throughout its course.

The series of chambers, with their passages and valves, may be arranged in various ways; but in a preferable modification the structure or apparatus is of a circular form in plan, as shown in figures 9 and 10,

Improvements in Apparatus for obtaining and applying cold air.

10, and is enclosed by a wall of non-conducting material. The structure is covered with non-conducting material in which suitable doors, 57, 58, are provided, and a non-conducting floor may be formed beneath it as shown if necessary. The chambers 52*a*, *b*, &c., are arranged in an annular series, encircling a central space, 59, which may be used as a cold store and into which the cold air is finally led after passing through the series of chambers. The chambers 52*a*, *b*, &c., which may be formed by means of metal plates or other suitable material, are provided with doors or valves, 54, on their outer sides communicating with the annular passage 53, also with doors or valves, 55, in the radial partitions separating the chambers, and also with doors or valves, 56, on their inner sides, and communicating with the central space 59. The cold air first enters one chamber, 52*a*, through its outer door or valve, 54, and then passes successively by the partition doors 55 into and through the other chambers, 52*b*, *c*, &c., until it reaches a chamber, 52*h*, having its inner door, 56, open, by which it passes into the central space or cold store 59. When the freezing is complete in chamber 52*a*, that chamber is shut off and the outer door 54 of the next one, 52*b*, opened, whilst the moulds of ice are removed through a door, 57, in the cover, and moulds with water or other liquor substituted. This chamber, 52*a*, is then made the last of the series by opening its inner door 56 and that, 55, in the radial partition separating it from the chamber 52*h*, which was previously the last, and closing the door, 56, of this previously last chamber, 52*h*. The same changes are made with each of the chambers in regular succession so that the cold air may be used to the best advantage, as already explained. From the central chamber 59 the air may be allowed to escape through small openings, or it may be led thence by a special duct back again to the refrigerating machine.

Having thus particularly described my said invention and the manner of performing the same, I have to state that I do not restrict myself to the precise details herein described or delineated, but that what I believe to be novel and original, and claim as the invention which I desire to secure by Letters of Registration is—

1. The combination of apparatus for mechanically cooling air, in which a motor cylinder operating with combustible gas or vapour and the parts appertaining to such cylinder are fixed to or carried on the same bed-frame as cylinders for the compression and re-expansion of the air, the various parts being arranged substantially in the manner hereinbefore described with reference to figures 1 and 2 of the accompanying drawings.
2. The combination of apparatus for mechanically cooling air, in which cylinders for the compression and re-expansion of the air are arranged upon a locomotive framing on wheels, together with a steam boiler with one or more steam-motor cylinders, substantially in the manner and for the purposes hereinbefore described.
3. The apparatus hereinbefore described for cooling the compressed air, and consisting of pipes through which the air passes, and of means whereby water is supplied to the outsides of the pipes in films or spray to be evaporated through exposure to currents of air, such apparatus being combined with cylinders for the compression and re-expansion of the air, substantially as and for the purposes hereinbefore described.
4. The combination or arrangement of parts hereinbefore described with reference to figures 9 and 10 of the accompanying drawings for applying cold air in making ice, and consisting of a series of chambers protected by non-conducting walls and covers fitted for receiving moulds or boxes in which the ice is to be formed, and provided with doors or valves in connection with passages by means of which the cold air is made to pass successively through the chambers with periodical changes of the succession of the chambers in regular rotation, substantially as hereinbefore described.

In witness whereof, I the said Joseph James Coleman have hereunto set my hand and seal, this twenty-first day of April, in the year of our Lord one thousand eight hundred and eighty-two.

JOSEPH JAMES COLEMAN.

Signed and sealed in the presence of—

ELI MERCER,
Coachman, Carnforth,—Witness.

THOMAS TOWERS,
Coachman, Carnforth,—Witness.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to Joseph James Coleman, this 26th day of August, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

We have carefully examined the specification and drawings, 82-744, accompanying an application from Mr. Joseph James Coleman for Letters of Registration for an invention for mechanically cooling air, and we see no objection to this Petition being granted.

Sydney, 19 July, 1882.

We have, &c.,
E. C. CRACKNELL.
CHAS. WATT.

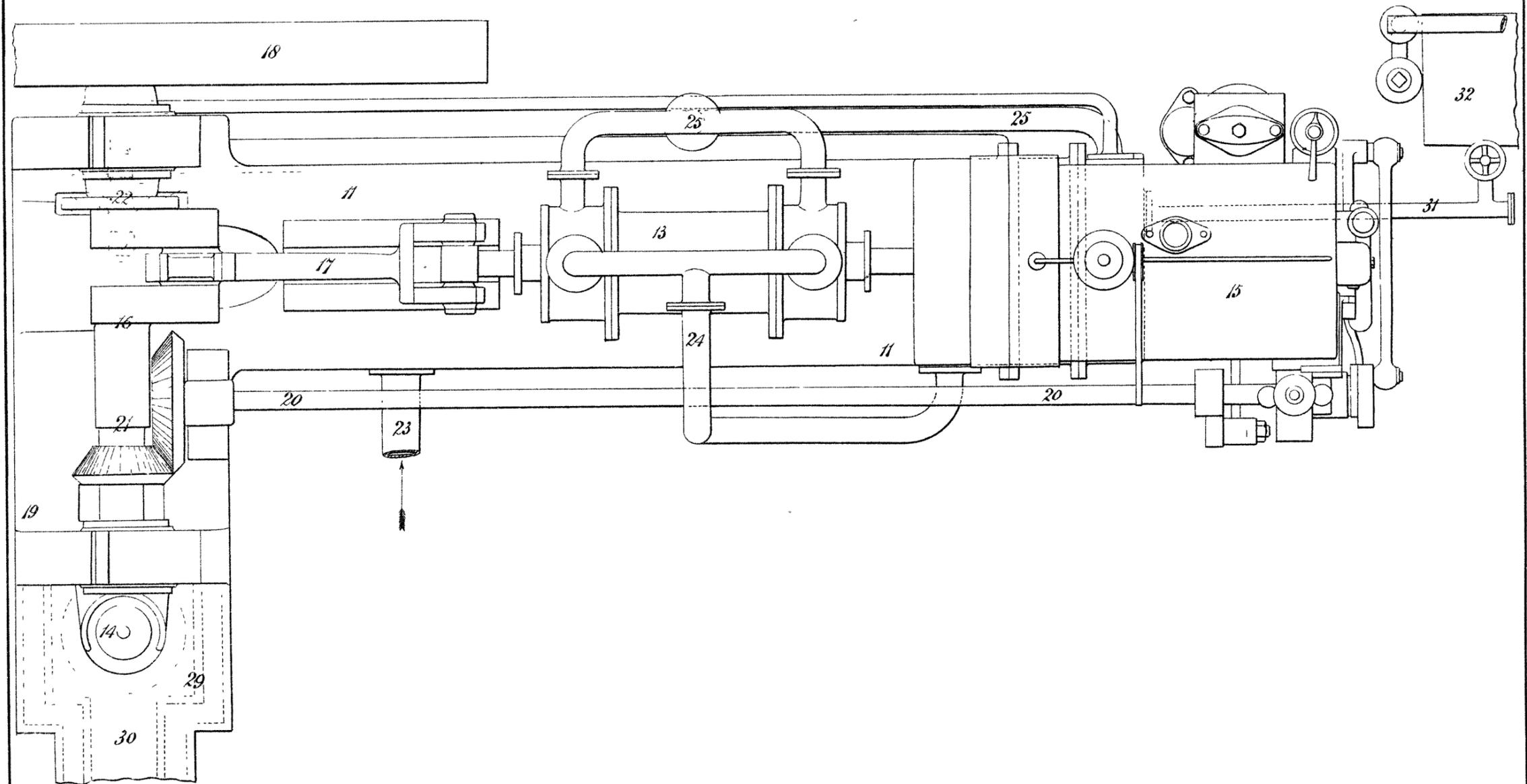
The Under Secretary of Justice.

B.

1116.

5 Sheets.
Sheet 1.

FIG. I.

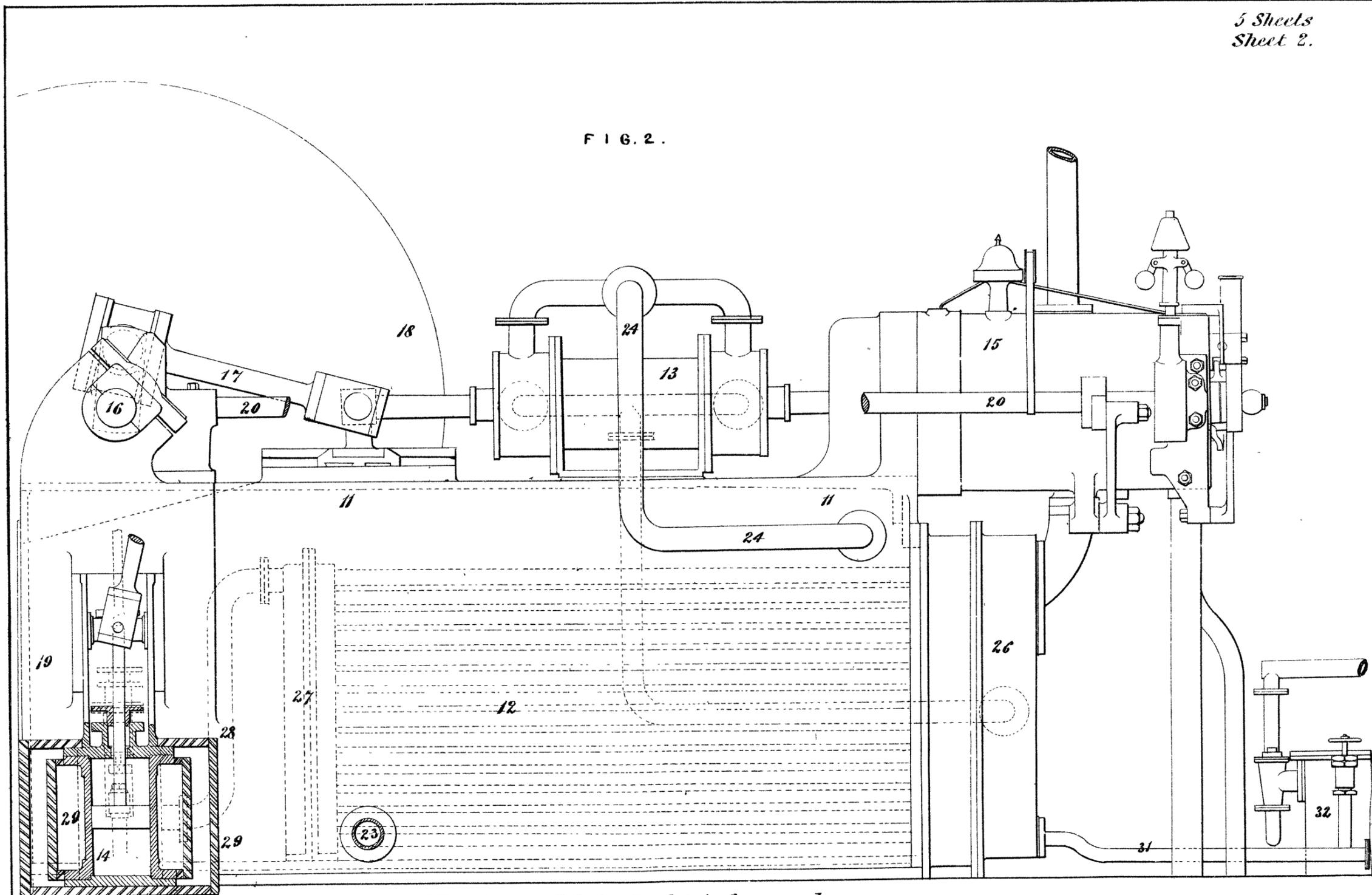


This is the Sheet of Drawings marked B referred to in the annexed
 Letters of Registration granted to Joseph James Coleman, this
 26th day of August, A.D. 1882.
 Augustus Loftus.

Joseph James Coleman

(Sig. 32.)

FIG. 2.



*This is the Sheet of Drawings marked C referred to in the annexed
 Letters of Registration granted to Joseph James Coleman, this 26th day
 of August, A.D. 1882.*

Augustus Loftus.

Joseph James Coleman

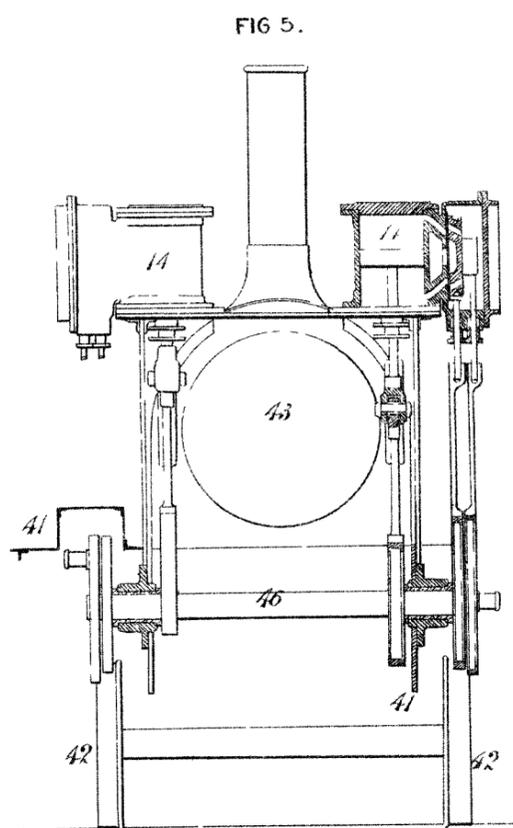
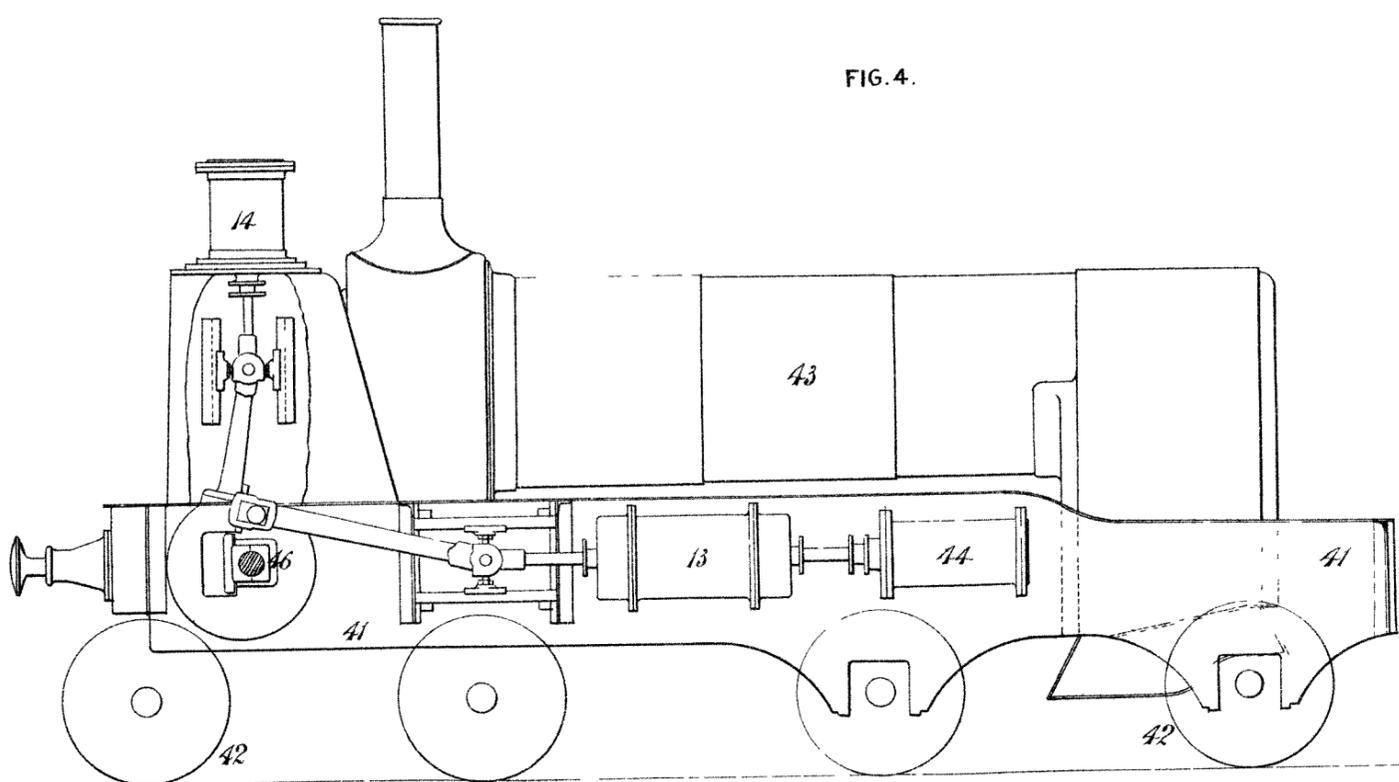
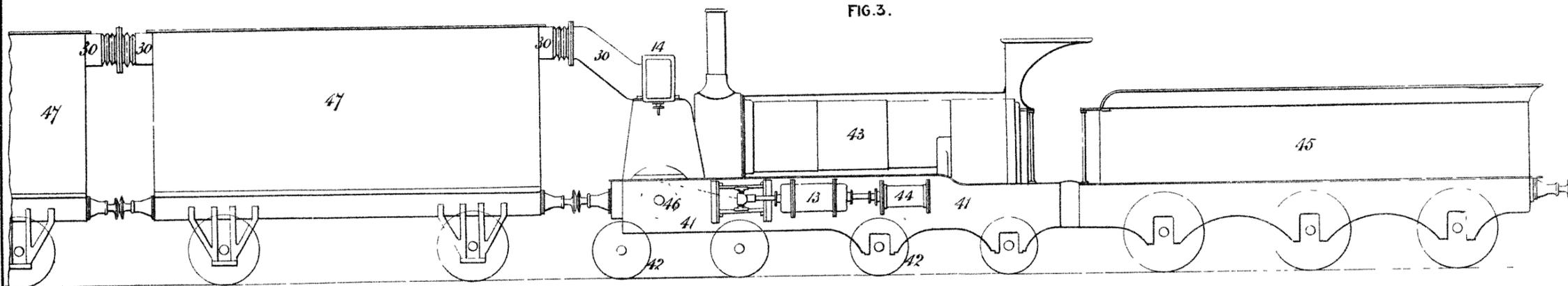
(Sig. 32-)

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

D.

1116.

5 Sheets
Sheet 3.



*This is the Sheet of Drawings marked D referred to in the annexed
Letters of Registration granted to Joseph James Coleman, this 26th
day of August, A.D. 1882.*

Augustus Loftus.

Joseph James Coleman

(Sig. 32-)

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

E.

1116.

5 Sheets
Sheet 4

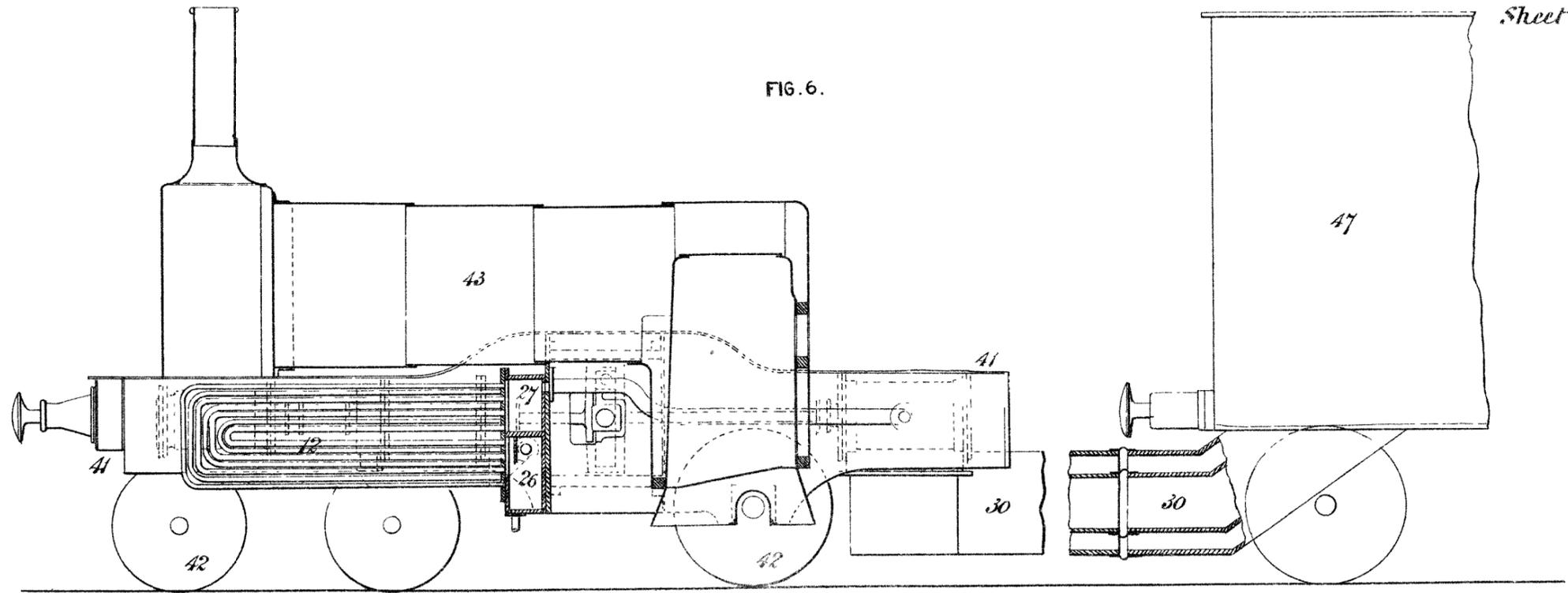


FIG. 6.

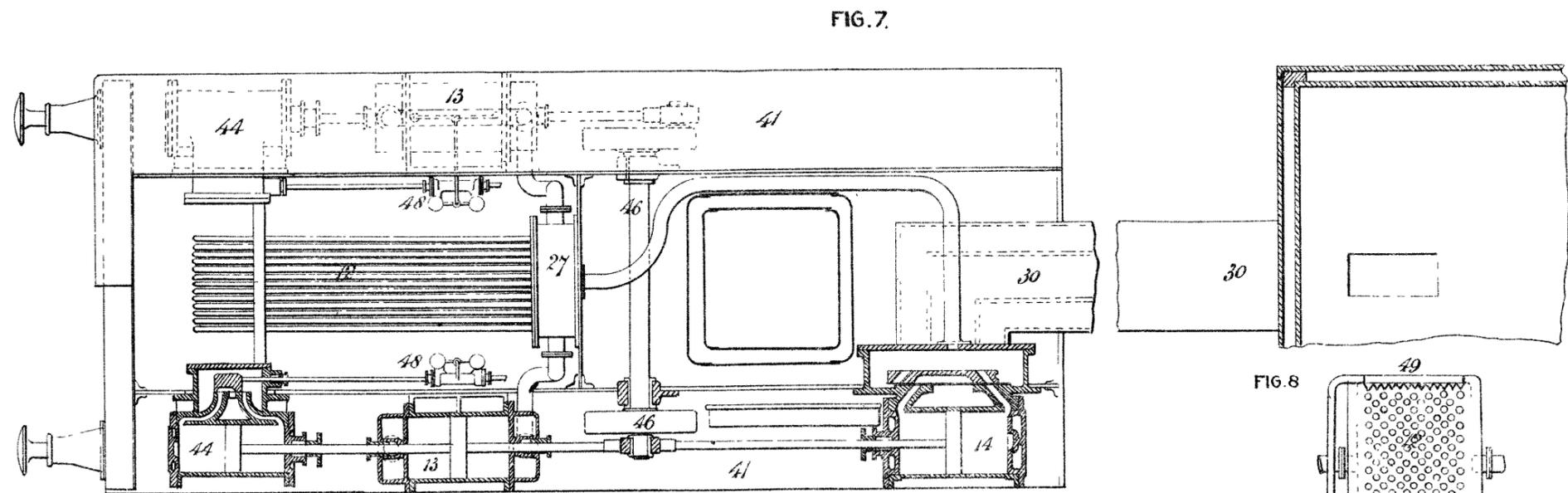


FIG. 7.

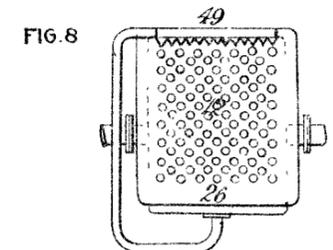


FIG. 8.

*This is the Sheet of Drawings marked E referred to in the annexed
Letters of Registration granted to Joseph James Coleman, this 26th
day of August, A. D. 1882.*

Augustus Loftus.

Joseph James Coleman

FIG. 9.

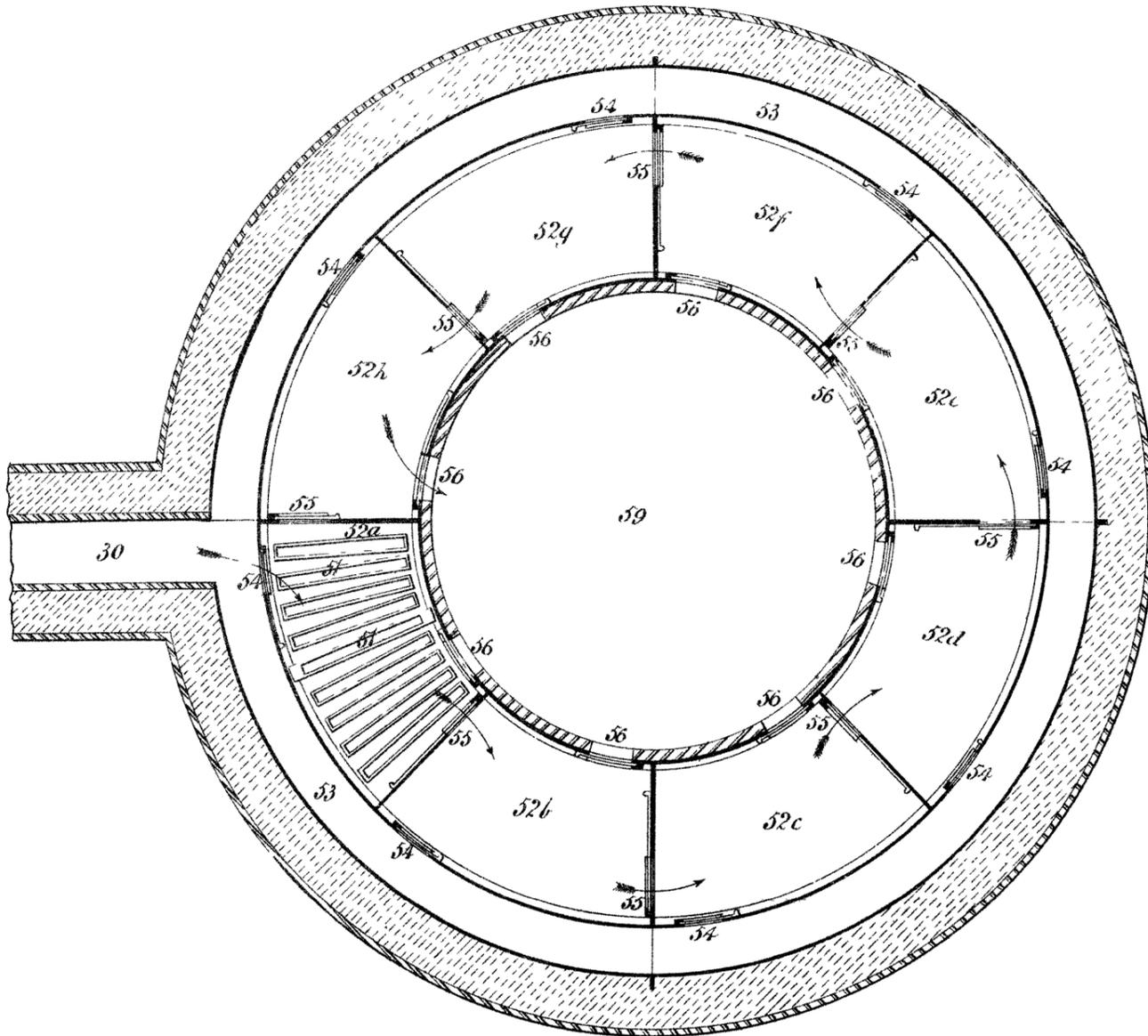
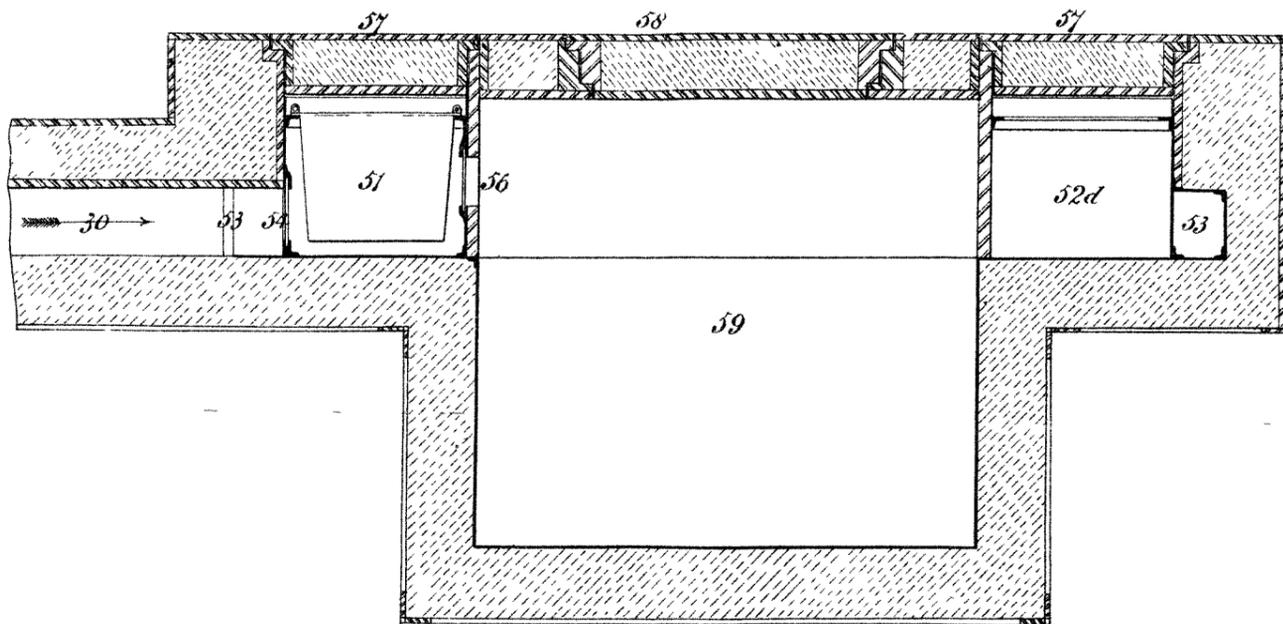


FIG. 10.



*This is the Sheet of Drawings marked Preferred to in the annexed
Letters of Registration granted to Joseph James Coleman, this 26th day
of August, A.D. 1882.*

(Sig. 32-)

Augustus Loftus. Joseph James Coleman



A.D. 1882, 26th August. No. 1117.

IMPROVEMENTS IN APPARATUS FOR HOLDING OR CARRYING EGGS.

LETTERS OF REGISTRATION to John Halley and Alexander Barr, for Improvements in Apparatus for holding or carrying Eggs.

[Registered on the 26th day of August, 1882, 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 HALLEY and ALEXANDER BARR, both of Glasgow, Scotland, 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 Apparatus for holding or carrying Eggs," 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 John Halley and Alexander Barr, 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 Halley and Alexander Barr, 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 Halley and Alexander Barr 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 August, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Apparatus for holding or carrying Eggs.

A.

TO ALL TO WHOM THESE PRESENTS SHALL COME, we, JOHN HALLEY and ALEXANDER BARR, both of Glasgow, Scotland, send greeting :

WHEREAS we are desirous of obtaining Letters of Registration for the Colony of New South Wales, 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 next and immediately after the date of the said Letters of Registration, make, use, exercise, and vend, within the said Colony of New South Wales, an invention for "Improvements in Apparatus for holding or carrying Eggs": And whereas, in order to obtain such Letters of Registration, we must, by an instrument or specification in writing under our hands and seals, particularly describe and ascertain the nature of the said invention, and in what manner the same is to be performed : 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 in writing, reference being had to the accompanying drawings, that is to say :—

Our said invention relates to the holding or carrying of eggs in large or small quantities, and consists in fitting boxes, baskets, barrels, trays, frames, or other receptacles, with improved spring holders which will hold the eggs securely notwithstanding variations in sizes, and which are such as to prevent injury from ordinary shaking or concussion, or from the turning over of the receptacles or packages. The use of straw or other packing material is dispensed with, and possible contamination of the eggs by such material completely avoided.

The spring holders and the receptacles may be constructed in a variety of ways, but the selection of modifications shown on the accompanying two sheets of explanatory drawings, and the following particular description thereof, will enable those concerned to understand the nature of the invention, and what we believe to be the best modes of practically carrying it out. In these drawings the same reference letters are used to mark the same or like parts wherever they are repeated.

Figures 1 and 2 on sheet 1 of the accompanying drawings are a plan and a side elevation of a simple, efficient, and inexpensive modification of spring holder, which consists of three fingers or members, A, made of round steel or other suitable elastic wire. One of the fingers, A, if shown separately in face and edge elevation in figures 3 and 4, and is bended into the form of a loop, which, as viewed edgewise, is shaped to suit the form of an egg. The upper part is curved inwards, the extreme end B being however turned outwards, so that when the three fingers are combined they retain the egg, whilst their extreme upper ends, B, form a conical or flared mouth to facilitate the insertion of the egg. Spring coils, C, are formed on the lower parts of the wires, and the ends of the wires are fixed in a board, bar, or plate, D, in the manner indicated in the drawings, or in any other convenient way. The holder now being described is made for holding an egg with its long axis at right angles to the board D, and when the egg is pressed with one end down against the upper ends, B, of the fingers A, the fingers open to admit the egg, and then close by their spring action and retain it securely.

The wire forming each finger or member A may be bended in various ways so as to have sufficient spring action, whilst parts of it grasp or hold the egg in a secure manner when placed in the holder. Figure 5 shows a mode of bending the lower part of the wire at E to increase the elasticity ; and figure 6 shows a simple plain form which may be adopted when the wire is sufficiently elastic ; figure 7 shows a modification having four fingers or members, A, and made out of two pieces of flat steel wire, similar to what is used for watch springs, the pieces being crossed at the bottom and fixed by a screw, F, or by a nail, to the board D. One length of wire may be bended to form all the members of a holder. The fingers or members, B, of the spring holders may be made of ornamental forms, examples of which are shown in figure 8, which comprises two face views of single fingers and two views of complete holders. Each holder may be formed of a single piece of sheet metal, cut as shown in figure 9, and then bended into the proper form, and, if desired, embossed or otherwise ornamented.

Figure 10 is a plan, and figure 11 is a side elevation of a modification of our egg-holder as made of round wire bended or shaped so as to give more elasticity than is possessed by the modifications hereinbefore described ; and figure 12 is a face-view of one of the three members forming the holder. Each member A is formed with a loop of the wire extending downwards from the top between the two sides, and forming a tongue, T, the bottom of which is curved inwards, to give elastic support to the bottom of the egg. A circular hole is formed in the board D, as shown in figure 12, to allow of the egg being placed in a lower position, so that space may be saved when a number of boards or trays are arranged one over another. When the board D is made with holes in this way, any suitable woven fabric or felt or rubber-cloth may be fixed on the upper surface of the board, and will at the holes form yielding cushions for the bottoms of the eggs ; and when such cloth or flexible covering is used the tongues T need not have their bottom ends bended inwards so far as shown. Instead of the board being made with holes covered with cloth or the like, pieces of felt, cork, or other suitable elastic material, and shaped liked gun-wads, may be placed on the board, to act as cushions to the bottoms of the eggs.

Wood, cane, ebonite, or other suitable material may be used instead of metal for forming the spring holders, the elasticity of the material itself being relied on for allowing of the opening and automatic closing of the fingers A, as in the modification shown in figure 13, the fingers of which are of cane ; or the pieces forming the fingers may have springs applied to them as in the modifications shown in figures 14 to 19. Figures 14 and 15 are a plan and a sectional side elevation of a modification in which the bottom ends of the fingers A are bent outwards and entered into a dovetailed socket in the board D, whilst a small rubber ball, G, placed in the centre between them serves both to retain them and to act as a spring, being compressed when the upper ends of the fingers are opened. Figures 16 and 17 are a plan and a sectional side elevation of a modification in which the lower parts of the fingers A are encircled by a rubber ring, H, which acts as a spring, the fingers being held in position by their bottom ends being hook-shaped and engaging in an undercut part of the socket formed for them in the board D. Figures 18 and 19 are a face-view and an edge-view of a finger, A, which is jointed to the board D by means of a wire staple, J, and has a spring, K, applied to the back of it. Figure 20 shows a single finger of wood or ebonite, or similar material, having

Improvements in Apparatus for holding or carrying Eggs.

having its lower bent end entered into a dovetailed socket in the board, whilst a separate spring, K, is applied to it. Figures 21 and 22 show modifications in each of which each finger of wood or ebonite, or similar material, is fixed upon a spring. Figures 23 and 24 are a plan and a vertical section of a modification in which a slight recess is formed for each egg in a bottom board or bar, L, whilst to a vertical bar, M, there is fixed a spring-fork or clip, N, to retain the upper part of such egg.

Figures 25 and 26 on sheet 2 of the drawings are a side elevation and an end elevation of a modification of spring holder constructed for holding an egg with its long axis parallel to the board D. This holder is made of two pieces of round steel or other elastic wire, bended and fixed in a manner which will be easily understood from the figures, and which is analogous to what is hereinbefore described with reference to figures 1 to 4. An egg is shown in the holder in figures 25 and 26, and it will be obvious that holders for holding the eggs in the same position may be modified in various ways analogous to those hereinbefore described for holding eggs with their long axis at right-angles to the board.

When several rows of spring holders are combined together upon a tray or other surface they may be arranged as shown in figure 29, which is a vertical section as taken diagonally across a number of rows. In this modification, instead of there being a quite separate holder or set of holding fingers for each egg, the fingers for the several holders are clustered or combined together in the interstices which occur between the eggs. Each cluster of holding fingers forms what may be designated as a spring stud, and it is obvious that such spring studs may be constructed in a variety of ways and of various materials.

The spring holders, made more or less like any of the modifications shown on the accompanying drawings, and hereinbefore described, may be arranged in rows or sections of dozens or other numbers to facilitate counting, being fixed upon boards or trays or frames, or in boxes or other receptacles. Figures 30 and 31 are a side elevation and an end elevation of a convenient form of tray shown filled with eggs. A number of such trays may be set one over the other in a box or packing-case when the eggs are to be carried in considerable quantities. Figures 32 and 33 of the accompanying drawings are a plan and a vertical section showing as opened a convenient form of folding-box for carrying a moderate quantity, but which may of course be made of various sizes. This box is made in halves, hinged together and fitted with closing catches and with handles, and it can be very conveniently carried by hand. A sheet of felt or cartridge-paper, or millboard, or other suitable material, may be placed between the two layers of eggs, and ventilating holes may be made at convenient parts of the box. Where eggs are collected from several farms, separate sets of boxes with distinctive labels may be allotted to the different farms, so that the customers of the egg merchant may, if they desire it, rely on the eggs they purchase being from particular farms. For a small quantity, such as one, two, or three dozen, a convenient arrangement will consist of a single board or tray fitted to slide into a case, the opening of which is at one end, and which is provided with a handle or handles if desired.

The trays or boards may have springs fitted to their undersides, to diminish the effect of concussion when they are set down on a table or counter; and when a number of trays are to be combined in a box or packing-case, the ends or side pieces are shaped so that the trays will fit together without requiring extra space for the springs.

The trays may be formed of light wood covered with thin tinned iron, to which the holders may be securely fixed by soldering. The trays may also be made entirely of metal, and may, for example, be shaped so as to conveniently serve for holding a small or large number of eggs in a pan whilst being boiled.

For the convenience of packing in barrels the spring holders may be fixed on circular trays, and when the trays are of a form precluding the use of rows of holders of uniform numbers, the total number held by each tray may be prominently marked or shown on it. When it is desired to coat the eggs with a preservative composition, this may be very conveniently effected by dipping each trayful of eggs in an inverted position.

The spring holders may be arranged in rectangular or hexagonal rows, or otherwise than in straight rows; thus, for the purposes of being displayed in shop windows, for example, and in order to occupy space not conveniently available for other purposes, they may be fixed on tree-like structures or on rings, or spheres, or pyramids, or on frames or supports made in any more or less ornamental form; or they may be fixed on rods or stout wires, as shown in figures 27 and 28, or so as to project horizontally from walls or other vertical surfaces.

Trays provided with our improved holders may be mounted or fitted with trunnions or journals to admit of their being easily turned over, and a series of such reversible trays may be combined together like the slats of a Venetian blind, so that those who wish to turn the eggs repeatedly with a view to their better preservation may be enabled to do so with facility.

We have, in conclusion, specially to state that in every modification of our improved spring egg-holders it is essential to and characteristic of our invention that the holding fingers are incurved or bended inwards above and beyond the concave parts fitting the broad part of the egg, such incurved parts of the fingers serving to retain the egg and prevent it from falling out when the holder is inverted, and the extreme outwardly bended or flared points of the fingers being for the purpose hereinbefore described, of allowing the fingers to be opened by an egg when pushed in with sufficient force.

Having thus particularly described our said invention and the manner of performing the same, we have to state that we do not restrict ourselves to the precise details herein described or delineated, but that what we believe to be novel and original, and claim as the invention which we desire to secure by Letters of Registration, is—

1. The fitting of boxes, baskets, barrels, trays, frames, or other receptacles, with spring holders for eggs, such holders being constructed with incurved retaining fingers, substantially as hereinbefore described.
2. The making of spring holders for holding or carrying eggs each with two or more fingers or members curved inwardly at their upper parts, and formed with mouth parts shaped so that an egg will open them on being pushed in or drawn out, substantially as hereinbefore described.
3. The making of the spring holders with incurved retaining fingers or members of metal or other material possessing the necessary elasticity in itself, and substantially according to any of the modifications hereinbefore described with reference to figures 1 to 13 and 23 to 29 of the accompanying drawings.

Improvements in Apparatus for holding or carrying Eggs.

4. The making of the spring holders with incurved retaining fingers or members which have separate springs applied to them, and substantially according to any of the modifications hereinbefore described with reference to figures 14 to 22 of the accompanying drawings.
5. The making of the spring holders in clusters, or as spring studs, to occupy the interstices between the eggs, substantially as hereinbefore described with reference to figure 27 of the accompanying drawings.
6. The fixing of the spring holders in a holding box such as hereinbefore described with reference to figures 32 and 33 of the accompanying drawings.

In witness whereof, we, the said John Halley and Alexander Barr, have hereunto set our hands and seals, this eighth day of May, in the year of our Lord one thousand eight hundred and eighty-two.

Signed and sealed in the presence of—
 DAVID FERGUSON, witness,
 ROBERT KINNIBURGH, witness.

JOHN HALLEY.
 ALEXANDER BARR.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to John Halley and Alexander Barr, this twenty-sixth day of August, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

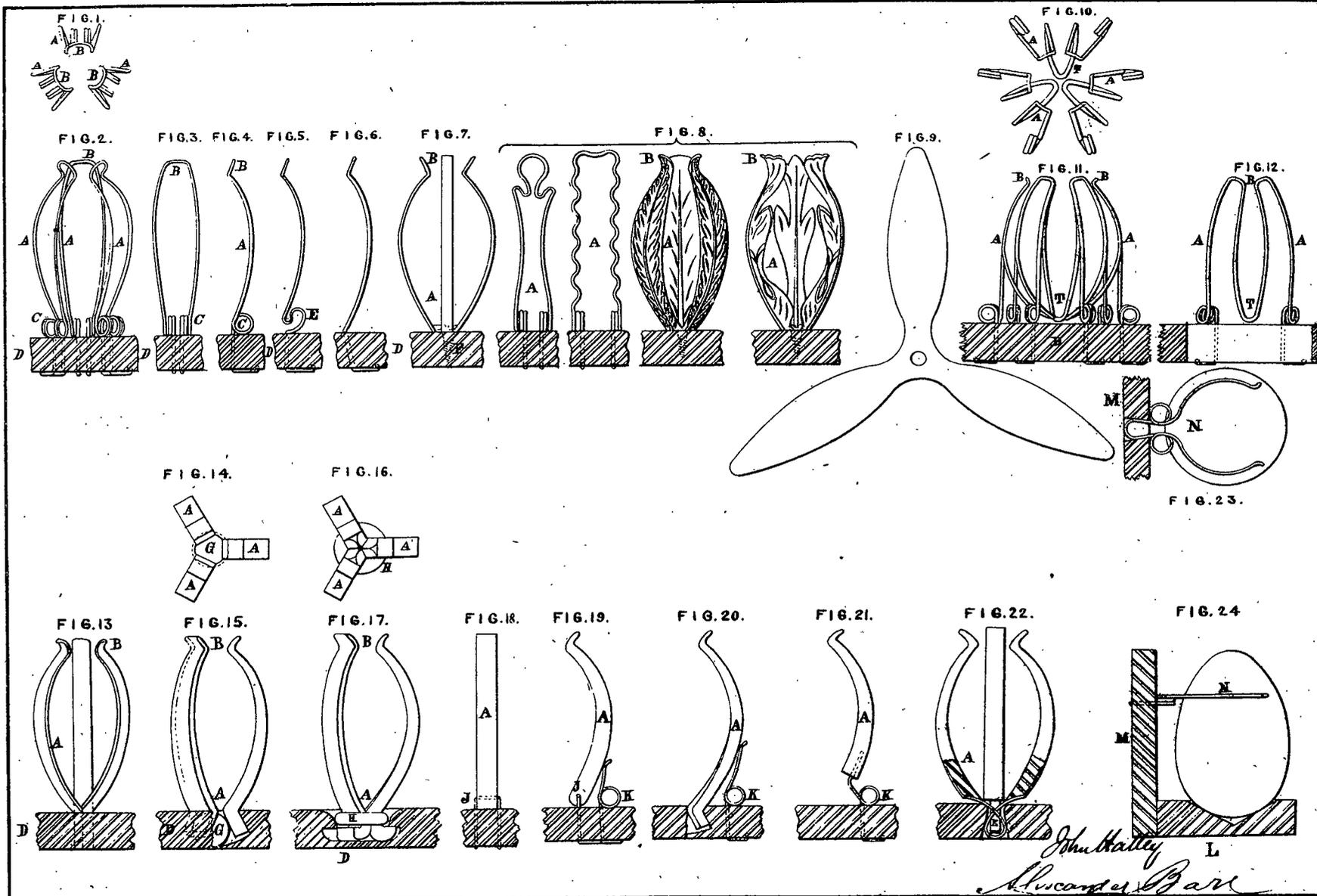
Sir,

The application of Messrs. John Halley and Alexander Barr, for Letters of Registration for an invention entitled "Improvements in Apparatus for holding or carrying Eggs," having been referred to us, we have examined the plan and specification accompanying the same, 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. FRASER.
 THOS. RICHARDS.

The Under Secretary of Justice.

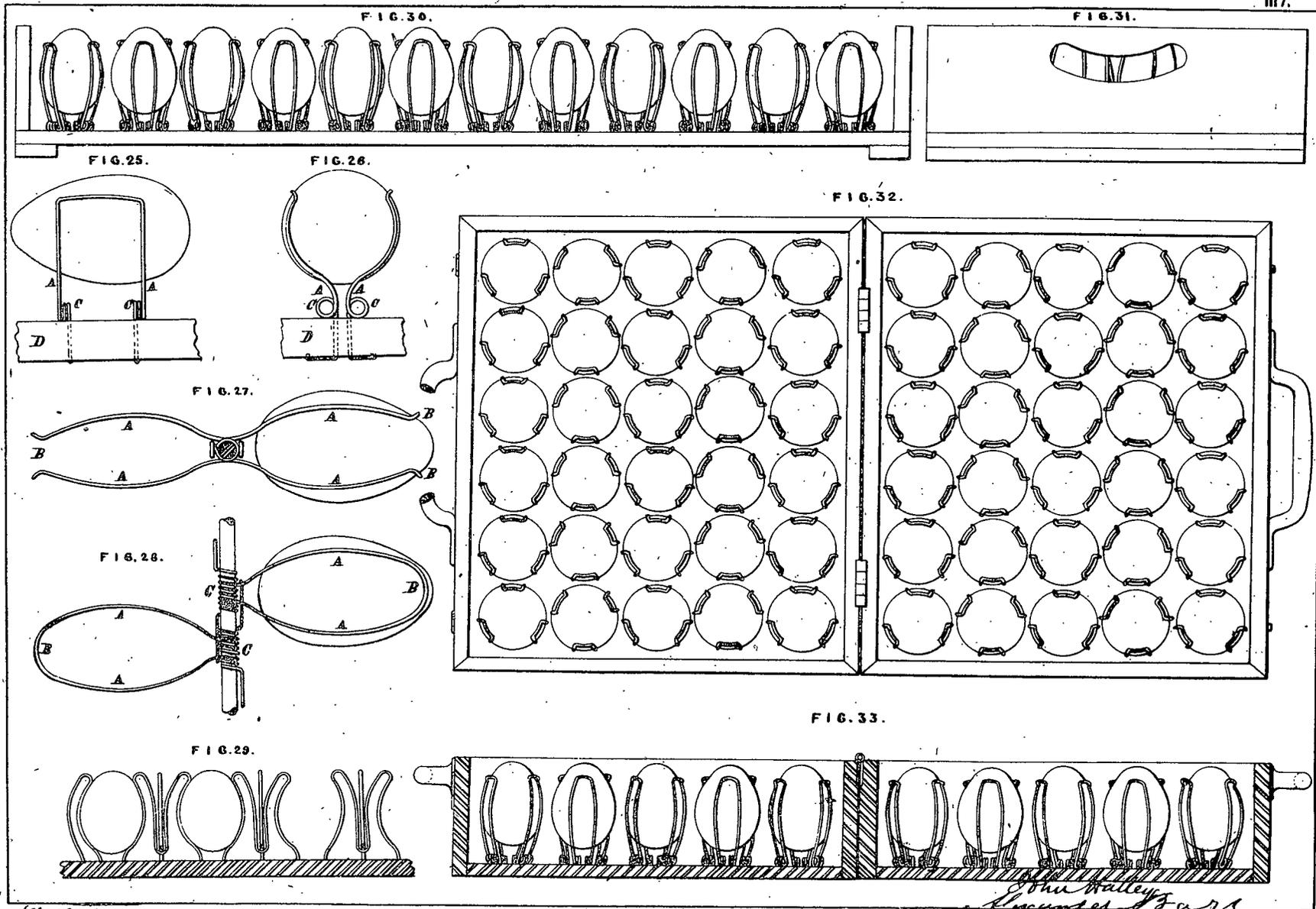
[Drawings—two sheets.]



John Halley
Alexander Barr

(875-) PHOTO-LITHOGRAPHED AT THE GOV. 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 Halley and Alexander Barr, this twenty-sixth day of August, A.D. 1882.
Augustus Loftus.



(Sig. 875)

This is the Sheet of Drawings marked C referred to in the annexed Letters of Registration granted to John Halley and Alexander Barr, this twenty-sixth day of August, A.D. 1882.

Augustus Loftus.

John Halley
Alexander Barr



A.D. 1882, 26th August. No. 1118.

IMPROVEMENTS IN THE MANUFACTURE OF AIR-GAS FROM GASOLINE.

LETTERS OF REGISTRATION to Daniel Howard Martin, for Improvements in the production and manufacture of Air-gas from Gasoline.

[Registered on the 26th day of August, 1882, 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 DANIEL HOWARD MARTIN, of Ipswich, in the Colony of Queensland, 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 "Improvements in the production and manufacture of Air-gas from Gasoline," which is more particularly described in the specification, marked A, and the two photographs, marked respectively B and C, and the three sheets of drawings marked 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 Daniel Howard Martin, 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 Daniel Howard Martin, 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 Daniel Howard Martin 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 August, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in the manufacture of Air-gas from Gasoline.

A.

SPECIFICATION.

THIS invention consists of certain improvements in the production and manufacture of Air-gas from Gasoline.

It is more compact, effective, and economical than any other machine yet made, as well as being perfectly safe and completely under control.

There are four separate parts—

- 1st. That which supplies the compressed air, hereafter called the air-compressors.
- 2nd. That which contains the gasoline through which the air passes, hereafter called the generator.
- 3rd. That which receives the gas from the generator and supplies the burners, hereafter called the gas-holder.
- 4th. That which stores the gasoline to supply the generator, hereafter called the feeder.

The power necessary to keep the air-compressors at work is supplied by a weight, suspended at one end of a rope, which passes over a pulley, and is connected with the drum and ratchet of the air-compressor. This weight requires winding up.

The drawings hereunto annexed show—

- 1st. Perspective view of apparatus.
- 2nd. Longitudinal section.
- 3rd. Side elevation, showing air-compressors, air-pipes, and stop-cocks, stopping-lever, counterpoise, and drum.
- 4th. Main shaft, showing crank for working air-compressors, bearings, pinion wheel, stopping-lever, and counterpoise. Also plan and section of spring stopping-gear.

Referring to drawing No. 2—A is one of the air-compressors, consisting of double-action bellows. B is the other air-compressor behind A. C C are outlets from air-compressors conveying air to generator. D is the gas-generator. E E are lever taps in outlets from air-compressors. F is a pipe with lever tap, through which the gas passes to the receiver, and thence to the holder. G is elbow pipe from feeder to generator. In the lower end of the pipe is fitted a valve, which is acted upon by a float and lever with its fulcrum, in order to regulate the level of gasoline in the generator. H¹ is the receiver which receives the gas through pipe F, whence it passes upwards through perforations at top into the gas-holder. Into the upper part of the receiver is fitted a tube. H² is the gas-holder, having a guide rod fixed at the top, which works into the tube in receiver. H³ is the tank of gas-holder. I¹ I² are levers inside and outside of tank of gas-holder, jointed nearly midway. At the end of I² is attached a lever with slot pieces at end, which controls the stopping-gear. J is main pipe to supply the burners. This pipe is inclined towards the machine, so that all condensation must run back to the receiver. K is feeder for storage of the gasoline, fitted with screw tap on top. L is handle working the three lever-taps E F E, by means of connecting rod, which is brought in contact with extra bolt of stopping-gear; this handle when moved down locks the machine and cuts off all communication with the gas generator.

Referring to photograph No. 1 A—M is drawing of cock fitted into generator.

Referring to drawing No. 4—N is the stopping gear, consisting of lever with square joint, spring, and bolt, with extra bolt for locking the machine when out of use.

The operation of the machine is as follows:—The tank of the gas-holder is first filled with water, then the feeder tap is opened, and the screw tap of feeder taken out and water poured in until the gauge on the generator rises to the lower mark, after which the gasoline is poured into the feeder, as may be required. The weight having been wound up revolves ratchet and drum with large toothed wheel, which imparts motion through pinion wheel to main shaft with crank in centre. As the crank revolves it sets in motion the two air-compressors, which force the air through the pipes into the water at bottom of generator, and the air so forced passes up through gasoline, becoming thus fully carburetted. It then leaves the generator as gas through pipe and receiver into the gas-holder, and from thence to the burners. As the holder become filled with gas it rises until the lower stud or holder raises lever I¹ and simultaneously depresses lever I², which shoots the bolt of stopping-gear and causes the making of gas to cease. The holder then descends as the gas is consumed until the upper stud depresses lever I¹ and simultaneously raises lever I², which withdraws the bolt of stopping-gear, and the making of the gas is renewed, and thus the machine continues filling and exhausting the gas-holder with the most perfect automatic action.

The particular claims in this invention are—

- 1st. The double-action air-compressors, which are so constructed and fitted in the machine as to produce four currents of air, overlapping each other, thereby forcing a steady and continuous air supply into the generator.
- 2nd. The main shaft, with crank in centre for working the air-compressors.
- 3rd. The outlets from the air-compressors, which terminate as dip-pipes into water at bottom of generator, thereby preventing back pressure.
- 4th. The guide-rod in centre of gas-holder, which dispenses with outside guides.
- 5th. The supply valve in generator, moved by float and lever in order to regulate the level of gasoline.
- 6th. The stopping-gear and levers in connection therewith, inside and outside of tank.
- 7th. The handle L for locking the machine when not in use.

Improvements in the manufacture of Air-gas from Gasoline.

8th. The process of manufacture, which is quite original; the air does not merely pass over the gasoline but is forced through it, thereby causing a complete agitation, by means of which the whole of the gasoline, large or small, is converted into gas, without residue or waste, and without the use of any carburetting material other than the gasoline itself. By using the air-compressors the machine has great pressure, and the risk of accident is thereby removed, making it perfectly safe for household use. Owing to the rapid generation of gas by this process only a small evaporating surface is required, so that the machine is more compact and manageable than any other gas machine yet invented. The machine is self-regulating, and will, with equal efficiency, supply a single light or any number of lights up to its capacity.

DANIEL H. MARTIN.
By his Attorney,
JOHN RANKEN.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to Daniel Howard Martin, this 26th day of August, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

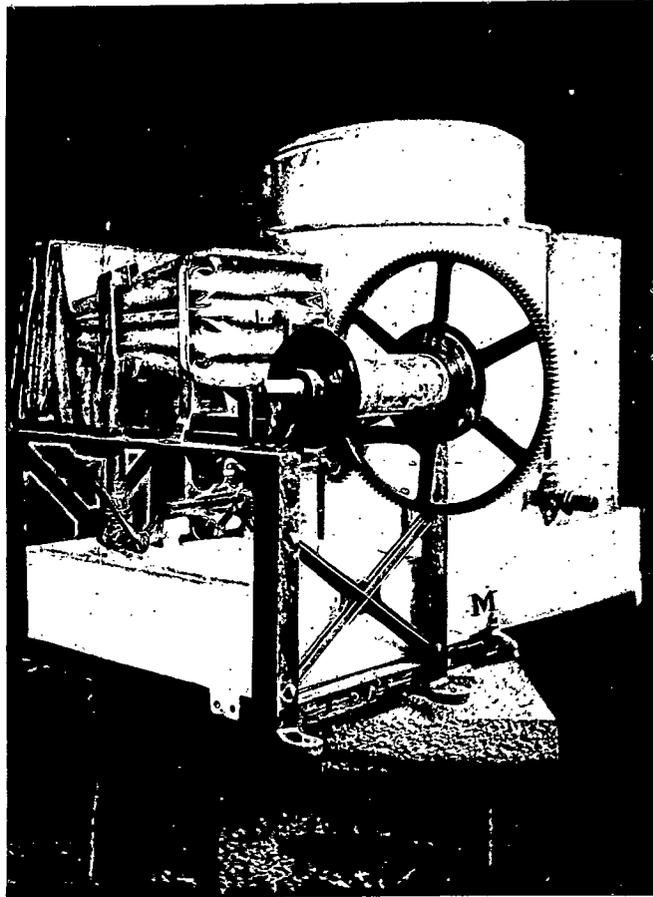
We do ourselves the honor to return to you the documents transmitted for our report, under you B.C. communication of June 27th, No. 82-7,378, which have reference to Mr. Daniel Howard Martin's Petition for Letters of Registration, for his invention for "Certain Improvements in the production and manufacture of Air-gas from Gasoline," and we have to state that we see no objection to the issue of said Letters of Registration, in accordance with Mr. Martin's specification and drawings.

Sydney, 18 July, 1882.
We have, &c.,
CHARLES WATT.
A. LEIBIUS.

The Under Secretary of Justice.

[Drawings—four sheets.]

B.



No. 1 A. { *This is the Photograph marked B referred to in the annexed
Letters of Registration granted to Daniel Howard Martin, this
26th day of August, A.D. 1882.*

AUGUSTUS LOFTUS.

*Daniel H. Martin,
by his attorney,
John Parker.*

C.



No. 1 B. { *This is the Photograph marked C referred to in the annexed
Letters of Registration granted to Daniel Howard Martin, this
26th day of August, A.D. 1882.*

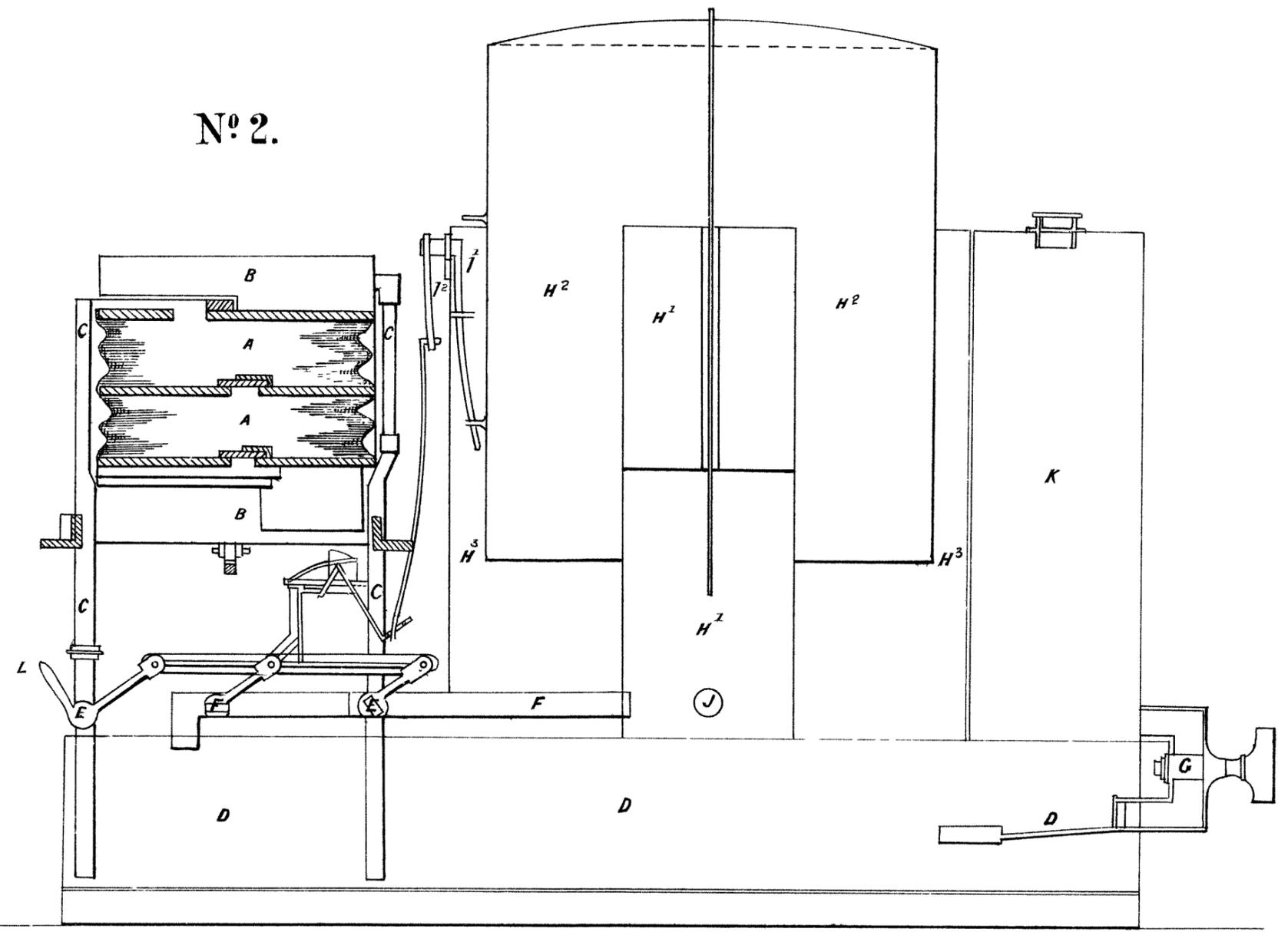
AUGUSTUS LOFTUS.

*Daniel H. Martin,
by his attorney,
John Parker.*

D.

1118.

N^o 2.



SCALE QUARTER SIZE.

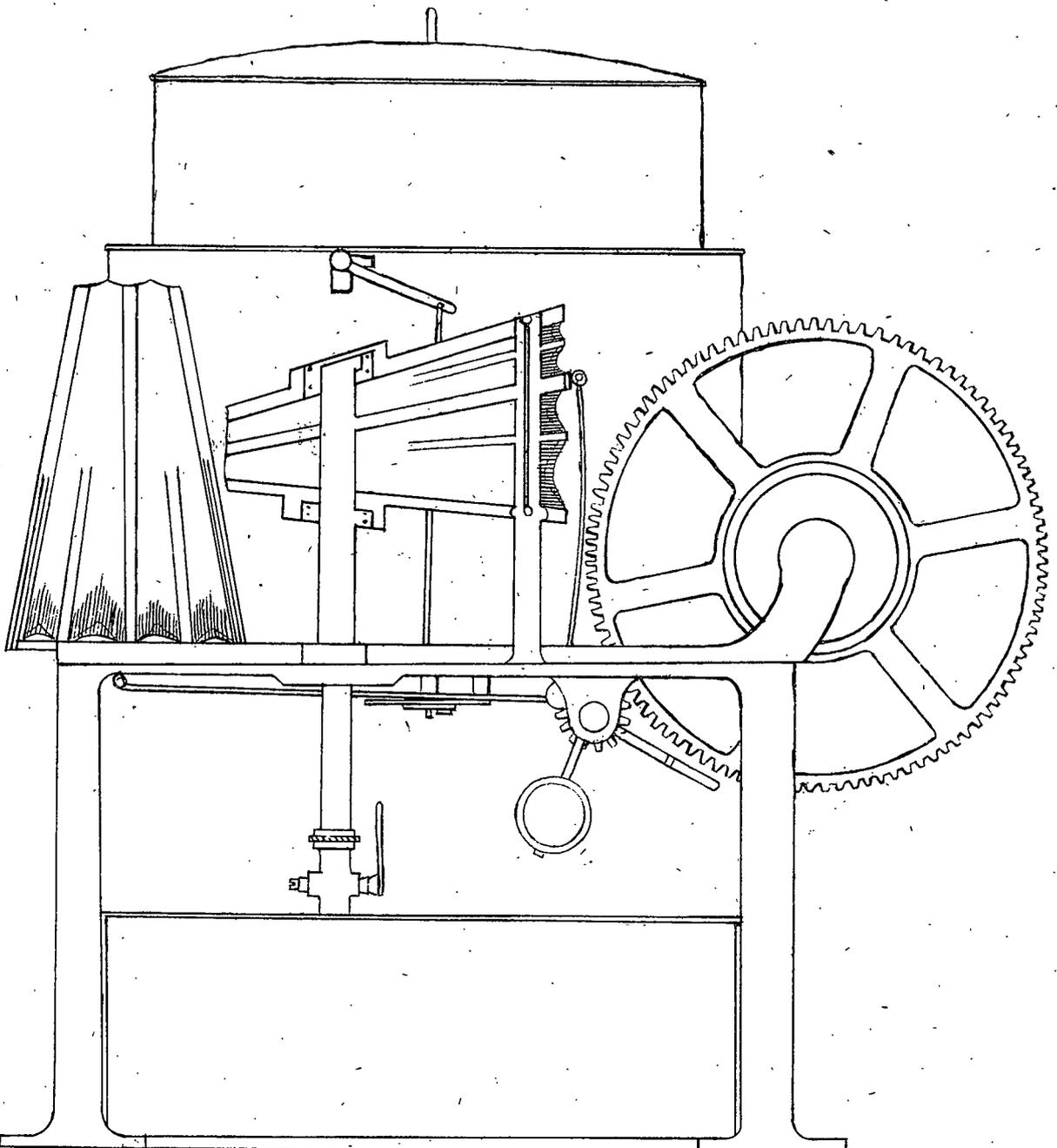
*This is the Sheet of Drawings marked D referred to in the
annexed Letters of Registration granted to Daniel Howard
Martin, this 26th day of August A.D. 1882.*

Augustus Loftus.

*J. P. Daniel H. Martin
by his Attorney
Alvin Pauline*

(Sig. 875-)

N^o 3.



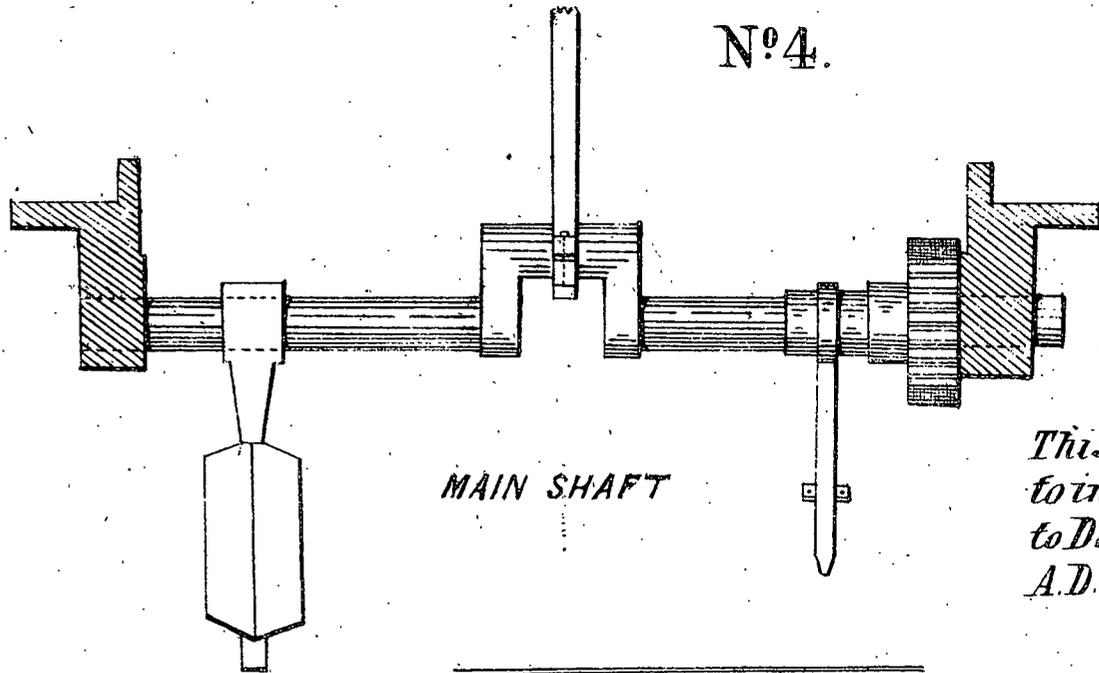
SCALE QUARTER SIZE

This is the Sheet of Drawings marked E. referred to in the annexed Letters of Registration granted to Daniel Howard Martin, this 26th day of August AD. 1882.

Augustus Loftus:

*S. C. Daniel H. Martin
by his Attorney*

N^o 4.

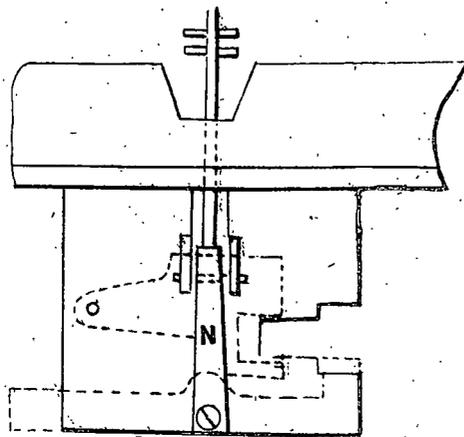


MAIN SHAFT

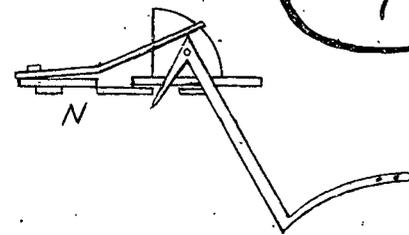
This is the Sheet of Drawings marked F referred to in the annexed Letters of Registration granted to Daniel Howard Martin, this 26th day of August A.D. 1882.

Augustus Loftus.

Scale Half Size.



PLAN OF STOPPING GEAR.



SECTION OF STOPPING GEAR.

*D. H. Daniel H. Martin
by his Attorney*

John Paul M.



A.D. 1882, 26th August. No. 1119.

IMPROVEMENTS IN APPARATUS FOR VENTILATING, COOLING, AND WARMING.

LETTERS OF REGISTRATION to Heinrich Mestern, for Improvements in Apparatus for ventilating, cooling, and warming buildings and rooms.

[Registered on the 26th day of August, 1882, 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 HEINRICH MESTERN, of Berlin, in the Empire of Germany, 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 ventilating, cooling, and warming buildings and rooms," 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 Heinrich Mestern, 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 Heinrich Mestern, 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 Heinrich Mestern 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 August, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Apparatus for ventilating, cooling, and warming.

SPECIFICATION of HEINRICH MESTERN, of Berlin, in the Empire of Germany, engineer, for an invention entitled "Improvements in Apparatus for ventilating, cooling, and warming buildings and rooms."

THE object of my invention is to alter the temperature of a room or building by the employment of a falling jet or spray of water (hot or cold) under pressure within a vessel, into which vitiated, pure, or medicated air, gas, or vapour can be drawn by said water in its descent, and be separated therefrom so that the air, gas, or vapour as it leaves the water may be passed through an intermediate chamber within said vessel for issuing into a room or apartment, or into the atmosphere, or otherwise disposed of.

For the purposes of my invention I attach to the inside of a tall cylindrical vessel another vessel of nearly the same height, and I leave a space between the two in communication with the inner cylinder at the lower part by an opening. The upper end is terminated by two outlets provided with valves, either of which can be closed or opened at pleasure to direct the escaping air, vapour, or gas into a room or into the atmosphere, as desired. That is to say,—I may, by opening one valve, cause a fresh supply of atmospheric air to be forced into the room, slightly raised in temperature by coming into contact with hot water flowing under pressure from the rose or spreader arranged within the inner cylinder, or I can withdraw the heated air from a room or apartment and cool it by the action of cold water from the same rose or spreader, or I may pass warm atmospheric or other heated air into a room or apartment in the same manner by simply shifting the position of the two valves, or I can change the temperature of a room by simply drawing the air into the apparatus at one part and cause it to flow or issue at another part after having been in contact with the water hot or cold.

The next part of my invention relates to a special construction of spray producers, which consists in one arrangement in fitting an adjustable cone plug in the bottom of a supply pipe, and in having in connection with said cone a cap so that a thin annular space can be formed between them to determine the thickness or thinness of the annular stream of water that shall leave the nozzle.

According to another construction of nozzle or spray producer I provide a lower stem with a loose cone, having notches and teeth cut straight or at an angle. Said loose cone is free to revolve under the pressure of water leaving the nozzle, so that by the contact of the water therewith, coupled with the revolving action given to the cone, the water is broken up in finer particles or into a mist. The annular space of the nozzle in this arrangement looks in the reverse direction, that is to say: in the first arrangement the water sprays outwards to strike direct upon the inner vessel, but in the second arrangement it sprays inwards to strike upon the loose cone, by and from which it spreads outwards against the inner vessel.

The construction or arrangement of an apparatus for carrying my invention into practice is clearly shown in the annexed drawings, figures 1 and 2. A is the outer cylinder, and B the support; C is the inner cylinder, and D the space between; E F are top passages, and G H the valves therein; I is a chain attached to arms J J of the valves G H, and connected to an axle pin, K, on whose outer end a handle is affixed to allow it to be turned to the right or to the left according to the desired positions of the valves G H; L is a rose or spreader from which water (hot or cold) is caused to flow and be dashed with force against the inner cylinder C, and create a vacuum behind and within the conical shape it assumes from the shape of the rose or spreader, the issue of the water being at an angle near its edge only.

M is an opening at the bottom of the inner cylinder to allow the air when acted upon by the water to pass to the space D, to find an outlet by the passage F or E, as will be understood by figure 1, a vertical section, in which the valve G is closed and the valve H open. The arrows show the direction of travel of the air from a room to the outside of the wall. Figure 2, also a vertical section, shows the reverse of this. In this view the valve H is closed and the valve G open. N is a pipe to convey the water after use for the purpose above described to a drain or elsewhere. Figure 3 is a vertical section; figure 4, an elevation of a modified apparatus.

The cylinder C, open at the lower end, is fixed concentrically within the larger cylinder A, the bottom, P, of which is hollowed out as shown. The annular spaces D, between the two cylinders A and C, leads to the chamber Q, and thence to the perforated dome R, for circulation in the room.

The rose or spreader is shown at figure 5, consisting of a barrel, a, with an inclined faced edge at its lower part, b; c is an internally-fitting pipe with a cone face at d, adjustable to suit the thickness of the spray.

A modified construction or arrangement of nozzle is shown at figure 6, consisting of—

First—An end piece of the pressure-pipe e, furnished with an external screw-thread.

Second—Of a valve-box, f, screwed to the aforesaid end piece of the pressure-pipe, and which narrowing at its end forms a conical valve-seat.

Third—Of a valve, g, adapted to the above-mentioned valve-seat. This valve is formed with radial guide arms or wings, and with a central bored hole.

Fourth—Of a screwed adjusting-pin, h, passing through the central hole of the before-mentioned valve. The upper end of this pin is formed with wings, i i, which are secured in the valve-box, and the lower end projecting out beyond the end of the valve is furnished with a screw-thread.

Fifth—Of an adjusting screw-socket, j, with internal screwed thread formed thereon, closed at its lower end, which is formed into a button, k, for turning it round. This adjusting screw-socket is screwed on to the before-mentioned adjusting-pin h until a shoulder of the socket touches the valve. When the adjusting screw socket j is screwed further up by means of the button k at its lower end the valve is opened, but when it is turned back the valve is closed again by the pressure of the water.

Sixth—Of a revolving socket, l, provided with straight or screw-like notches or vanes, figures 7 and 8, which socket revolves round the adjusting screw-pin h, and is carried by a projecting rim or shoulder on the adjusting screw-socket j.

Immediately the valve is opened by turning the adjusting screw-socket j by means of the button k the water under pressure shoots obliquely downwards towards the axis of the valve, and strikes the notches or vanes of the revolving socket l, which is thus set in violent rotation by the blows of the water on such notches or vanes, and the pressure water is broken up into very fine mist, diverging obliquely and radially downwards.

Having

Improvements in Apparatus for ventilating, cooling, and warming.

Having now described the nature of my said invention and in what manner the same is to be performed, I declare that I claim,—

First—The novel combination of two cylinders, A and C, top passages E F, valves G H, chain I, axle-pin K, and rose or spreader L, arranged in the manner set forth, for the purposes explained.

Secondly—The two valves G H in top passages E F for opening and closing and for determining the inflow of air to or from a room or apartment, and the cooling or heating of such air in its passage, as described.

Thirdly—The apparatus for ventilating, cooling, and warming buildings and rooms, as represented in the drawings, figures 3 and 4, wherein cold or hot water admitted to the apparatus under pressure is used to purify and cool or warm the air passed through the apparatus, in the manner hereinbefore described.

Fourthly—The peculiar construction of the spray-nozzle, represented in figure 5, whereby a very forcible spray is produced with a minimum consumption of water, as hereinbefore described.

Fifthly—The pressure water-rose produced by the combination of the pressure-pipe *e*, the fixed conical valved seat, the axially perforated movable conical valve, the adjusting screw-pin *h*, the adjusting screw-socket *j*, and the rotating socket *l*, with straight or screw-like notches, as hereinbefore described and illustrated in the drawings hereunto annexed.

In witness whereof, I, the said Heinrich Mestern, have hereunto set my hand and seal, this fourth day of May, 1882.

HEINRICH MESTERN.

Witness—

GUSTAV DITTMAR.
P. REINHEG.

This is the specification referred to in the annexed Letters of Registration granted to Heinrich Mestern, this twenty-sixth day of August, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

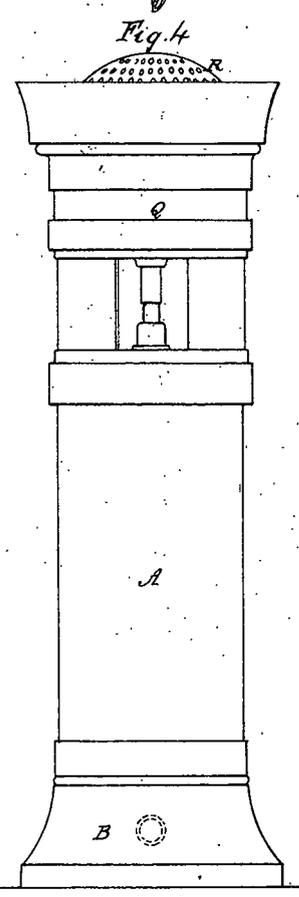
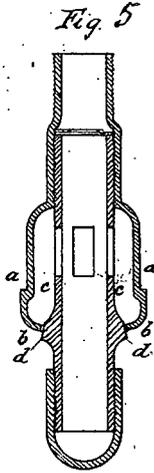
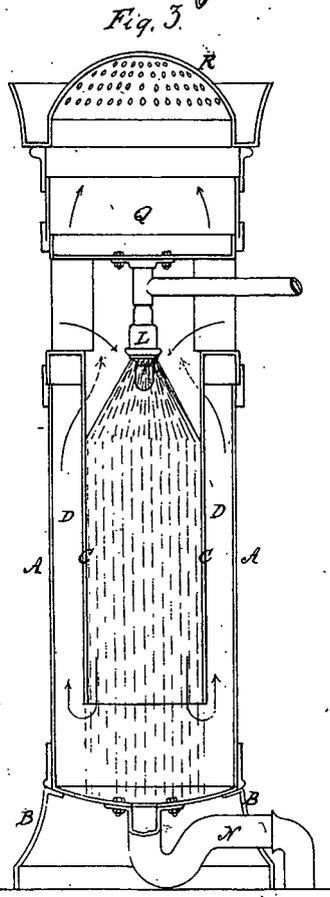
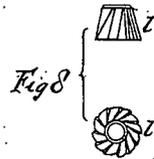
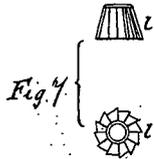
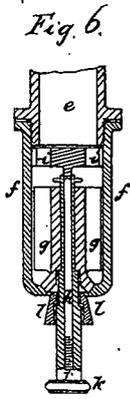
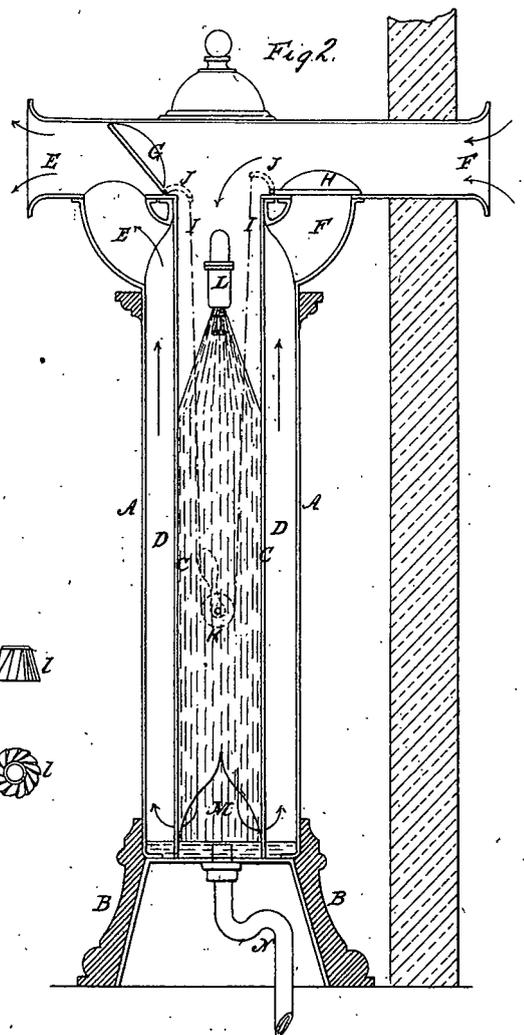
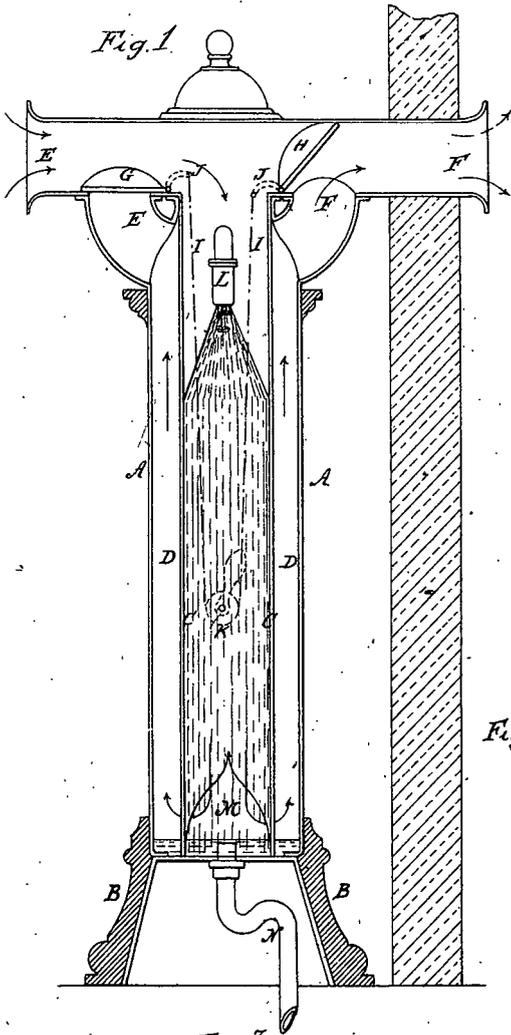
The application of Mr. Heinrich Mestern, of Berlin, for Letters of Registration for an invention for "Improvements in Apparatus for ventilating, cooling, and warming buildings and rooms," having been referred to us, we have examined the plans and specification accompanying the same, and have now the honor to report that we see no objection to the issue of Letters of Registration as prayed for.

We have, &c.,

JAMES BARNET.
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 Heinrich Western, this twenty sixth day of August A. D. 1862.

(875-)

Augustus Loebus.

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



A.D. 1882, 5th September. No. 1120.

IMPROVEMENTS IN MACHINERY FOR BREAKING-UP AND TILLING THE GROUND.

LETTERS OF REGISTRATION to Joshua Alexander Kay, for Improvements in Machinery for breaking-up and tilling the ground.

[Registered on the 7th day of September, 1882, 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 JOSHUA ALEXANDER KAY, of Flinders-lane East, in the city of Melbourne and Colony of Victoria, 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 for breaking-up and tilling the ground," 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 Joshua Alexander Kay, 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 Joshua Alexander Kay, 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 Joshua Alexander Kay 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 September, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Machinery for breaking-up and tilling the ground.

A.

SPECIFICATION of JOSHUA ALEXANDER KAY, of Flinders-lane East, in the city of Melbourne and Colony of Victoria, mechanical engineer, for an invention entitled "Improvements in Machinery for breaking-up and tilling the ground."

My invention consists in an improved construction and arrangement of machinery for ploughing, or digging, or breaking-up the earth prior to its undergoing the subsequent operations of turning over, sowing, and harrowing, when the land is to be tilled, and prior to its being lifted and removed when the object is simply that of excavation, as in the forming of dams, &c. In the former case I add the contrivances for turning over, sowing, and harrowing, to those for ploughing, digging, or breaking-up, so as to enable one machine to perform all these operations at one and the same time, but in due succession, so far as the order of their procedure is concerned; and in the latter case I may add or omit the elevators for lifting the broken-up earth into a vehicle, or conducting it to any required point.

The ploughing, digging, or breaking-up portion of my machinery consists essentially of a succession of revolving horizontal shafts, one behind the other, each imparting motion to a series of multiple picks or breaking-up tools, each such multiple pick consisting of a number of points or single picks, which enter the ground in the same line in succession. I prefer to make such multiple picks, and to connect them to the shaft, in the manner hereinafter described and shown in my drawings, it being necessary that the picks on each shaft should not travel in the same line as those immediately before it, and that the second one should be lower than the first, so as to dig to a greater depth, and thus divide the work and lessen the strain. Two of such shafts might be sufficient, but I prefer to have three, and in this case the third one is on the same level as the second, and is only used to ensure more perfect work. The whole of these shafts are supported in bearings attached to a main framing, which is raised and lowered by suitable leverage, and are driven by spur wheels on the main shaft, as hereinafter described.

The machine as a whole has three wheels, one being a leading or steering wheel in front, and the two others being draught wheels, one at either side, immediately behind the ploughing, digging, or breaking-up portion of it. Immediately behind the draught wheels is my turning-over machinery, consisting of a series of scoops or shovels, the whole width of the machine, which revolve with a shaft to which they are connected, and which is itself driven from said spur wheels on the main shaft, in the manner hereinafter described.

Immediately behind this turning-over contrivance I attach a seed-sower of the same width as the machine, which is worked from the scoop-shaft, also as hereinafter described. In this seed-sower there is of itself no novelty.

Immediately behind this seed-sower I also suspend a row of teeth or tines reaching to the ground, so as to act as a harrow. This is supported by gudgeons working in bearings in the frame, so as to admit its swinging to and fro, and thus allowing the teeth to pass over the weeds or other obstruction.

Referring now to my drawings, figure 1 shows plan, and figure 2 side elevation of my machine as a whole. Figure 3 shows side view of one of my multiple picks, and figure 4 similar view of my revolving scoops or shovels, both on a larger scale than the other views. A is the front or guide wheel, worked by the steering handle B and bridle B¹ on vertical spindle C, as is well understood. D is the main framing of the digger, one end of which is supported on spindle C, and the other on the axle of the draught wheels. Bolted to this framing are cheek-plates, D¹, in which are the bearings for shafts E, each shaft carrying a series of multiple picks, E¹, kept a proper distance apart by sleeves or washers, E², and bolted to discs E³ as shown. On either end of each of these shafts are pinions or toothed gearing F, the whole of which are set in motion by spur wheels G fixed on the axle H of the draught wheels I. These draught wheels revolve freely upon their axle, except when the clutches K are closed by hand lever L.

Behind the draught wheels are the scoops or shovels M, which are fastened by bolts M¹ to discs M², fitted on shaft M³, at either end of which are pinions F¹ driven by toothed wheels, also marked F¹, and all receiving motion from spur wheels G on axle H.

Behind the revolving scoops or shovels is a seed-sower, N, of common construction, and whose brush, O, is driven by cord O¹ gearing over pulleys O² and O³, the latter of which is on the end of shaft M³, from which it receives its motion.

Behind the sower is the light swinging harrow-rake, consisting of one or more rows of teeth across the hinder end of the machine.

Q is a double lever for raising and lowering the machine at pleasure. It works on fulcrum R, which also acts as an axle-bush. S is a strong flat connecting rod, one end of which is around said axle-bush, and the other end around the collar of the intermediate wheel-stud, so as to move the hind cheek-plates T back and forth, to keep wheels G and F¹ always in gear as the machine is raised or lowered.

The shafts for the picks and the shovels may be substituted by gudgeons formed on the discs, to which they are bolted.

The action of the machine is as follows:—When the horse, steam, or other power is applied to drag the machine over the ground to be operated upon, the framing which carries the picks is lowered to the required depth by means of lever Q, and the clutches thrown into gear by means of handle L. As the machine is then drawn forward, the main or driving wheels I are set in motion, and the spur wheels G propel the driving gear of the picks, scoops, and sower, when the two latter are attached. The picks as they revolve enter the soil and dig or break it up as before described, and for some purposes of agriculture their operation alone would be sufficient for the requirements of the soil, in which case the hinder part of the machine would be dispensed with; but as in wheat or cereal growing it is of great importance to completely turn over the soil so as to destroy weeds, larvæ of insects and other vermin, I apply the revolving shovels or scoops, which lift the pulverized soil right up and discharge it again behind in the wake of the machine comparatively smooth and regular in depth. The seed is supplied to the hopper, and the brush is so set and constructed that its interstices just allow the proper proportion of seed to pass out on to the surface of the land, when it is covered in to the required depth by the light harrow-rake.

The

Improvements in Machinery for breaking-up and tilling the ground.

The pick points may either be hardened or covered with shields, which can be easily renewed when worn. By reversing their motion the machine might be used for potato-digging. It may be set to work shallow for grass or other seed sowing, or lowered to any required depth for ploughing or excavating, or other purposes.

When my machine is used for excavating for roads, dams, canals, and so on, an elevator might be attached in lieu of the seed-sower, so as to carry up the soil to an inclined shoot for depositing it at a distance; or the machine might be constructed with pickers revolving, to which fixed mould-boards might be attached like ploughs; or stationary tines might be fixed to tear up the soil, followed by my revolving shovels or scoops. As these devices would use much more labour or power to do the same work, I prefer to use the contrivances shown in my drawings.

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 shape or number of my picks and shovels, or to the construction of the sower or harrow, as they may be altered or varied without departing from the nature and principle of my invention; but what I believe to be new, and therefore claim as my improvements in machinery for breaking-up and tilling the ground, is—

First—The construction of such machinery with a succession of lines of picks, multiple or otherwise, carried on discs supported by and revolving with shafts or gudgeons, and whether such lines of picks be on the same level or one lower than the other.

Second—Constructing such multiple picks by bolting them together and to a disc, in the manner herein described and explained, and shown most clearly in figure 3 of my drawings.

Third—Constructing said machinery with a series of revolving scoops or shovels behind the picks or breaking-up implements, for turning over the loosened earth, and, when needed, for discharging it into elevators for removal.

Fourth—The combination and arrangement of a seed-sower and a harrow with my contrivances for breaking-up and turning over the earth, as herein described and explained, and as shown in my drawings.

In witness whereof, I the said Joshua Alexander Kay have hereto set my hand and seal, this twenty-sixth day of June, one thousand eight hundred and eighty-two.

JOSHUA A. KAY.

Witness—EDWD. WATERS,
Melbourne, Patent Agent.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to Joshua Alexander Kay, this fifth day of September, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 31 July, 1882.

Having examined the specification and plans accompanying the Petition, we have the honor to recommend that Letters of Registration should be issued to Mr. Joshua Alexander Kay, for an invention entitled "Improvements in Machinery for breaking-up and tilling the ground," 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—two sheets.]

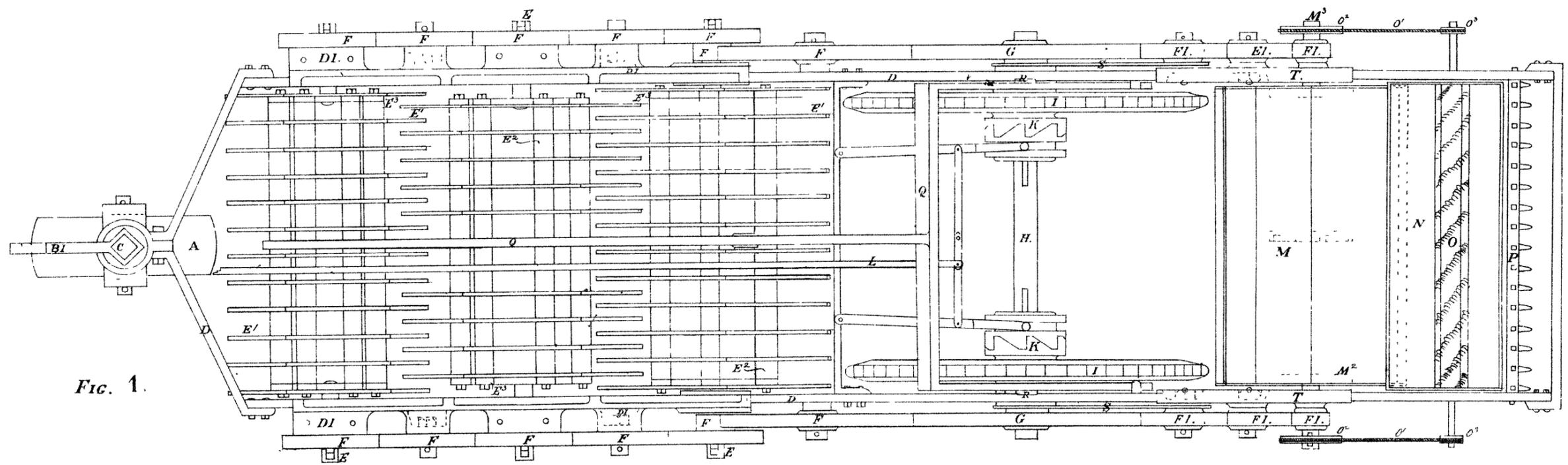
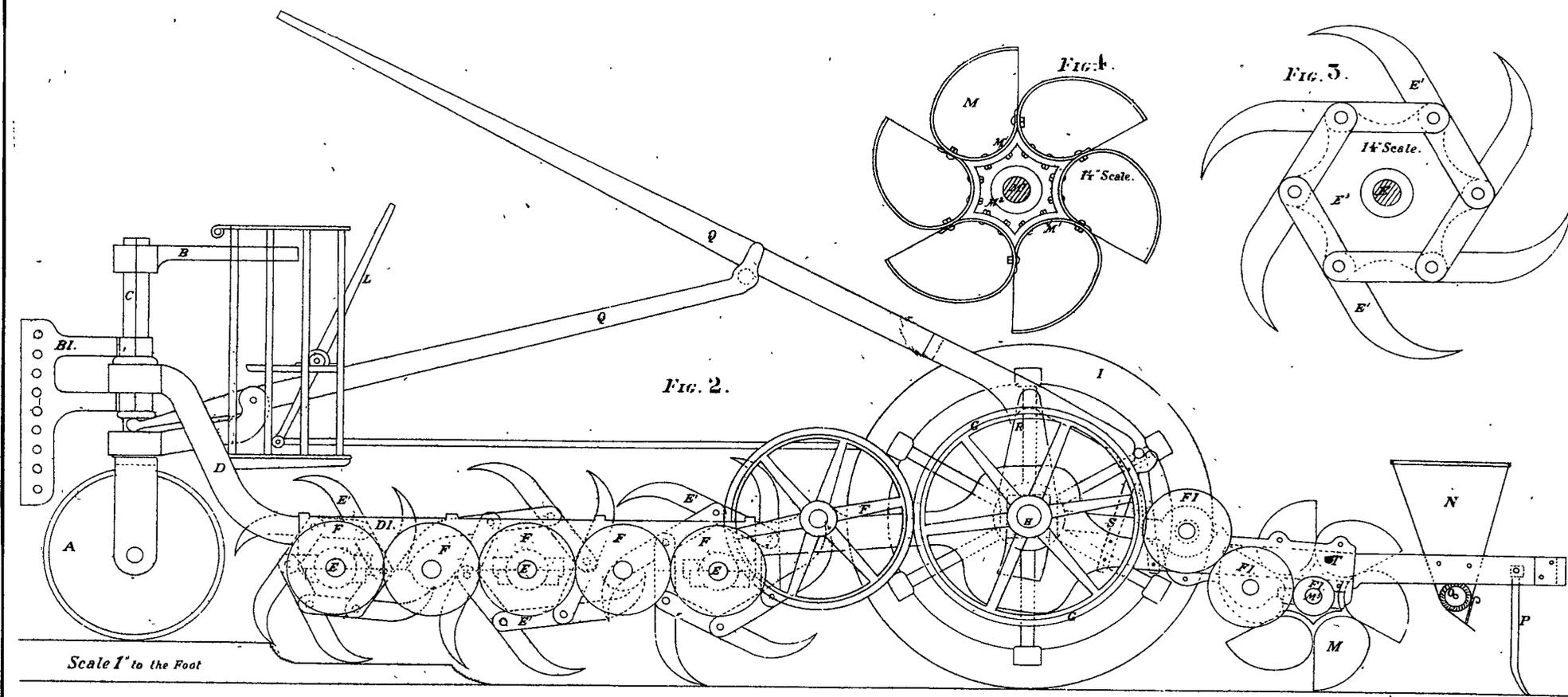


Fig. 1.

*This is the Sheet of Drawings marked B referred to in the annexed
 Letters of Registration granted to Joshua Alexander Kay, this fifth
 day of September, A.D. 1882.*

Augustus Loftus.

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



Scale 1" to the Foot

This is the Sheet of Drawings marked "C" referred to in the annexed Letters of Registration granted to Joshua Alexander Kay, this fifth day of September, A.D. 1882. Augustus Loftus.

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



A.D. 1882, 5th September. No. 1121.

IMPROVEMENTS IN CONTRIVANCES FOR VARYING THE GAUGE OF THE
WHEELS OF ROLLING STOCK.

LETTERS OF REGISTRATION to David Anderson, for Improvements in contrivances for varying the gauge of the wheels of rolling stock for rail and other permanent ways.

[Registered on the 7th day of September, 1882, 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 ANDERSON, of Fairview, Stawell, 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 "Improvements in contrivances for varying the gauge of the wheels of rolling stock for rail and other permanent ways," 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 Anderson, 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 Anderson, 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 Anderson 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 September, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in contrivances for varying the gauge of the wheels of rolling stock.

SPECIFICATION of DAVID ANDERSON, of Fairview, Stawell, in the Colony of Victoria, gentleman, for an invention entitled "Improvements in contrivances for varying the gauge of the wheels of rolling stock for rail and other permanent ways."

My invention consists mainly of certain improvements in railway and other rolling stock, by which the gauge of the wheels may be adjusted; and secondly, of machinery, whereby such alteration or adjustment of gauge is effected.

The first part of my invention consists of a peculiar construction of the axles of rolling stock for rail and other permanent ways, in which either wheel is keyed to a sleeve, the inner end of which terminates in a flange. This sleeve slides over and upon the axle and the feathers thereon. The axle I make with a solid collar in the centre, and on either side of such collar I place a clamp or hinged collar having two or more recesses or hollows to fit over the flange of the sleeve and a strong hinged bolt to tighten said clamp thereon. I bolt both clamps or hinged collars together through the solid collar of the axle.

The second part of my invention consists of a certain combination and arrangement of machinery in which a sole plate carries the bearings for two sets of rollers. Each set consists of two rollers, upon which travels a platform, the upper side of which is recessed to the shape of the tire of a wheel, or carries a rail. The underside carries a nut (right or left handed as the case may be) in which one end of a right and left handed screw works. This screw has a thrust bearing in the centre of the sole plate, and is provided with a collar having sockets for a crowbar or other means of turning it.

In order, however, that my invention may be more perfectly understood, I will now describe the same with reference to the accompanying drawings, in which figure 1 shows a side elevation, partly in section, of a pair of wheels provided with my improved axles resting in the recesses upon the platforms of my improved machinery, as they would be just previous to narrowing their gauge; figure 2 is an end elevation of the same; figure 3, a plan of the machinery alone; and figure 4 and 5, detail views of the hinged clamps.

AA are the wheels, which may be of any description so long as their bosses, A¹, are large enough. B is the axle with solid collar, B¹, in the centre. B² are steel feathers, properly secured to said axle. C are the sleeves terminating in flanges, C¹. DD are the clamps or hinged collars, having two recesses, D¹ and D², in each. D³ are the hinged bolts having plate washer, D⁴. D⁵ are the bolts through the clamps and the solid collar of the axle, and having connecting plates, D⁶, at either end. E is the sole plate of my improved machinery, firmly bolted to a solid foundation; and E¹ and E² are the two sets of rollers thereon. F are the platforms carrying recesses, F¹, and nuts, F². G is a right and left handed screw with turning collar, G¹, and thrust bearing, G².

The mode of operation is as follows:—When it is desired to use the rolling stock of a rail or other permanent way upon another way of different gauge, my improved machinery is placed where the break of gauge occurs. To transfer the rolling stock, the rails or recesses F² on the platforms F of such machinery are set by means of the screw G to the gauge of the line on which the stock is. A vehicle provided with my improved axles is then pushed upon such platforms, the clamp bolts D³ of such axles unscrewed so as to admit of the clamps being opened on their hinges D⁵, so freeing the flanges C¹ of the sleeves C, to which the wheels A are keyed. The rails or recesses on the platforms are next adjusted, by means of the right and left handed screw G, to the gauge of the line upon which it is desired to run the vehicle. The flanges C¹ of the sleeves C on the axles should now fit in another recess, D², in the clamps, which are closed and tightened up as shown in figure 4, and the vehicle then moved on to the second line.

In the drawings illustrating this invention the vehicle is shown at its widest gauge, and with only one vacant recess in each of the clamps on the centre of the axle, thus admitting of its alteration to one other gauge only; but of course the number of these recesses might be increased and the length of the sleeve altered, so as to admit of its adjustment to as many gauges as may be required.

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 invention is:—

First—Constructing axles of railway rolling stock with an extensible sleeve or sleeves to admit of the alteration of the gauge of their wheels.

Second—Constructing such axles with a solid collar in the centre and with a hinged clamp on either side, having recesses for receiving and holding the flanges on the inner ends of the axle sleeves, substantially as herein described and explained.

Third—The combination of the sole plate E, the rollers E², platforms F and F¹, having recesses, F² and F³ (or their equivalent in the shape of rails), with a right and left handed screw, G, turning collar, G², and thrust bearing, G³, in the manner and for the purpose herein described and explained.

In witness whereof, I the said David Anderson have hereto set my hand and seal, this seventh day of June, one thousand eight hundred and eighty-two.

D. ANDERSON.

Witness—

EDWD. WATERS,
Melbourne, Patent Agent.

This is the specification referred to in the annexed Letters of Registration granted to David Anderson, this fifth day of September, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Improvements in contrivances for varying the gauge of the wheels of rolling stock.

REPORT.

Sir,

Sydney, 27 July, 1882.

Having examined the specification and plan accompanying the Petition, we have the honor to recommend that Letters of Registration should be issued to Mr. David Anderson, for an invention entitled "Improvements in contrivances for varying the gauge of the wheels of rolling stock for rail and other permanent ways," as shown in the drawing and described in the specification attached to his Petition.

The Under Secretary of Justice.

We have, &c.,

JOHN WHITTON.
E. O. MORIARTY.

[Drawings—one sheet.]

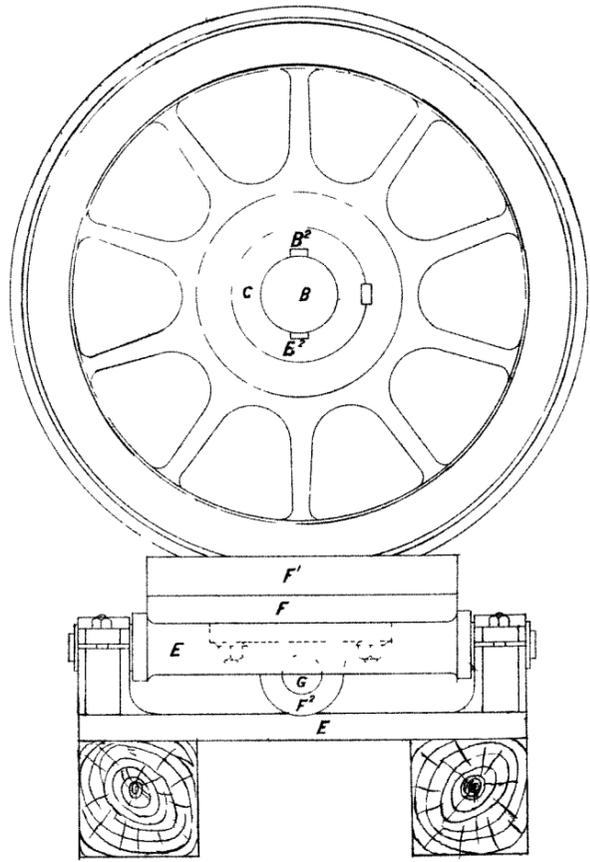


FIG 2.

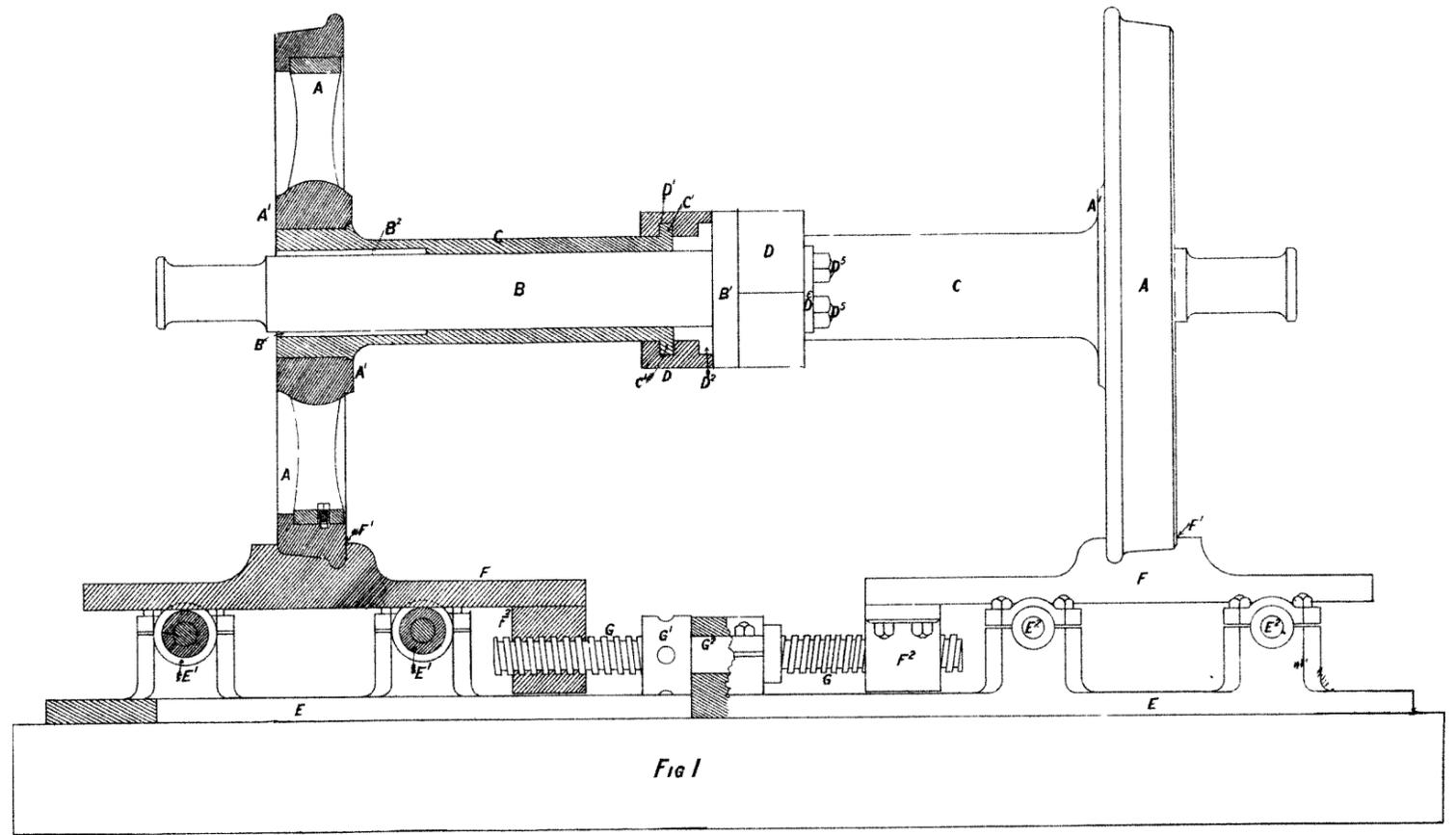


FIG 1

—D. ANDERSON'S PATENT—

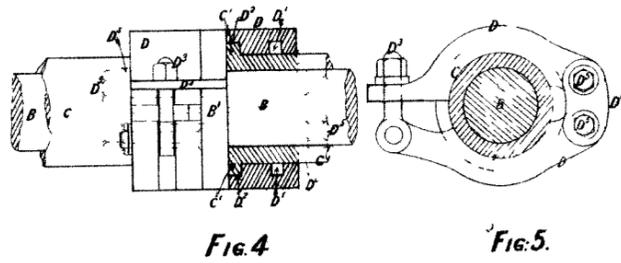


FIG 4

FIG 5.

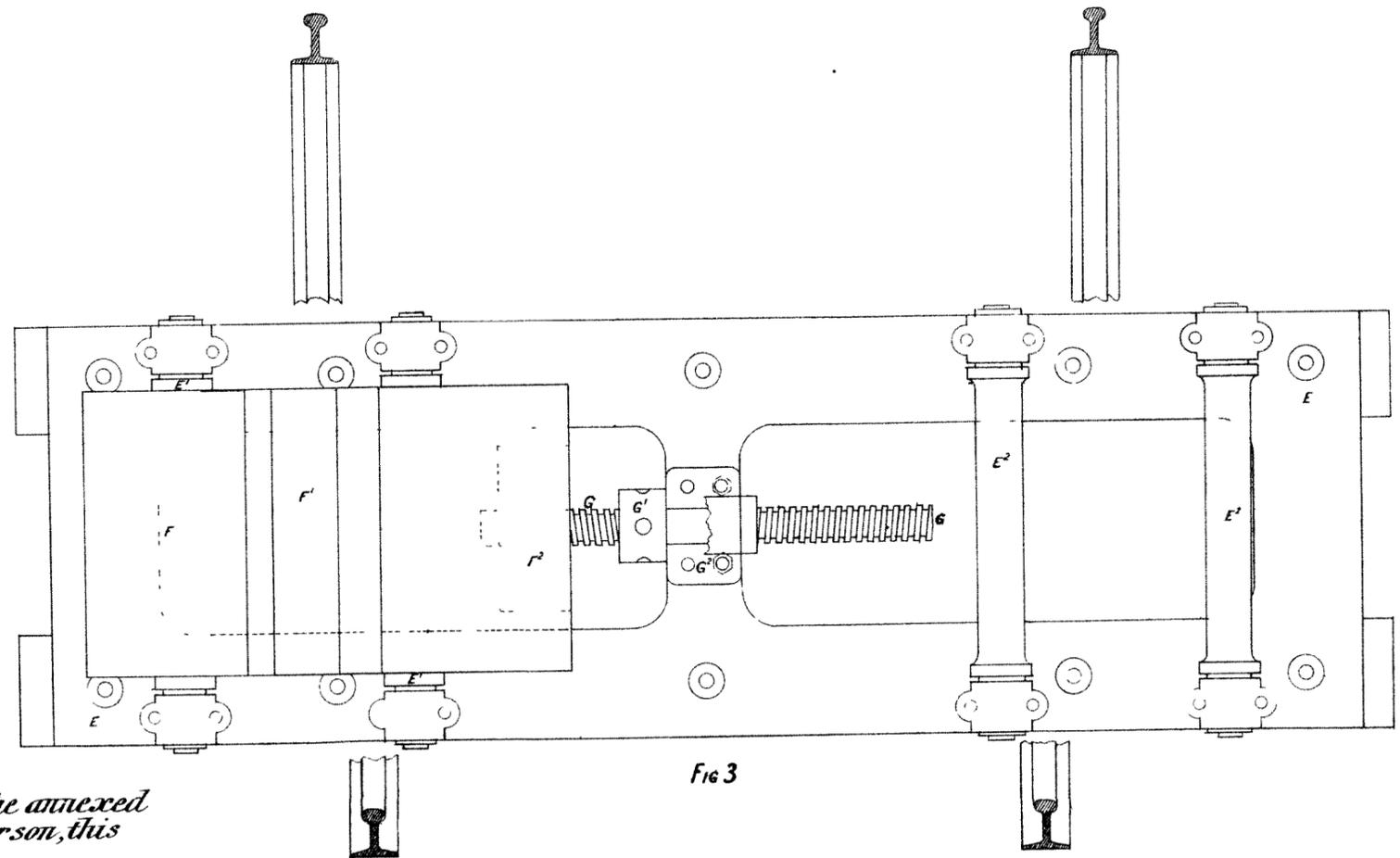


FIG 3

*This is the Sheet of Drawings referred to in the annexed
Letters of Registration granted to David Anderson, this
Fifth day of September, A. D. 1882.*

Augustus Loftus.



A.D. 1882, 5th September. No. 1122.

IMPROVEMENTS IN PNEUMATIC BRAKE APPARATUS.

LETTERS OF REGISTRATION to George Westinghouse, junr., for Improvements in Pneumatic Brake Apparatus for Railway Trains.

[Registered on the 7th day of September, 1882, 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 Canal Road, King's Cross, in the county of Middlesex, 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 Pneumatic Brake Apparatus for Railway Trains," 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 Westinghouse, junior, 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, junior, 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, junior, 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 September, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Pneumatic Brake Apparatus.

SPECIFICATION of GEORGE WESTINGHOUSE, junior, of Canal Road, King's Cross, in the county of Middlesex, England, engineer, for an invention entitled "Improvements in Pneumatic Brake Apparatus for Railway Trains."

THIS invention relates to the pneumatic apparatus employed for working the brakes on railway trains. In apparatus of the kind to which this invention relates each brake carriage is provided with a cylinder, the piston of which is connected to the brake rods or levers. In some cases this cylinder is at one end extended so as to present a considerable space as an air reservoir, its other end communicating with a pipe which is connected throughout the train from a reservoir of compressed air on the locomotive or tender. Between this pipe and each brake cylinder is interposed a valve arrangement so disposed that when the train pipe is charged with compressed air the brake piston moves so as to take off the brakes, but when the pressure in the train pipe is relieved, either purposely by opening a cock or valve, so as to let air escape from it, or accidentally by the rupture or separation of the pipe, the brake piston is caused to move so as to put on the brakes. Apparatus acting in this way have been described in the specifications of patents formerly granted to me, and have been and still are in extensive use. The present invention relates more particularly to the construction and arrangement of the brake cylinder and its air reservoir and the valve apparatus which is interposed between the cylinder and the train pipe, the object being to secure simplicity of manufacture, facility of repair, and rapidity of action, with considerable economy in the expenditure of compressed air required for the operation of the brakes.

My improved construction of this apparatus will be readily understood on reference to fig. 1 of the accompanying drawings, which shows a longitudinal section of the same. The brake cylinder A is made with its reservoir end, A¹, extended in the form of a dome, through the centre of which passes the rod B of the piston C, which is made with a tubular extension, D, working as a plunger in the tubular part, A², of the cover A³.

A cup leather, E, forms an air-tight packing to the plunger, and serves instead of an ordinary stuffing-box.

A flange, D¹, is faced with leather or other suitable material which, when the piston is at the end of its out-stroke, bears against the end of A², as shown, and thus affords an additional security against leakage of air past the piston rod.

The cover A³ of the cylinder is formed with a projecting hollow boss or chamber, F, which constitutes a valve box and which is closed by a screw-cap, G. It is provided with two lateral apertures, one at H, communicating with the train pipe, and one at I, communicating with the outer air. It has also an aperture, K, communicating with the end of the cylinder, and another, L, communicating with a passage, M, that is formed at the side of the cylinder and is provided with two lateral openings, N N¹, one on each side of the piston C, when this is at the extreme out-stroke. The valve box F has a piston, O, fitted to slide upon the stem P¹ of an escape valve, P, that is pressed upon its seat by a spring, Q, so as to close the opening I to the outer air. The stem P¹ has a collar, P², against which the piston O presses on its outward motion, thereby moving the valve P away from its seat, and a groove, P³, is formed in the stem so as to allow for the passage of air from the one side of the piston to the other when at its extreme in-stroke, as shown. The aperture L is fitted with a valve, R, acted upon by a spring, R¹, so as to close the opening, and its stem is extended somewhat into the valve box, so that as the piston O approaches the end of its in-stroke it presses against this stem and thus forces open the valve.

The apparatus operates in the following manner:—The train pipe being charged with compressed air, the pressure forces the piston O inwards, so that it opens the valve R and also uncovers the groove P³, so that air entering through H can flow along the groove P³ and enter the cylinder A on both sides of the piston through the passages K and M, thus charging both ends of the cylinder with compressed air. The valve P being closed, there is no escape of air through the opening I.

The piston C, though it has an equal degree of pressure on both sides, has its area reduced on the one side by the sleeve D, and consequently the excess of pressure on the other side causes this piston and its rod to be moved outwards, thereby taking off the brakes, which movement may if required be assisted by weights or springs acting on the brakes. If now the air pressure in the train pipe, and consequently that in the outer end of the valve box F, be reduced either purposely or accidentally, the piston O will be moved outwards by the excess of pressure in A, thereby closing the groove P³ and opening the escape valve P, and also allowing the valve R to close the opening L.

As the air behind the piston C can now escape through the passage K and opening I, the piston C is moved inwards by the superior pressure in front of it (which is prevented from escaping as soon as the piston C covers and passes the hole N¹), and the brakes are put on.

On again charging the train pipe the piston O is moved inwards, opening the passage P³ and valve L, and the air pressure becoming thus again equalized on each side of the piston C (which is facilitated by the communication by the openings N and N¹), the piston again advances to the extreme position shown, thereby taking off the brakes.

The valve box F, instead of being made in one piece with the cover A³, may be made separate if desired, and in a slightly modified form, which I will now describe with reference to fig. 2; it may be applied in cases where the brake cylinder is of the ordinary construction, and a separate auxiliary reservoir is used, in which form it will take the place of the valve arrangement described in my former patents as "the triple valve," employed to govern the air communications between the train pipe and the auxiliary reservoir and between the latter and the brake cylinder, as also between the brake cylinder and the outer air.

Fig. 2 is a vertical section of the modified valve apparatus. F is, as before, the valve box, and O is the piston, one end of the same fitted to slide on the stem P¹ of the valve P, which governs the passage K leading to the brake cylinder. A branch, I¹, from this passage leads to a small chamber containing the valve R that closes the opening I leading to the outer air; the valve R is pressed down on its seat by a spring, R¹, and it has a small stem or needle, R², projecting into the piston chamber, so that as the piston O approaches the end of its up-stroke it presses against this stem and forces open the valve. H is the branch leading to the train pipe and communicating with the cavity F¹ of the casing below the piston by a passage, H¹; L is the branch leading to the auxiliary reservoir; P³ is the spring pressing against the collar

Improvements in Pneumatic Brake Apparatus.

collar P² on the stem P¹, so as to force the valve P up against its seat; the collar P² is coned as shown, and the sleeve of the piston O is recessed in a corresponding manner, so that the collar acts as a valve when the piston is pressed down upon it, thus preventing any leakage of air past the stem P¹. A small groove, S, formed in the lining of the casing, allows passage of air when the piston is in the raised position shown.

The action of the apparatus is as follows:—When the train pipe is charged with compressed air the pressure in the space F¹ forces the piston O upwards, allowing the valve P to close, and opening the valve R so as to allow air from the brake cylinder to escape through the opening I, and thus keep the brakes off. At the same time also air passes by the groove S and charges the auxiliary reservoir through the branch L. If now the pressure in the train pipe is rapidly and considerably reduced, either purposely or accidentally through the rupture of the pipe on the separation of the train, the pressure of the air in the auxiliary reservoirs will cause the piston to move downwards until it opens the valve P, thus allowing air to pass into the brake cylinder through the openings K¹ and passage K and apply the brakes. At the same time the valve R being released from the upward pressure of the piston closes, and prevents escape of air through I. On again admitting air to the train pipe the piston O is raised, opening the valve R and allowing P to close, whereupon the air escapes from the brake cylinder and the brakes are taken off.

Fig. 3 is a vertical section of a valve arrangement operating in the same manner as that shown in fig. 2, the construction being modified in certain details. The parts of the valve box shown by fig. 3, corresponding with those in the valve box shown by fig. 2, are marked by similar letters of reference, the modifications being as follows:—

The air which enters the cavity F¹ is made to pass through a screen, F², of wire gauze and porous material, such as loose sponge, F³, to sift it free from dust and moisture.

The stem of the valve P and its closing spring are enclosed within a tubular part of the stem of the piston O, and a pin, P¹, is passed through this tubular stem and through a slotted hole in the stem of P. The needle R², projecting down from the valve R, rests on the upper lip of the tubular stem of O, the action of O in opening the valve R being thus more central than in the arrangement shown in fig. 2.

Having thus described the nature of my invention and in what manner it is to be carried out in practice, I claim—

First—In valve apparatus for pneumatic brakes, a piston sliding on the stem of an escape valve leading to the open air, and so arranged in combination with the said valve and with a second valve leading to the brake cylinder that in the one position of the piston the escape valve is open and the cylinder valve is allowed to close, and in another position the cylinder valve is opened and the escape valve is allowed to close, substantially as and for the purposes herein described with reference to fig. 1 of the drawings.

Second—In valve apparatus for working pneumatic brakes, the piston O working in the casing F and operating in combination with the groove, valve stem P¹, valves P and R, springs Q and R¹, and openings I, K, and L, substantially as and for the purposes herein described with reference to fig. 1 of the drawings.

Third—The combination of the chamber F, piston O, and valves P and R with the passage M, having openings, N N¹, communicating with the brake cylinder A on both sides of the piston C, when this is at its extreme out-stroke, substantially as described with reference to fig. 1 of the drawings.

Fourth—In valve apparatus for pneumatic brakes a piston sliding on the stem of a valve leading to the brake cylinder, and so arranged in combination with the said valve and with an escape valve leading to the outer air that in the one position the piston opens the one valve, admitting air to the brake cylinder, and allows the escape valve to close, while in another position the piston opens the escape valve and allows the valve leading to the brake cylinder to close, substantially as herein described with reference to figs. 2 and 3 of the drawings.

Fifth—In valve apparatus for working pneumatic brakes the piston O working in the casing F, connected at H, K, and L, with the train pipe, the brake cylinder and the auxiliary reservoir, the said piston being arranged to operate in combination with the valves P and R and their stems and springs Q and R¹, opening I, and groove S, substantially as and for the purposes herein described with reference to figs. 2 and 3 of the drawings.

Sixth—In a pneumatic brake cylinder A, a domed extension, A¹, acting as an auxiliary reservoir, and having a tubular boss, A², in combination with a plunger, D, attached to the brake piston C, and provided with a packing washer, D¹, and cup leather, E, substantially as and for the purposes herein described with reference to fig. 1 of the drawings.

In witness whereof, I, the said George Westinghouse, junior, have hereunto set my hand and seal, this twelfth day of May, in the year of our Lord one thousand eight hundred and eighty-two.

Witness—

JNO. P. M. MILLARD.

GEO. WESTINGHOUSE, JUNR.

This is the specification referred to in the annexed Letters of Registration granted to George Westinghouse, junior, this fifth day of September, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Improvements in Pneumatic Brake Apparatus.

REPORT.

Sir,

Sydney, 31 July, 1882.
Having examined the specification and plans accompanying the Petition, we have the honor to recommend that Letters of Registration should be issued to Mr. George Westinghouse, junr., for an invention entitled "Improvements in Pneumatic Brake Apparatus for Railway Trains," as shown in the drawings and described in the specification attached to his Petition.

The Under Secretary of Justice.

We have, &c.,
JOHN WHITTON.
E. O. MORIARTY.

[Drawings—one sheet.]



A.D. 1882, 14th September. No. 1123.

IMPROVEMENTS IN FURNACES FOR REDUCING IRON ORES.

LETTERS OF REGISTRATION to Joel Wilson, for Improvements in Furnaces for reducing iron ores.

[Registered on the 14th day of September, 1882, 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 JOEL WILSON, of Dover, in the county of Morris and State of New Jersey, 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 Furnaces for reducing iron ores," 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 Joel 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 Joel 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 Joel 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 fourteenth day of September, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Furnaces for reducing iron ores.

SPECIFICATION of JOEL WILSON, of Dover, in the county of Morris and State of New Jersey, in the United States of America, for an invention entitled "Improvements in Furnaces for reducing iron ores."

THIS invention relates to a furnace adapted to accomplish the deoxidation of iron ores by cementation, preparatory to their being worked into manufactured iron, and consists in the constructions, combinations, and arrangements embodied in the said furnace, and hereinafter more fully set forth, by which the said result is more satisfactorily and economically accomplished than has heretofore been done.

Figure 1 is a side elevation of a furnace constructed according to my invention. Figure 2 is a vertical central section of the same, upon the plane indicated by the line *x x* drawn across figure 4, certain parts of the furnace being removed. Figure 3 is a vertical central section of the same, upon the plane indicated by the line *y y* drawn across figure 4. Figure 4 is a horizontal section of the same, showing the parts below the line *z z* drawn across figures 1, 2, and 3.

A is the shell of the furnace, which shell encloses the circular series of vertical retorts, B B, which are made of fire-clay or some other suitable refractory material, and the series so constructed as to form flues, C C, intervening between said retorts, as shown in the drawing. D is the top or cover of the furnace, which cover is made with openings, *a a*, immediately over the retorts B B, to allow the carbonic acid gas formed in the process of cementation to escape, and also to allow additional material to be supplied to the retorts as occasion may require. The construction of the series of retorts B B, and intervening flues C C, is such as to form and surround a cylindrical chamber, E, into which heat to carry on the process of cementation and reduction of the ore is received, through the flue F from a balling-furnace, in connection with which this furnace is designed to be worked, the heat passing from the flue F into the well-hole G, and thence ascending into the internal chamber E. To supply this necessary heat for operating this furnace, the heat and products of combustion which escape from the balling-furnace, and would otherwise pass into the chimney, are turned into the flue F, and rising into the internal chamber, impart a portion of their heat through the inner walls of the retorts B B to the materials contained in the said retorts, and as the retorts are arranged in a circle surrounding the internal chamber, the heat is very equally distributed among all the retorts of the series. The products of combustion from the internal chamber E are allowed to pass through the openings *b b* in the upper part of the chamber E in the flues C C, through which flues the products of combustion descend into the flues H H, and through the latter are discharged into an annular or collecting chamber, I, from whence they pass through the pipe J to the chimney. To at least prevent the escape of heat through the outer walls of retorts B B, the casing A is lined with or it is formed into a hollow cylindrical wall or casing, K, which should be of fire-clay or brick, or some other material which is a bad conductor of heat, and should be of sufficient internal diameter to leave a thin annular flue space between it and the outer wall of the retorts B B, as shown in the drawing; and into this annular flue space openings, *c c*, are made from the flues C C, to allow the heat and products of combustion to circulate freely between this casing K and the outer walls of the retorts B B, and thereby at least prevent the loss of heat through the outer walls of said retorts, and perhaps add somewhat through the said outer walls to the heat on the materials contained in the retorts. L L are partitions in the upper ends of the flues C C, to give an immediate downward direction to the heated products of combustion as they enter these flues, and prevent too much of the heat being expended at the upper ends of the retorts. *d d* are apertures in the bottoms of retorts B B, for the withdrawal of the iron or the ore after it has been subjected to the process of cementation. These apertures may be closed when not in use, by means of sliding doors, or by any other suitable device.

This furnace having been constructed as hereinbefore described, the ore to be reduced should be pulverized or crushed, and intimately mixed with a sufficient quantity of coal-dust, or other deoxidizing material, to remove the oxygen from the ore to be treated, and the retorts B B filled with this mixture. The waste heat from the balling or other furnace should then be turned into the pipe F, and allowed to pass continually through this furnace in the manner already described, and sufficient in quantity and intensity to keep the material in the retorts B B at a red heat, or at a sufficient heat to cause the carbon in the coal-dust or other deoxidizing material to combine with the oxygen in the ore and expel it therefrom. As the ore becomes sufficiently deoxidized to be worked, it may be removed from the retorts through the apertures *d d* and taken to the balling-furnace, where it is worked into balls, and it is afterwards treated in the usual manner. As the retorts become partially emptied, either from the withdrawal of the ore, as above stated, or from the burning out of the carbonaceous material, they should be filled up with an additional supply of the mixture of ore and deoxidizing material, and the process may be thus continued indefinitely.

Another and I think a better form of furnace embodying my invention is shown in figure 5, which is an elevation of one side of such furnace. Figure 6 is a section taken vertically and diametrically through said furnace from front to rear, in the plane indicated by dotted line *x'*, figure 8. Figure 7 is a section taken diametrically through the furnace, in the plane indicated by dotted line *x''*, figure 8. Figure 8 is a section taken horizontally through the furnace in the plane indicated by dotted line *x* on figure 5. Figure 9 is a bottom view of the flues surrounding the internal chambers, and also the retorts with the transverse flue passages at their bases. Figure 10 is a bottom view, showing the collecting chamber which surrounds the well-hole. Similar letters of reference indicate corresponding parts in the several figures.

In these figures I have illustrated a new mode of conducting the heated products of combustion from a balling-furnace under the retorts, on opposite sides of the discharge openings thereof, and into an annular flue space outside of the retorts; and a mode of increasing the draught spaces at the tops of the flues between the retorts, without weakening the retorts, all as will be hereinafter explained.

In these figures, A represents the outer casing surrounding that portion of the furnace in which are the retorts and flues, and A' represents the outer wall of that portion of the furnace through which the spent products of combustion pass off to the chimney. The furnace walls A and A' are cylindrical, and between the wall A and an interior circular arrangement of flues and retorts is an annular space, *b*, into which heat enters from an internal chamber, E, through passages, *n n*, at the bottoms of the retorts B. The retorts B and flues C are arranged alternately around the central flue chamber E, as described in figures

Improvements in Furnaces for reducing iron ores.

figures 1 to 4, and represented in figures 8 and 9, which central chamber is provided on top with a cover, D, and at its lower termination it opens into a well-hole, G, into which the heated products of combustion are received from a balling-furnace through a horizontal flue, F, which is below the surface of the ground. Surrounding the well-hole G above the flue F, and enclosed by the wall A', is an annular collecting chamber, I, having an outlet, J, leading to a chimney, and also a number of inlets, *b*, corresponding to each descending flue, C, which inlets are at the top of pipes H, that communicate with the lower ends of said flues, C, as shown in figure 7. The pipes H surround the upper portion of the wall of the well-hole G, and form lower continuations of the flues C below the bottoms of the retorts B, so that the descending products of combustion can be carried from the upper to the lower portions of the furnace, between the spaces which are left for the removal of the ore after it has been subjected to the process of cementation. In other words, the flue pipes H afford access to the discharge holes *d* at the bottoms of the retorts, which holes are provided with gates or doors, *d*¹, applied in any suitable manner.

In figures 1 to 4 I have the same arrangement of flue pipes, H, beneath, and on opposite sides of the discharge holes of the retorts, and in said figures these pipes form external continuations of the flue C, and communicate with an annular collecting chamber; but this chamber is located below the inlet flue F, while in the present instance the collecting chamber is wholly above said flue F, for a reason hereinafter explained.

The products of combustion rise through the well-hole G into the internal chamber E, and a part of these products enters the annular space *b* through openings, *e*, and passages, *n*. Most of the products rise to the top of the chamber E, and thence pass horizontally outward through short conduits, *c*, and enter the upper ends of the flues C through apertures *c*¹ (shown in figure 7). The products thence descend through flues C and pipes H, and enter the annular chamber I, from which they are conducted off through pipe J into a chimney as above stated.

The upper ends of the retorts are provided with openings, *a*, which allow the carbonic acid gas formed in the process of cementation to escape, and also allow additional material to be supplied to the retorts as occasion requires.

By locating the flue F below the annular collecting flue I, instead of above it, as described in figures 1 to 4, the intensity of heat in said chamber I is greatly reduced, and the flue F can be passed under the surface of the ground, which gives room to discharge the retorts directly opposite the puddling furnace, thereby giving the use of two retorts, which could not be discharged if flue F passes through the annular chamber I on a horizontal level with it.

By means of the flues *nn* directly under the bottoms of the retorts B, a large quantity of heat is carried to the space *b* surrounding the retorts, which thoroughly heats the ore at the bottoms and outer sides of the retorts.

By having the horizontal external conduits *c* on top of the furnace as described for establishing communication between the internal chamber E and the descending flues C, I obtain a good draught and afford plenty of flue space, without weakening the retorts by leaving openings between them.

Having thus described a furnace embodying my improvements, in the mode in which I have practically used them, I declare that I am aware that furnaces with upright retorts for the calcining of bones and for other purposes have long been known in the arts, and therefore I do not claim broadly the use of such retorts, nor the arrangement of them in connection with a furnace for heating them. What I claim as my invention, and desire to secure by Letters Patent, is:—

First—The arrangement and combination, substantially as above set forth, of the circular series of upright retorts and intervening flues, the internal chamber within said series for the products of combustion, and the collecting chamber for receiving said products after they have traversed the intervening flues.

Second—The arrangement and combination substantially as before set forth, of the said internal chamber, the circular series of upright retorts surrounding that chamber, and the flue for delivering the products of combustion from the balling-furnace.

Third—The arrangement and combination, substantially as before set forth, of the internal chamber, the circular series of upright retorts surrounding that chamber, the flues intervening between the said retorts, and the external annular flue space surrounding said retorts.

Fourth—The arrangement and combination, substantially as before set forth, of the internal chamber, the circular series of upright retorts surrounding said chamber, the flues intervening between the said retorts, the annular flue space surrounding said retorts, and the partitions at the upper ends of said flues.

Fifth—The flue F (see figures 5, 6, and 7), located below the annular collecting chamber I, and communicating with the internal chamber E, which is surrounded by retorts and flues, substantially as described.

Sixth—The flue passages *nn* (see figures 7, 8, and 9) under the retorts B, leading from chamber E into the annular space *b* surrounding the retorts, substantially as described.

Seventh—The external conduits *c* (see figures 5, 6, and 7) forming communications between the chamber E and the upper ends of the descending flues C, substantially as described.

In witness whereof, I, the said Joel Wilson, have hereto set my hand and seal, this twenty-first day of July, one thousand eight hundred and eighty-two.

JOEL WILSON,

By his Agent, R. L. MALCOLM.

Witness—

EDWD. WATERS,
Melbourne, Patent Agent.

This is the specification referred to in the annexed Letters of Registration granted to Joel Wilson, this fourteenth day of September, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Improvements in Furnaces for reducing iron ores.

REPORT.

Sir,

Sydney, 7 August, 1882.

The application of Mr. Joel Wilson for Letters of Registration, for an invention entitled "Improvements in Furnaces for reducing iron ores" 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.,
A. LEIBIUS.
CHAS. WATT.

The Under Secretary of Justice.

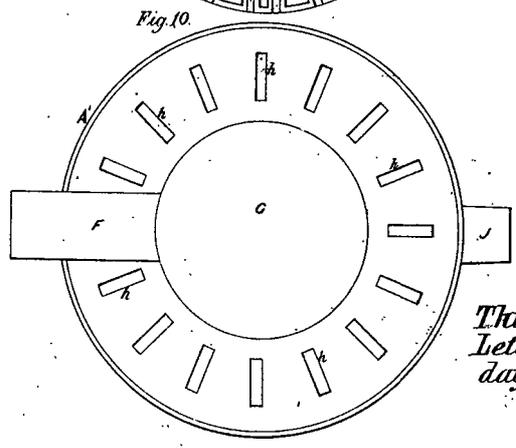
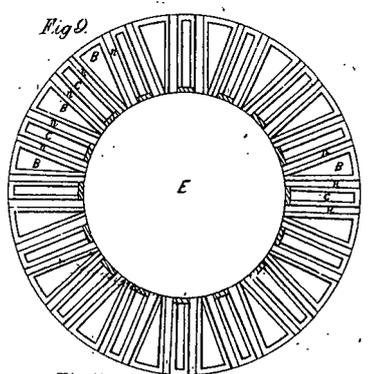
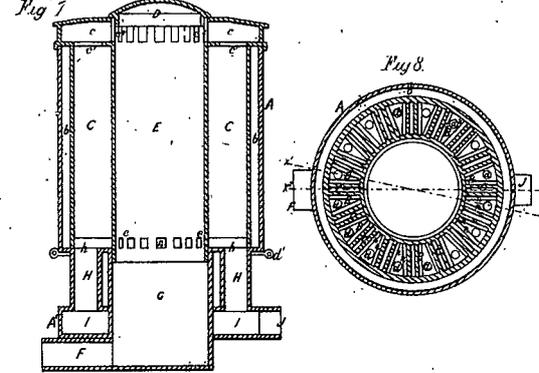
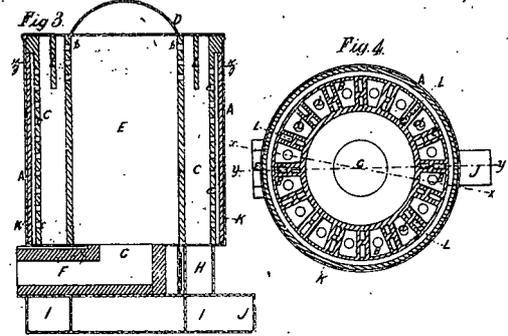
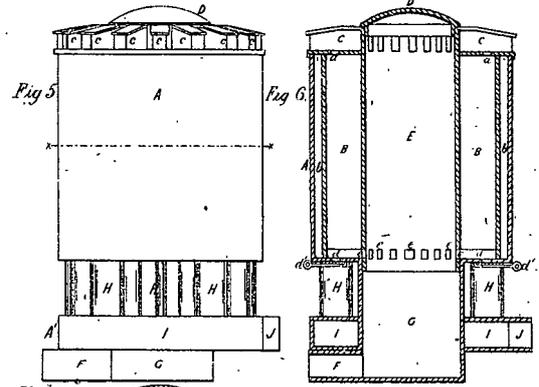
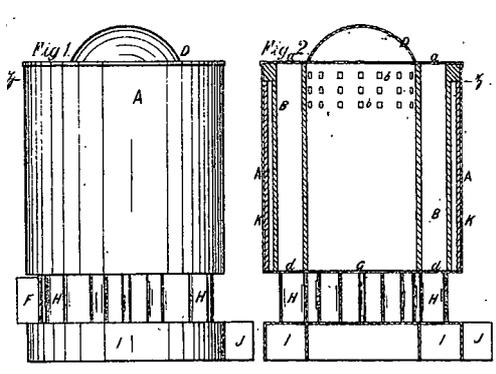
[Drawings—one sheet.]

No. 1124.

[Assignment of No. 1118. See page 317.]

Nos. 1125, 1126, & 1127.

[Assignments of Howling's Patent Spark-arrester.]



This is the Sheet of Drawings referred to in the annexed Letters of Registration granted to Joel Wilson, this fourteenth day of September, A. D. 1882.

Augustus Loftus.



A.D. 1882, 25th September. No. 1128.

AN IMPROVED COMPOSITION TO BE USED AS A PAINT.

LETTERS OF REGISTRATION to Antonio Buzolich and Thomas King Smith, for an improved Composition to be used as a Paint, either with or without the ordinary pigments.

[Registered on the 25th day of September, 1882, 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 ANTONIO BUZOLICH, of Nicholson-street, North Carlton, in the Colony of Victoria, decorator, and THOMAS KING SMITH, of Hoddle-street, Prahran, in the said Colony, manufacturing chemist, 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 Composition to be used as a Paint, either with or without the ordinary pigments," 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 Antonio Buzolich and Thomas King 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 Antonio Buzolich and Thomas King 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 Antonio Buzolich and Thomas King 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 twenty-fifth day of September, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

An improved Composition to be used as a Paint.

SPECIFICATION of ANTONIO BUZOLICH, of Nicholson-street, North Carlton, in the Colony of Victoria, decorator, and THOMAS KING SMITH, of Hoddle-street, Prahran, in the said Colony, manufacturing chemist, for an invention entitled "An improved Composition to be used as a Paint, either with or without the ordinary pigments."

OUR improved composition, which is to be used as a paint, either with or without the ordinary pigments, has many valuable properties. It is not only easy of application, pleasant to the eye and touch, and susceptible of receiving and retaining any tint or colour given to it, but it also produces a surface which is almost if not absolutely impervious to atmospheric influences, to the action of sea as well as fresh water, to the ravages of insects and parasites of every description, whether animal or vegetable, and is an excellent insulating material, in addition to which it can be produced at a reasonably cheap rate.

The process of manufacturing our composition is—first, to heat the oil which forms the basis of the composition; second, to destroy all animal life in it by poisonous acid; third, to refine it by chemical admixture and mechanical filtration; fourth, to supply a material which will neutralize the action of the alkali and acids used in the manufacture; fifth, to strengthen its body and prevent its coagulation; sixth, to poison it sufficiently to make it destructive of all insect and vegetable life when used; seventh, to increase its adhesiveness.

In practice we proceed as follows:—We first provide a common iron boiler of the size suited to the extent of the operations to be carried on, and in order to simplify the description we will suppose that only one gallon of oil is to be heated, as the proportions of the various ingredients will ever remain the same, no matter what quantity is used. This one gallon of ordinary seed or nut oil we place in the iron boiler, and heat it with a steam coil until it reaches a temperature about fifteen degrees below boiling-point, when (second) we add one and a quarter ounces of hydrochloric acid and stir it well together until it reaches about five degrees below boiling-point. We then (third) refine it by adding three-quarters of an ounce of phosphoric acid and immediately afterwards conducting it to a filter, which we prefer to construct in the following manner, but which of course may be constructed in any manner, so long as it acts effectively:—We take a wooden cask or vat and divide it into an upper and lower compartment, by fixing across the centre of the cask or vat an open perforated tray or grating, on which we first lay one piece (cut to size), of coarse filtering cloth, either flannel or flax bagging, then a complete layer each of about one inch in thickness of, in the following order, animal charcoal, fresh slacked lime, coarse fresh-water sand, wood shavings, pulverized wood charcoal, sawdust, and asbestos, evenly laid, levelled, and well compressed. On the top of this filter bed we lay a mat made of horse-hair of medium coarse texture or mesh (to act as a sieve), on to which the hot oil is poured, and allowed to trickle through the filter bed to the lower half of the cask or vat, where it remains until it is cold. The filtering operation is then only partially completed, but before wholly completing it we (fourth) add a quarter of an ounce of chrysophanic acid or an ounce and a half of common sulphuric acid, or whatever will be sufficient to neutralize the acids and alkalies used in the manufacture, and we then re-subject the partially prepared composition in a cold state to the action of the filtering apparatus before described, with this difference that we remove the horse-hair mat on the top and substitute for it one of a closer mesh or texture.

After this second filtration we (fifth) put one gallon of the oil thus refined into the same or a similar boiler to that already described, heat it to about twenty-five degrees below boiling-point, when we add small portions of the following mixture at intervals of a few seconds, viz., two ounces of shellac dissolved and mixed with one ounce of common resin or powdered rock benzoin, so as to form a paste. After adding this mixture, and when the composition is within fifteen degrees below boiling-point, we (sixth) add a solution of fourteen ounces each of ordinary powdered white and blue vitriol and seven ounces of chromate of potash, and (seventh) when it reaches to within seven to eight degrees below boiling-point we add first three ounces of crushed beeswax, and afterwards sixteen ounces of crushed garlic. Immediately after the garlic is added we cut off the steam from the coil and open a tap to allow the contents of the boiler to discharge into a receptacle below, where it remains to cool. When cold we pass it through a common sieve and it is ready for use.

Our improved composition thus produced may be used either with or without a pigment, as the circumstances of the case may require; thus, if it is required to remain as a coating like paint, say for instance on ships' bottoms, it must have a pigment, but if it is required to permeate a material so as to harden or dry it and destroy insect life therein, as for instance when applied to piles or damp walls, it should be used without a pigment.

When our composition is simply required for hardening and preserving, or as a water-proofing material, we omit items four and six, that is those ingredients which are specially used for their poisonous properties.

Having thus stated the various ingredients of which our composition is made, together with their proportions, and the time and manner of using them which we have found to produce the best results, we desire to state that these proportions may be varied, as well as the degrees of heat at which the various ingredients are to be applied, but under no circumstances must the liquor be allowed to boil, overflow, char, or burn during the process of manufacture.

Having thus described the nature of our said invention and in what manner the same is to be performed, we declare that we claim—

Our improved composition, substantially as and for the purposes herein set forth and described.

In witness whereof, we the said Antonio Buzolich and Thomas King Smith have hereto set our hands and seals, this twenty-second day of July, one thousand eight hundred and eighty-two.

Witness—

EDWD. WATERS,
Melbourne, Patent Agent.

ANTONIO BUZOLICH.
T. KING SMITH.

This is the specification referred to in the annexed Letters of Registration granted to Antonio Buzolich and Thomas King Smith, this twenty-fifth day of September, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

An improved Composition to be used as a Paint.

REPORT.

Sir,

The application of Messrs. Buzolich and Smith for Letters of Registration, for an invention entitled "An improved Composition to be used as a Paint, either with or without the ordinary pigments," having been referred to us, we have examined the specification, and have now the honor to report that we see no objection to the issue of Letters of Registration as prayed for.

Sydney, 11 August, 1882.

We have, &c.,

JAMES BARNET.
CHARLES WATT.

The Under Secretary of Justice.



A.D. 1882, 25th September. No. 1129.

IMPROVEMENTS IN SECONDARY BATTERIES.

LETTERS OF REGISTRATION to James Pitkin, for an invention entitled
 "Improvements in Secondary Batteries."

[Registered on the 25th day of September, 1882, 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 PITKIN, of Clerkenwell, 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 Secondary Batteries," 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 James Pitkin, 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 Pitkin, 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 Pitkin 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 twenty-fifth day of September, in the year
 of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Secondary Batteries.

A.

SPECIFICATION of JAMES PITKIN, of Clerkenwell, in the County of Middlesex, England, for an invention entitled "Improvements in Secondary Batteries."

MY improvements in secondary or storage batteries have for their object to enable an equal or greater amount of energy to be stored in less time, in electrodes which are equal in dimensions to but of very much less weight than those formed with solid plates of lead; and the invention consists, first, in making each electrode of a mass of very thin turnings or shavings of lead, or strips, shreds, or pieces of lead foil, or of highly laminated sheets of lead, intermingled in an entangled condition, packed in any suitable frame or holder of such construction as to retain the lead in place, when it is subsequently peroxidized or brought to a spongy condition, and allow free access of the electrolytic liquid.

I prefer to use very thin lead turnings obtained by turning down a cylinder of lead in a self-acting lathe, the tool being preferably so formed and held as to turn off shavings of a curly or spiral and wrinkled form, as they pack less densely in the frame or holder, and the electrolytic fluid has access through the whole mass of turnings, &c., which thus expose an active surface of enormous extent.

The invention consists, secondly, in a special construction of holder for this purpose, in which felt or other covering fabric is dispensed with and the internal resistance due to its use is avoided.

This holder consists of a frame having enclosing surfaces, which in the present instance are formed of louvre-like strips or laths of wood, ebonite, or other suitable material, fixed across it on both sides, the latter being placed obliquely and slightly overlapping one another, so as to leave interstices through which the liquid has free access, the laths of the two sets being inclined inwards and downwards. They may be fixed by having their ends inserted in inclined slits in the side bars of the frame, or in any other convenient manner. Between these two oppositely inclined series of laths the lead turnings or other thin shreds of lead of which the electrode is made are packed; or the enclosing surfaces of the holder may be plates of wood, ebonite, or other suitable material, perforated as closely as possible over their whole surface with holes or apertures, of any shape, but inclined downwards and inwards, at such an angle as, having regard to their size and the thickness of the plate, to afford little or no directly horizontal aperture for the lead oxide or spongy lead to fall out at.

In the accompanying drawings I have represented various examples of my invention. Figures 1 and 2 represent a face and edge view (partly broken away, to show the interior) of an electrode composed of a mass of lead turnings, &c., packed in a plain frame covered with felt. Figure 3 shows face view, edge view, and cross section of the special construction of louvre-like frame hereinbefore referred to. Figure 4 shows part face view and section of a frame having inclined perforations as above described.

Referring to figure 1, A is a plain open rectangular frame of wood, ebonite, or other non-conducting material, and B is an entangled mass of very thin lead turnings or shreds of lead foil, or other extremely attenuated sheets of lead, packed into the frame and retained by coverings C of felt or flannel stretched over each side of the frame A, and secured by sewing, cementing, pegging, or otherwise.

D is a rod of lead entering the mass of lead shavings, its inner end being flattened out and slit or divided into a number of leading strips or branches, *d*, distributed uniformly through the electrode.

The branching of the conductor in this way avoids a soldered joint and the local action resulting therefrom.

Referring to figure 3, A is a rectangular frame of wood or ebonite, as before, and B are laths or strips of the same material fixed obliquely to the opposite sides of the frames, and overlapping sufficiently to leave interstices between them and yet prevent the escape of the lead oxide or spongy lead. In the example shown, these laths are fixed by having their ends held in inclined notches or slits, C, in the edges of the frame, but they may be otherwise fixed. An opening, A', may be made in the top bar of the frame A, at which to introduce the lead turnings, &c. D is the lead wire conductor, to which in this instance is soldered a broad strip of lead, *d*, which is carried round the four sides of the main frame A in contact with the mass of turnings or shavings packed therein. This strip may also be divided at intervals into branches or strips, which are bent inwards and embedded in the mass of shavings.

In figure 4, B are the plates enclosing the space within the frame A. They have inwardly and downwardly inclined apertures, *b*, as shown, of such dimensions and at such an angle that the lower edge *b'* of an aperture on the outer surface of the plate shall be as high, or nearly so, as the upper edge *b''* of the same hole in the inner surface of said plate. These holes or apertures may be made in any convenient way.

The frame stands, when in the trough or box of the battery, upright on edge, as represented in the drawings, and two or more of them are coupled together in the ordinary way of constructing such batteries.

Having described the nature of my invention and the manner of performing the same, I declare that what I claim is—

- 1st—Making the electrodes for a secondary battery of an entangled mass of very thin turnings, shavings, or shreds of lead, packed into a suitable holder, substantially as herein described.
- 2nd—The combination of frame A, coverings C, rod D, split or divided into branches, and the mass of lead turnings or other thin shreds of lead, substantially as and for the purpose herein specified.
- 3rd—In a secondary battery, the combination with the lead or lead compound forming the electrode, of an enclosing frame by which the mass is held up in the battery, substantially as shown and described.
- 4th—In a secondary battery, a holder for the mass of lead or lead compound composing the electrode, constructed of series of oblique overlapping louvre-like laths fixed across opposite sides of a supporting frame, and having interstices between them, substantially as and for the purpose specified.

5th—

Improvements in Secondary Batteries.

5th—In a secondary battery, a holder for the mass of lead or lead compound composing the electrode, constructed of enclosing plates having downwardly and inwardly inclined apertures formed in them, said plates being fixed to opposite sides of an enclosing frame, substantially as shown and described for the purpose specified.

In witness whereof, I the said James Pitkin have hereunto set my hand and seal, this twenty-seventh day of June, 1882.

JAMES PITKIN.

Witness—

Wm. CLARK,
53, Chancery Lane, London, Patent Agent.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to James Pitkin, this 25th day of September, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

We do ourselves the honor to report, in reply to your blank cover communication of the 12th inst., No. 9,405, that we are of opinion the prayer of Mr. James Pitkin's Petition for the registration of an invention entitled "Improvements in Secondary Batteries," may be granted, in terms of his specification, drawings, and claim.

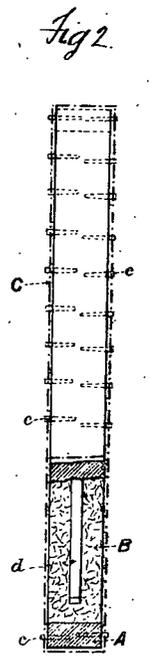
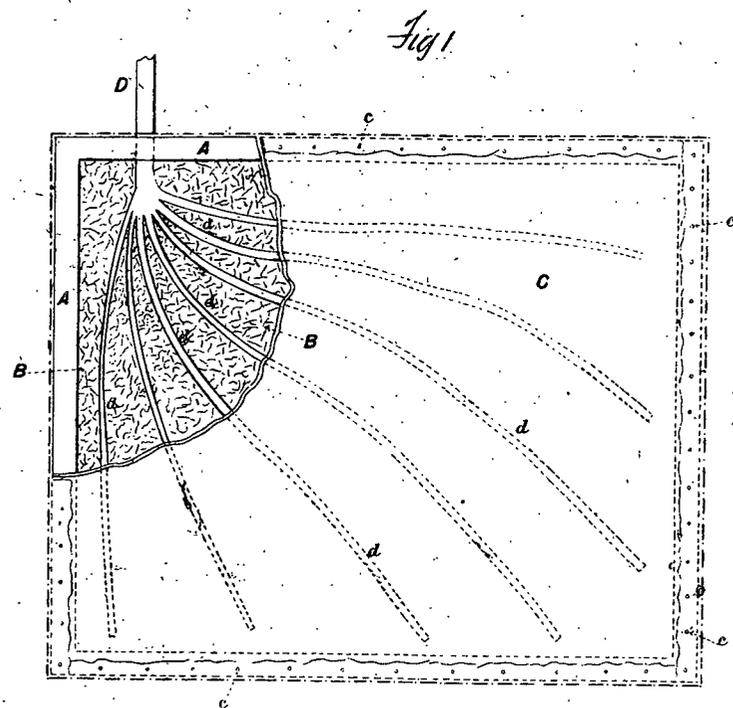
Sydney, 21 August, 1882.

We have, &c.,

E. C. CRACKNELL.
GOTHER K. MANN.

The Under Secretary of Justice.

[Drawings—two sheets.]



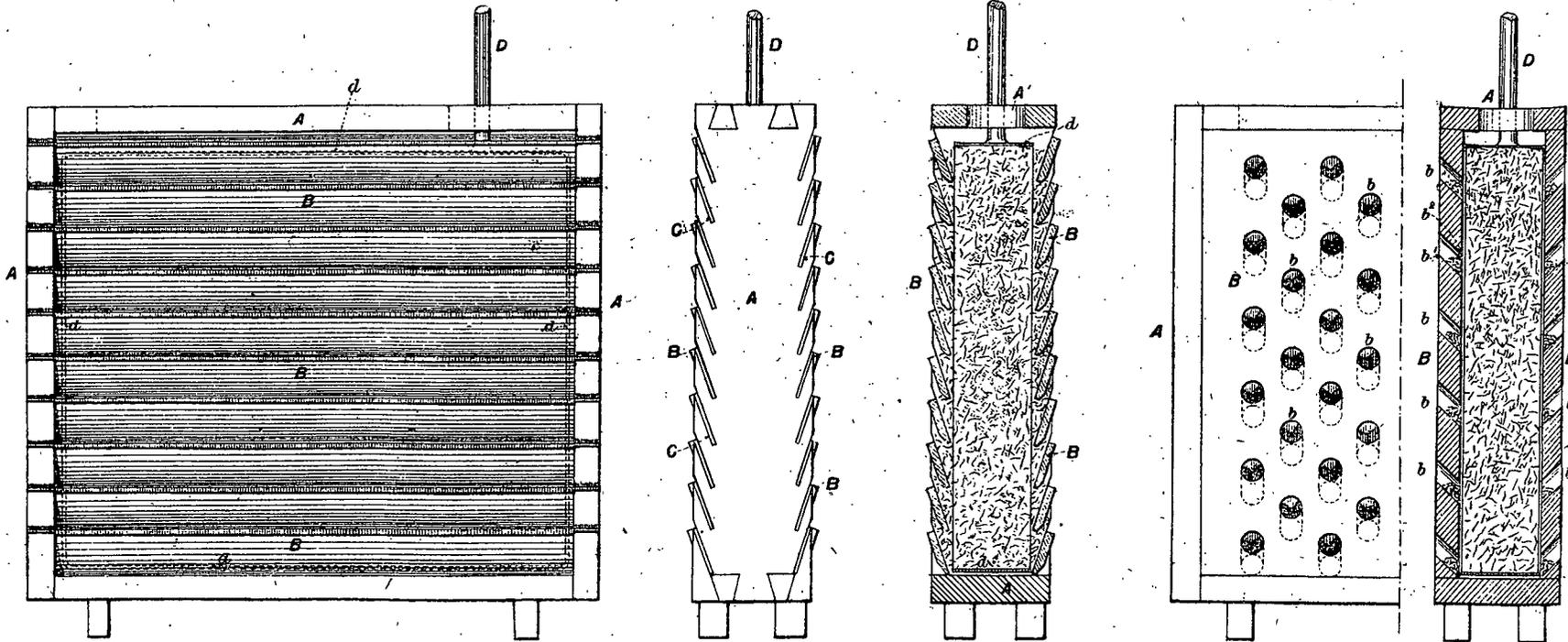
This is the Sheet of Drawings marked 'B' referred to in the annexed Letters of Registration granted to James Pitkin, this 25th day of August, A.D. 1882.

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

Augustus Loftus.

Fig 3.

Fig 4.



This is the Sheet of Drawings marked C referred to in the annexed Letters of Registration granted to James Pitkin, this 25th day of August, A.D. 1862.

Augustus Loftus



A.D. 1882, 25th September. No. 1130.

IMPROVEMENTS IN WEIGHING-MACHINES.

LETTERS OF REGISTRATION to Edme Augustin Chameroÿ, for an Invention entitled "Improvements in Weighing-machines."

[Registered on the 25th day of September, 1882, 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 EDMÉ AUGUSTIN CHAMEROÿ, of the Faubourg St. Martin, No. 162, Paris, in the Republic of France, 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 entitled "Improvements in Weighing-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 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 Edmé Augustin Chameroÿ, 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 Edmé Augustin Chameroÿ, 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 Edmé Augustin Chameroÿ 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 September, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Weighing-machines.

A.

SPECIFICATION of EDMÉ AUGUSTIN CHAMEROY, of the Faubourg St. Martin, No. 162, Paris, in the Republic of France, manufacturer, for an invention entitled "Improvements in Weighing-machines."

THE weighing of goods on ordinary balances or weighing-machines often gives rise to errors, because the weight has to be read off directly from the beam, without any mark being preserved by which it can be verified; in fact a verification can only be obtained by weighing a second time. This drawback would be entirely prevented if, at the time of weighing, a printed record of the weight produced mechanically on the machine itself could be obtained; and this is the object of my present invention, and of the several arrangements hereinafter described.

The first arrangement or modification of my invention, which I will describe as applied to platform scales, is represented in figures 1 to 4; figure 1 being an elevation; figure 2, a transverse section; and figure 3, a longitudinal section; while figure 4 is a view of the underside of the beam.

A is the platform on which the goods to be weighed are placed; B, the frame of the machine; C, the movable beam; D, the part connecting the beam C with the movement of the platform A; E, the movable index on the beam; and F, the fixed index on the frame; G is a flat steel or brass bar, fixed to the underside of the beam C, and engraved in relief with figures indicating the weight of the goods; H is the movable weight, which slides on the beam C, and carries below the bar a small plate, J, on which a ticket or card, I (shown separately in figure 5), rests; below the plate J is a cam, K, the axis of which is provided with a handle, L.

The operation of the machine is as follows:—The goods to be weighed having been placed on the platform A, the movable weight H is shifted on the beam C, until the index E is on a level with the fixed index F, that is to say, until a true balance has been obtained. The weight can then be read off in the usual way from the indications on the beam. Then, to obtain a printed record of the weight, the ticket I is slipped under the engraved bar G, the cam K is then turned by means of its handle L, so as to lift the plate J, and the ticket I is thus caused, by pressure, to receive an impression of the figures corresponding to the weight. The cam handle L is then lowered, and the ticket I withdrawn.

When the weighing has been effected, the movement of the beam may be prevented by a hinged stop, M.

The printing of the ticket might also be done by the means generally adopted for printing railway tickets, or in the damp way followed in numbering bills or warrants; or, in some cases, the figures indicating the weight, instead of being engraved on the beam, may be arranged on rotating discs representing units, tens, and hundreds; these discs would be fixed at one point to the machine, and be operated by the travel of the sliding weight H on the beam C; or the advance of the weight on the beam could be effected by an endless screw, or a toothed wheel, or a steel band on an axle, which at the same time works the numbering discs of the weight.

For weigh-bridges with two beams the application of these several modes will be the same. It will suffice for each weight to have a system of printing, the figures of which would arrange themselves below one another on the ticket, so that they may be readily added.

Again, there could be arranged in the interior of the movable weight H, and on the same plane as the beam C, a steel plate, having the units 0 to 9 indicated by lines or marks engraved in relief, which would be impressed on the ticket at the same time as the figures of the beam. In this case the figures representing tens are followed by a small line, *a*. The ticket impressed in this way is represented in figure 11. The figures 2 and 7 are marked by the beam, and indicate by the line *a* that the figure 8 should be taken as the unit, as shown by the corresponding line.

Figures 6 to 10 represent another arrangement, in which I employ several weights (say three), of different values, and fixed on separate and parallel sliding bars. The same letters of reference apply to parts corresponding to those represented in figures 1 to 4. V is the tare of the machine; J J¹, J² are the parallel bars provided with weights; H is a weight of (say) 10 lbs. on the bar J; H¹, a weight of 1 lb. on the bar J¹; and H², a weight of one-tenth of a pound on the bar J². On the underside of the bars is a series of notches, L L L, say ten on each bar; and on the upper side is a set of projecting figures, K, one opposite each notch L. These figures represent on each bar the numbers 0, 1, 2, 3, 4, 5, 6, 7, 8, 9. Each bar has a handle, N N¹ N², by which it can be lifted. On the upper side of the scale beam O is a knife-edge, P, on which one notch, L, of each bar rests. Above the bars is a block, Q, having an up and down movement in a frame, T, the downward movement being given by pressing upon a knob, R, and the upward movement by a spring, S. The weights, with their bars, slide on rails or guides on the scale-beam.

The action of this controlling weighing-machine is as follows:—After having "tared" the machine, the notches L of the several bars J J¹ J² must be placed on the knife-edge P, so that the figure 0 may be opposite, and the weight indicated be 0. The machine in this position is in equilibrium, that is to say, the movable index E and fixed index F are exactly opposite each other. If goods to be weighed be then placed on the platform, and it is required to obtain a printed record, the way to proceed is as follows:—

First—Try if, by pushing the first weight H on the first bar J, a notch, L, is found which corresponds approximately to the weight, it being understood that the figures indicated on this first bar represent 100 lbs. each. Suppose, for example, that the bar placed at the figure 3 was too heavy and at figure 2 it was too light, the goods would therefore weigh more than 200 and less than 300 lbs.

Second—Proceed in like manner with the second bar J¹, which represents tens, and it will be found at (say) the figure 3, which will signify that the weight is less than 240 but more than 230 lbs.

Third—Proceed in like manner with the third bar J², which represents units, and the exact weight will be obtained, say 237 lbs. (see figure 10).

The machine now showing by its indexes E F that the exact weight has been ascertained, the movable stop M is raised so as to prevent movement of the machine. The knob R is then pressed down so as to cause the block Q to impress on the ticket I the figures representing the weight. These figures will be found side by side, and can therefore be easily read.

I

Improvements in Weighing-machines.

I may remark that it is always necessary to bring the bars $J J^1 J^2$ into the notches $L L$, because there would not otherwise be figures opposite to give the impression of the weight.

This arrangement has, over the first arrangement described, the advantage that it gives the weight in figures instead of indicating divisions, which are always liable to cause errors. In short, this arrangement may be applied to the various forms of weighing-machines, and always gives the same result, viz., a correct weighing, with an indication of the weight in figures impressed automatically.

The tickets printed by the machines may be made to show on one side the gross weight and on the other the tare; also the date and the number of the machine.

Instead of weights sliding in the usual way on the beam, I may use weights moved in a circular direction at the ends of arms or radii turning in a vertical plane. On the axis of which these arms turn, are keyed stop ratchets and sectors, provided with figures for printing on tickets, as above explained.

Figures 12, 13, and 14, sheet 2, represent another arrangement, with graduated weights. A is the beam formed at the upper side, with notches indicating the weight, while the lower side is furnished opposite these notches with projecting figures; B is a movable weight sliding on the beam A ; C is a weight for indicating tens, and sliding in the weight B ; it has, like the beam A , notches and projecting figures, but only from 0 to 9. The weight of C is calculated so as to produce by its displacement one-tenth of the indications given by the weight B ; D is a weight for indicating units; it has, like C , notches and projecting figures from 0 to 9; E is a handle to move the weight C ; G is an opening in the weight B for reading off and impressing the weight weighed on the machine; H is a small movable plate placed at the bottom of the opening G and below the beam A ; J is a cam or eccentric on the spindle of the handle K ; L is the ticket for receiving the impression of the weight weighed; M is a spring stop on the weight B .

The goods to be weighed having been placed on the platform of the machine, the weight B is shifted up to the point at which the beam A indicates equilibrium; then this weight is moved back until the spring stop M meets one of the notches in the beam A , which makes it immovable. The same is then done with the weight C for the tens, and with the weight D for the units. The total weight of the goods is thus indicated in figures. To obtain an impression of this weight it is sufficient to put a ticket, L , in the opening G , then to move the handle K , which, by means of the cam J , causes the weight indicated by the projecting figures to be impressed upon the ticket.

The weight for the units may be dispensed with by using a ticket on which the units 0 to 9 are printed beforehand. This printing is spaced according to the distance of the figures representing tens; a small horizontal line, a , accompanying each figure of the tens would indicate the figure of the units to be taken. One of these printed tickets is shown in figure 15.

Figure 16 represents the same ticket after having received the indication of the weight, weighed by a machine with a single sliding weight. Thus, for example, the weight indicated is $162\frac{1}{2}$ lbs. The figures 1 and 6 have been impressed by the projecting figures on the beam, and represent the hundreds and tens. The small horizontal line a following the figure 6 of the tens shows that the unit to be taken is 2 plus a fraction of about $\frac{1}{2}$, making the total weight $162\frac{1}{2}$ lbs.

Figure 17 represents a ticket which has been used in a machine with two sliding weights capable of weighing up to 2,000 lbs. The weight indicated is 1,876 lbs.

Lastly, figure 18 represents a ticket from a machine with one sliding weight and two bolts (verrous). The weight impressed is 19,756 lbs. It is formed by the figures 19 of the beam, which represents thousands, then by the figure 7 of the first bolt, which indicates hundreds; then by the figure 5 of the second bolt, marking the tens; finally, the figure 6 of the units is shown by the horizontal line a , making the total 19,756 lbs.

Figures 19 and 20 represent another arrangement of weighing-machine, with multiple weights. A is the frame of the machine; C , the beam or arm connected to the part B ; N , a knob to print the figures; O , the ticket. To weigh with this arrangement of machine, it is necessary successively to place on the racks $G H J$ the weights $D E F$. These weights represent respectively, 10 lbs., 100 lbs., and 1 lb. They have each a stop at the centre. The discs $K L M$ bear the figures in relief, showing the weight of the goods weighed, and the printing is effected in the manner above described.

Instead of small tickets, each receiving separately an imprint, as hereinbefore described, a ribbon or endless band may be used which successively moves at will in the interior of the movable weight, so as to receive at each weighing an imprint of the weight. The series of weighings can thus from time to time be verified on this endless band, which it is sufficient to unroll.

And having now described the nature of my said invention and in what manner the same is to be performed, I declare that I claim—

First—Constructing weighing-machines so that they register the weights weighed, that is to say, print or impress the weight of the goods on a ticket or like device; this printing being effected in relief or otherwise, and in a dry or a wet way, substantially in the manner and for the purpose hereinbefore described.

Second—The arrangement of machine with single movable weight, hereinbefore described with reference to figures 1 to 5.

Third—The arrangement of machine with several weights, hereinbefore described with reference to figures 6 to 10.

Fourth—The employment in the movable weight of the machine of a steel plate for printing lines to indicate units, as hereinbefore described with reference to figure 11.

Fifth—The arrangement of machine with graduated weights, hereinbefore described with reference to figures 12 to 14.

Sixth—The arrangement of machine with multiple weights, hereinbefore described with reference to figures 19 and 20.

Seventh—Constructing weighing-machines of my system without the movable weight for the units, so as to allow of the use of tickets previously printed with the units, as hereinbefore described with reference to figure 15.

Eighth—

Improvements in Weighing-machines.

Eighth—Constructing weighing-machines of my system so that a ribbon or endless band may be used in the movable weight in lieu of separate tickets, as and for the purpose hereinbefore described.

In witness whereof, I the said Edme Augustin Chameroiy have hereto set my hand and seal, this seventh day of May, 1882.

E. A. CHAMEROY.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to Edme Augustin Chameroiy, this twenty-fifth day of September, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir

We do ourselves the honor to report, in reply to your blank cover communication of the 29th ultimo, No. 82-8,871, that we are of opinion the prayer of Edme Augustin Chameroiy's Petition for the registration of "Improvements in Weighing-machines" may be granted, in terms of his specification, drawing, and claim.

Sydney, 9 August, 1882.

We have, &c.,

EDMUND FOSBERY.
GOTHER K. MANN.

The Under Secretary of Justice.

[Drawings—two sheets.]

No. 1131.

[Assignment of No. 1130.]

FIG. 1.

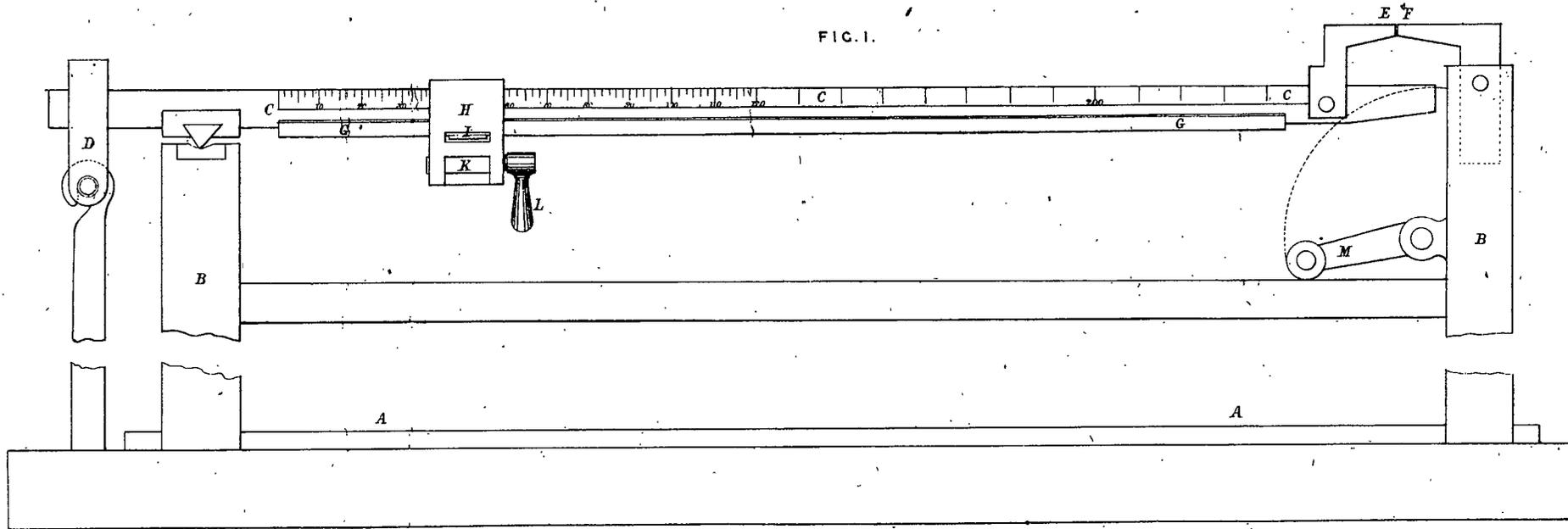


FIG. 11.



FIG. 2.

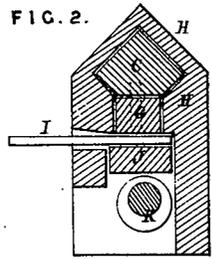


FIG. 3.

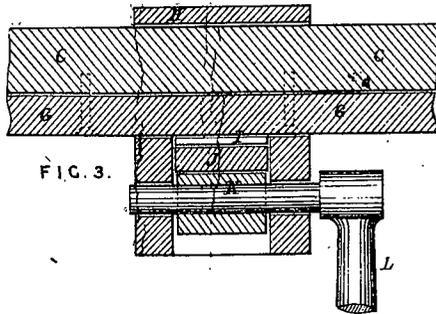


FIG. 9.

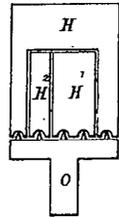


FIG. 4.

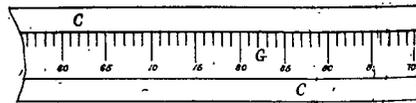


FIG. 5.

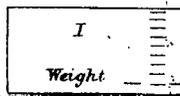


FIG. 6.

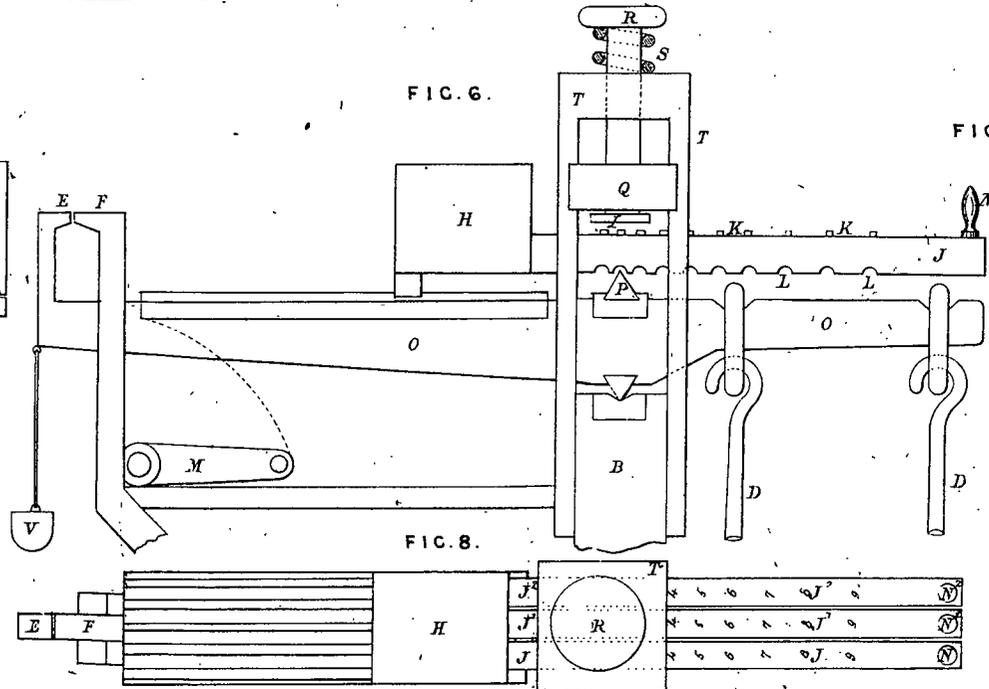


FIG. 7.

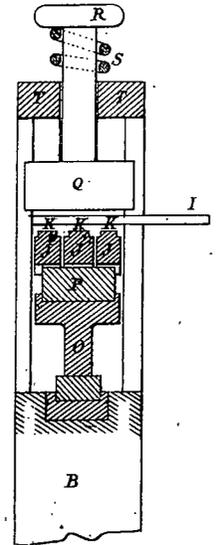
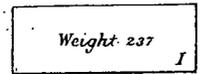


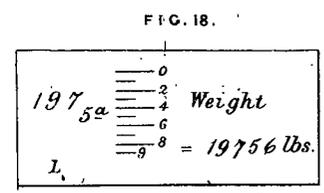
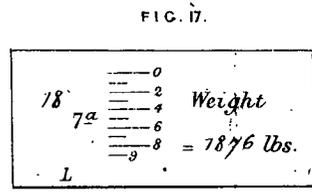
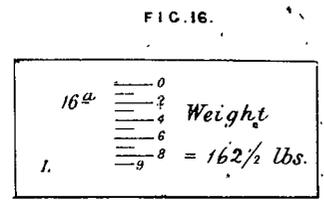
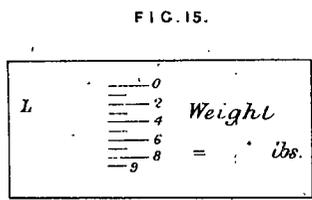
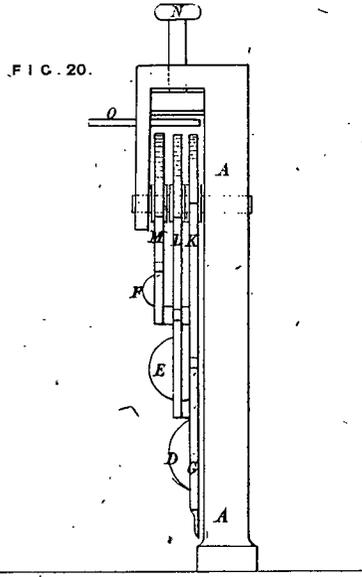
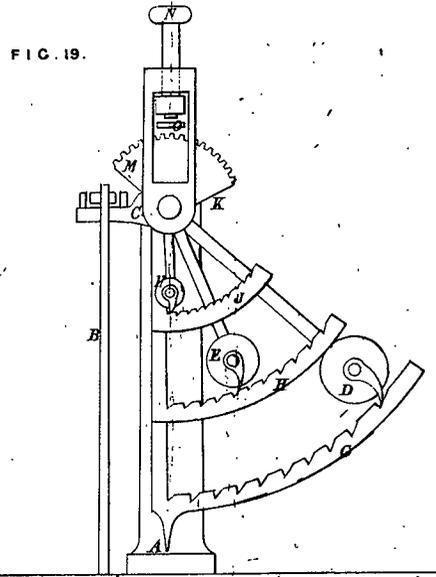
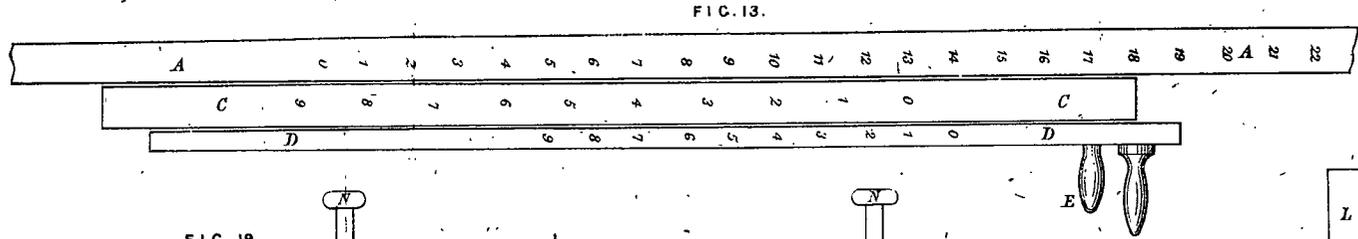
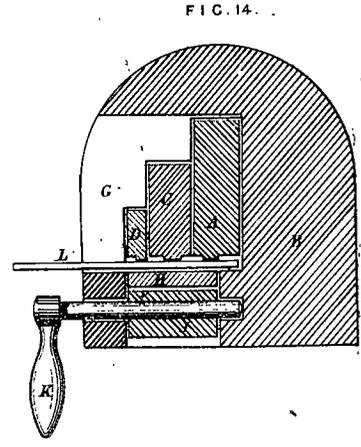
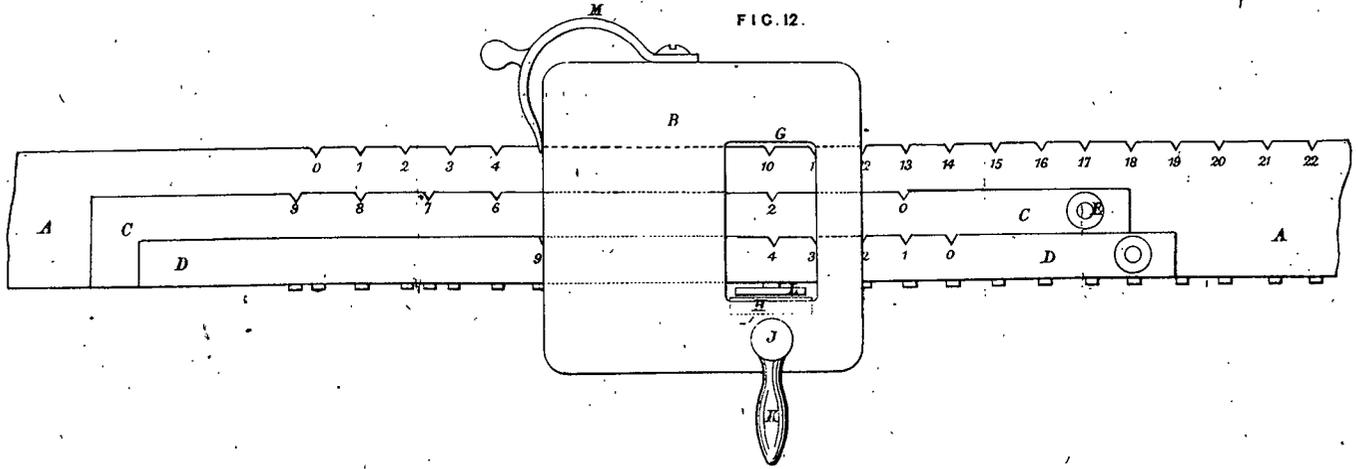
FIG. 10.



This is the Sheet of Drawings marked B referred to in the annexed Letters of Registration granted to Edme Augustin Chameroy, this twenty-fifth day of September, A.D. 1882.

Augustus Loftus.

C.



This is the Sheet of Drawings marked C referred to in the annexed Letters of Registration granted to Edine Augustine Chameroy, this twenty-fifth day of September, A.D. 1882.
 PHOTO-LITHOGRAPHED AT THE GOVT. PRINTING OFFICE, SYDNEY, NEW SOUTH WALES. *Augustus Loftus.*



A.D. 1882, 27th September. No. 1132.

IMPROVEMENTS IN MAGNETO-ELECTRIC MACHINES.

LETTERS OF REGISTRATION to Henry Francis Joel, for Improvements in Magneto-electric Machines.

[Registered on the 27th day of September, 1882, 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 JOEL, of Dalston, in the county of Middlesex, 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 Magneto-electric 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 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 Joel, 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 Joel, 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 Joel 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 September, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Magneto-electric Machines.

A.

SPECIFICATION of HENRY FRANCIS JOEL, of Dalston, in the county of Middlesex, England, civil engineer, for an invention entitled "Improvements in Magneto-electric Machines."

My invention relates to improvements in magneto-electric machines, whereby they are rendered less costly in construction and maintenance and the force of the generated current is improved, and especially to that class of magneto-electric machines which produce continuous currents by the aid of special commutators, as distinguished from magneto-electric machines which produce alternating currents, or currents of constant direction and power.

My improvements are essentially in the construction of the frame, the field magnets, the revolving armature, the commutator, and the brushes and frames; and further, in the novel disposition of the magnets relatively to the armature, and in the method of connection between the armature coils through the commutator. And in order that my said invention may be fully understood, I now proceed more particularly to describe the same, reference being had to the drawings hereunto annexed, in which like letters refer to like parts in corresponding figures, the letters N and S and *n* and *s* always representing north and south magnetic poles.

Figs. 1 and 2 show front and side elevation respectively of one form of my improved dynamo machine.

I mount upon an iron base-plate, A, two upright standards, B, one at each end, upon which plunger blocks, *b*, are fixed to carry the axle of the revolving armature, so that the armature may be easily taken out when desired, without disturbing the rest of the machine.

Upon the base-plate A, I mount four upright field electro-magnets, braced across the top by the iron plate *a*.

In this type of my machine I arrange the said magnets C in pairs with the wire so coiled as to make the north and south poles of each pair in the centre of the magnets and opposite to one another, as shown at N and S; to these poles I attach extending pole plates *n s*, shown in detail in figs. 3, 4, 5, and 6, hereinafter more particularly specified.

The revolving armature I show in detail; in fig. 7, a half front elevation; fig. 8, a plan; fig. 9, a vertical section; and fig. 10, a horizontal section. This armature I construct in eight or many distinct sections, D D¹ D² D³, &c., though I find in practice that in this type of my machine an odd number (preferably nine) best answers my purpose.

The cores consist of small plates, E, constructed in sets of four, fixed together in parallel and opposite pairs, each pair being composed of two plates (with a space between) half overlapping (fig. 9), and across the middle is coiled the insulated wire G. A series of separately wound sections with projecting ends is thus formed, and these sections are fitted one to the other in a continuous double ring of iron cores, E, of flat surface, and the projecting ends of each section alternately overlap and are attached to those of the next. All bolts, *f*, fixing the opposite plates of the double ring must be of non-magnetic material, so as to preserve the two sides in magnetic insulation. This construction is clearly shown in figs. 9 and 10. The ring thus formed is carried upon radial spokes, F, of non-magnetic material, and the fitting screws *f* serve the double purpose of attachment to the spokes and connection of the overlapping ends of the sections. These coiled sections are interspaced by special iron cheeks, *e*. These cheeks *e* bind and fix the sections together so as to make a complete ring armature and cover the heads of the smaller internal screws; they are constructed with a lip to bite on the inside top faces of the exposed portion of the overlapping plates, and are secured to the spokes by the brass bolts *f*¹.

I have found that the strongest action obtainable from ring armatures with projecting cheeks, of my or other construction, occurs when the projecting cheeks make and break from the ends of the extended pole-plates. I intensify this action by arranging the pairs *n n*¹ and *s s*¹ of extending pole-plates to alternately overlap or be in advance of one another, as shown in fig. 3. In this case the coil passing across the centre of the pole-plates is, at the moment of passage, comparatively neutral, whilst at the same moment (in consequence of the odd numbers) there is no neutral coil in front of the centre of the other poles. This arrangement I have adopted in figs. 1 and 2, where the armature is made up of nine coils, and it enables me to cut out the coils singly and at alternate poles, in place of in pairs, as hitherto practised in other machines, and thus to minimize the neutral portion and avoid sparking at the commutator by the decreased change of resistance from the single coil in place of the pair of coils cut out.

Another modification of the extending pole-plates that I may adopt is by affixing thereto or forming thereupon in pairs, *n n*¹ and *s s*¹, projections, shown by dotted lines in fig. 5 and in profile in figs. 4 and 6. In this modification the neutral coils are cut out between the pole-plates (similarly to the position in the ordinary ring armatures) and not in the centre, as specified in regard to fig. 3, and the magnetic make and break takes place at or near the centres of the pole-plates.

This construction I may apply to machines with armatures made up of an even number of coils, or to armatures of ordinary construction without projecting cheeks, and I may apply the projections on pole-plates in opposite pairs and not overlapping or stepped.

By this construction of pole-plates I have the advantage of the currents from the induction action being added to the currents made from the magnetic make and break.

My improved commutator I show in sectional elevation in fig. 11, and in plan in fig. 12.

It is constructed of separate pieces of metal, H, fitted on a ring of insulating material, J, shown black, stepped one on to the other in such manner as to form a ring presenting alternately, as revolved, a solid or divided face. These pieces H are fixed parallel with the axle of the machine, and have their sides rabbeted or cut down. One of the rabbeted sides receives the screws for attaching the wires, whilst the other allows for the screws which fix the pieces to the axle. Each part is made interchangeable and easy to be fixed or removed, whilst the whole commutator can be quickly taken off the axle of the machine. In conjunction with my commutator I may construct upon the same axle or therewith a short-circuiting device. This device, which will be more clearly understood by reference to the diagrammatic figure 23 (sheet 2) consists of an indented wheel, *h*, with the indentations filled with insulating material, *j*, the whole mounted on the ring J. This device enables me, through a subsidiary brush or brushes, K, to short-circuit

Improvements in Magneto-electric Machines.

circuit from the commutator through the alternating exposed metallic portions at the intervals of the insulating material occurring at the time of increase consequent on the cutting out of the neutral coil. The objects of this short circuit will be hereinafter more fully specified.

In fig. 2, however, it will be seen that I have not employed my commutator, but that known as "Varley's," consisting of a number of rings corresponding to the number of single or double coils on the armature, with insulating spaces for reversing and cutting out the bobbins as desired. The brushes K and holders L (shown in fig. 14 a front elevation, and 15 a plan) I construct so as to operate in a single frame, M. I attach them to the top of the machine (conveniently to the brasses of the plummer block, as shown) and construct them in two halves, so that the brushes and holders can be easily taken apart. I conveniently fit a handle, Z, to enable me to move the whole round, and by means of a set screw, z, at the foot thereof, to fix it in any desired position. The brushes are moved separately and independently when desired, by means of the rack *m* and pinion *l*.

The chief advantages I obtain by my before-specified type of construction and electrical arrangement, some of which are common to my modifications, are—

Simplicity and economy of construction of the whole machine.

The disposition of the armature in an odd number of coils, enabling me to cut out a single coil in place of a pair of coils.

That all screws and holding bolts are across the centrifugal action, and have not therefore any tendency to fly out during the rotation of the machine.

That the core plates and coil sections are detachably attached, thus offering great facilities for repairs, and allowing the coils to be separately wound in a lathe.

That the built up construction of core-plates permits their manufacture in small pieces at a low cost by stamping.

That the double ring construction of armature not only offers the known advantages of a hollow and ventilated core, but enables the double magnetic make and break to be utilized to its fullest extent.

That the simplified construction of the commutator, brushes, and brush-frame afford facility for easy removal and repair of parts.

A second type of my machine, with a novel disposition of magnets relatively to the armature, is shown on sheet II. The standards, frame, and field magnets are however similar to those specified in relation to my first type, save that the field magnets C C are arranged in opposite (N. and S.) in place of similar (N. and N. or S. and S.) pairs. These pairs (N. and S.) are placed so as to alternate by overlap or be in advance of one another, as before specified in relation to the pairs (N. and N. or S. and S.), fig. 3 (sheet I), or they are fitted with the alternative device specified in relation to figs. 4, 5, and 6, or they may be arranged as usual exactly opposite each other and not overlapping.

Fig. 16 is a front elevation of the ring armature; fig. 17 is a section of the same; fig. 18 is a diagrammatic view of the complete armature and connections.

I now connect together the two rims E of the armature magnetically, instead of isolating them from one another, but I preferably lay them flat, as shown, and parallel to the axis. The rim is built up of sections with overlapping ends in a similar manner to that adopted in the first type, or they may be solid rings. The magnetic connection of the two rims is effected by iron bracing bridges, *ee'*, which interspace the coils and bind and fix the sections together. Upon the radial non-magnetic supporting spokes and rim F, double-rabbeted, as shown, I support the iron bridge pieces *e'*, which fit into the rabbeted rim, and are themselves rabbeted on the top (seen clearly in fig. 17). Upon these bridges I laterally slide the double rim of overlapping sections, and clamp the whole together by the top bracing bridge pieces *e*, secured by the bolts P. Where it is desired to take out any section, the removal of the bracing bridge piece which clamps it will leave it free to be laterally slid out. The bridge pieces *e* and *e'* are shaped to project and serve as cheeks to the rims. The wire is coiled upon the sections of the rims independently, and all those sections coiled in one direction are placed on one side of the rim, and all those coiled in the opposite direction are placed on the other side of the rim.

The connection between the armature coils and my special commutator H (shown more clearly in fig. 18) is made by wires, *g*, each of which leads from one commutator plate, and is branched to the similar poles of a pair of the coils G and G', one G on one side of the double rim, and the other G' on the opposite side, but a coil in advance of the first-named. I am enabled to adopt this method of connection in series by my before-described alternating arrangement of the pole plates (or its alternative, shown in full lines at N S, fig. 18), or I may place the poles of these field magnets exactly opposite each other (shown in dotted lines), and in that case I arrange to connect the coils in parallel circuit instead of in series. The neutral portion of the bracing bridge pieces *ee'* occupies the place and corresponds to the isolating space adopted in the first-described type of my machine, and I may at times construct this machine with the iron bridging pieces *ee'*, not projecting from the face of the core rings, and also entirely without the iron bridging pieces, simply using two rings only wound with wire in reverse direction.

The action of my second type of revolving armature and the paired arrangement of the field magnets and a special advantage derived therefrom is the creation of a magnetic field of great intensity, owing to the short distance between the opposite poles N. and S. of the field magnets, which may be almost joined by the bridge pieces *ee'*, and which consequently influence the wire on the circular rim to a much greater extent than in the ordinary machines.

A third type of my machine is shown in sheet II; fig. 19 is a half elevation of the revolving armature; fig. 20 is a plan of the same; and fig. 21, a section of the same. I now use two poles only of the field magnets in one machine wholly north on one side of the armature and wholly south on the other. The ends of the extending pole-plates presented to the armature are bevelled in a diagonal plane (fig. 20). The ring consists of but a single core, built up of sections of my overlapping plates E and coils G. The overlap of the plates E is indicated in fig. 19 by additional shading in the top section. Upon the radial non-magnetic supporting spokes and rim F, I fix the overlapping core plates by means of tooth projections, Q, on the said rim F, and they are clamped in position by the bracing bridge pieces E, secured by the horizontal bolts *f'*. These bridge pieces E are externally indented, so that as they revolve they offer

Improvements in Magneto-electric Machines.

a sequence of edges to the bevelled faces of the extending pole-plates N.S., and thus make and break a number of times. Any section may be laterally slid off by the removal of the bracing bridge-piece which clamps it.

A fourth type of my machine is shown in figs. 22 and 23, which are a front elevation and diagram respectively.

In this type of my machine I mount the field magnets in two sets of four poles side by side, each set composed of two N. and two S. poles paired N. N. and S. S. (one set being clearly shown in fig. 22). The pole extending plates overlap (fig. 23), as first described (or the alternative is adopted).

The armature ring, consisting of coils wound on sections of overlapping plates, is built up as specified in reference to figs. 1 to 10. In the improved method of connection adopted between the armature coils, through the commutator H, I use eight or other convenient and even number of coils. These I divide into two distinct circuits, G and G². I construct the commutator in stepped pieces (as specified in reference to figs. 11, 12, and 13), to make in one revolution a number of breaks equivalent to the number of coils. The section of the stepped commutator is shown, for the sake of clearness in the diagram, flattened or developed, instead of in its real position, which is cylindrical. Each system of coils is thus alternately alone in connection with the leading wires, through the brushes K, at the moment when each of the latter is passing across one of the solid sections between the steps of the commutator, as shown in the diagram. At all other positions in the revolution the two systems are combined in parallel circuit, and the change takes place when the system of coils not in connection with the leading wires is almost neutral.

In combination with the above I employ the auxiliary short-circuiting device already specified, to connect up in a shunt circuit supplementary coils of wire, R, coiled round the field magnets in a similar method to that advocated by Wheatstone, or I lead the current through a separate leading wire to be utilized as may be desired.

I may use subsidiary brushes, K, to make contact with the commutator plates in circuit with the neutral system of coils G, to utilize the extra current from the break in the circuit.

In any of the aforesaid types I find that I may magnetically insulate the sections of coiled cores from one another without destroying their effect. Each section of coiled core may be subdivided into two or more sections of wire coil, which may be connected in series or otherwise, as hereinbefore specified. The projecting cheeks *c* need not invariably interspace every coil, but may occur at alternate intervals.

My magneto-electric machines, in any of the types specified, are applicable to all the uses in which any known dynamo or magneto electric machines are of service, such as for electric lighting, motive power, electro-plating, &c.

And having now fully described and ascertained the nature and objects of my invention, and the manner in which it is to be performed, be it known that the particular arrangements and parts which I claim as novel are—

First—In magneto-electric machines, the construction of an annular armature core built up of separate coiled sections, each section being made up of overlapping iron core plates (wound with one or more coils of wire), forming two distinct iron core rings and complete armature, substantially as and for the purpose specified.

Second—In magneto-electric machines, the stepping or overlapping of the field magnet poles and the formation of projections thereupon to obtain many magneto makes and breaks, substantially as hereinbefore specified, more particularly in reference to figs. 3, 4, 5, and 6.

Third—The combination of a commutator constructed in step-shaped pieces with the subsidiary short-circuiting device and the electrical connections, as and for the purposes hereinbefore specified in reference to figs. 11, 12, 13, and 23.

Fourth—The construction of the bushes and holders, substantially as and for the purposes specified in reference to figs. 14 and 15.

Fifth—In a magneto-electric machine, the construction of a double ring armature (solid or built up in sections) coiled with insulated wire, interspaced or not by iron bridging-pieces, the whole being in combination with field magnets in pairs of reversed polarity, substantially as and for the purposes specified in reference to figs. 16, 17, and 18.

Sixth—The general construction and arrangement of my magneto-electric machine and the method of electrical connection of the coils thereof with the commutator, substantially as specified in reference to the diagram fig. 18.

Seventh—In my construction of magneto-electric machines, the peculiar arrangement and combination of diagonally bevelled pole-plates with indented armature cheeks, substantially as and for the purposes specified in reference to figs. 19, 20, and 21.

Eighth—In a magneto-electric machine, the combination of the sets of four poles with the revolving armature, commutator, and electrical connections, substantially as and for the purposes specified in reference to figs. 22 and 23.

In witness whereof, I the said Henry Francis Joel have hereunto set my hand and seal, this sixteenth day of June, in the year of our Lord one thousand eight hundred and eighty-two.

HENRY FRANCIS JOEL.

Witness—

JNO. P. M. MILLARD.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to Henry Francis Joel, this twenty-seventh day of September, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT

Improvements in Magneto-electric Machines.

REPORT.

Sir,

We do ourselves the honor to report, in reply to your blank cover communication of the 12th instant, No. 9,404, that we are of opinion the prayer of Mr. Henry Francis Joel's Petition for the registration of "Improvements in Magneto-electric Machines" may be granted, in terms of his specification, drawings, and claim.

The Under Secretary of Justice.

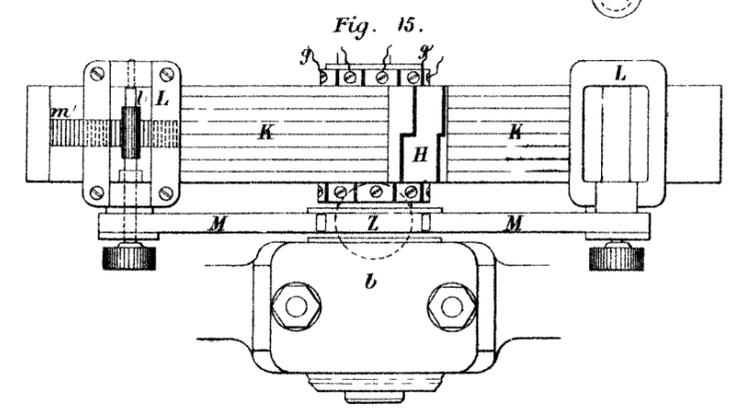
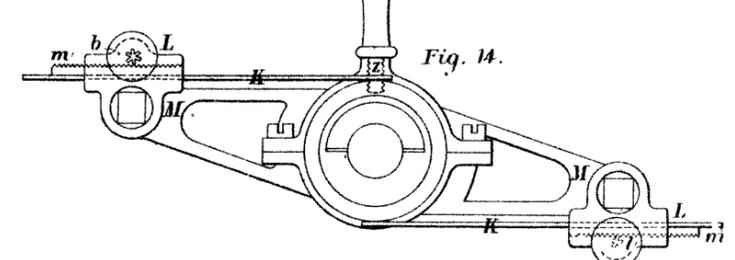
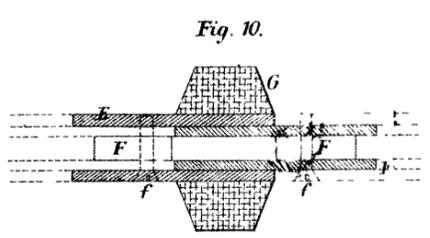
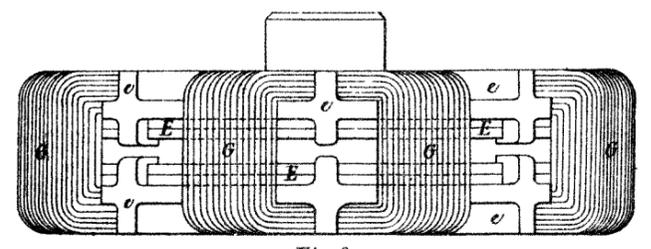
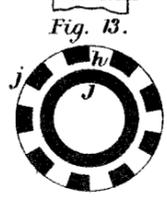
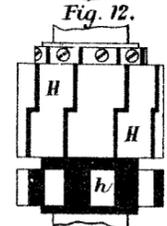
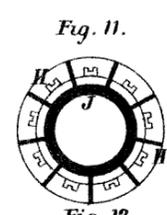
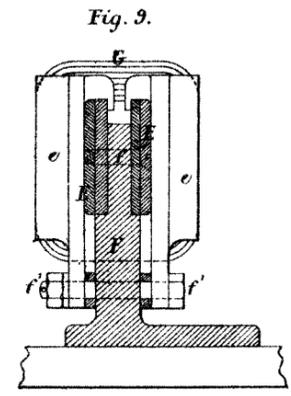
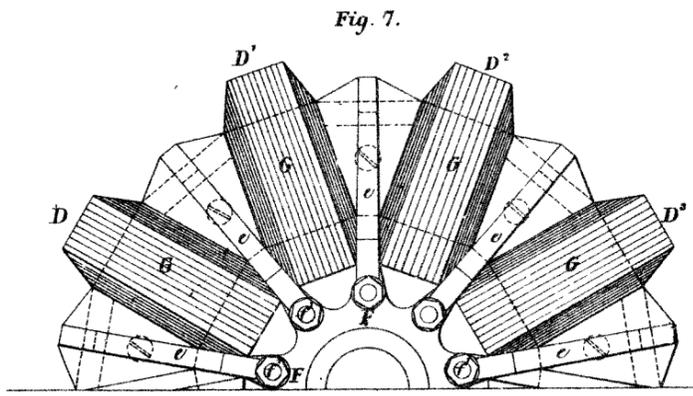
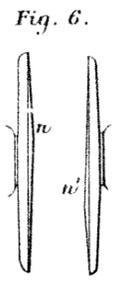
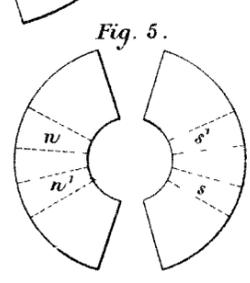
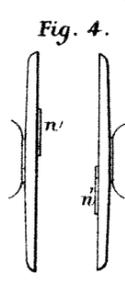
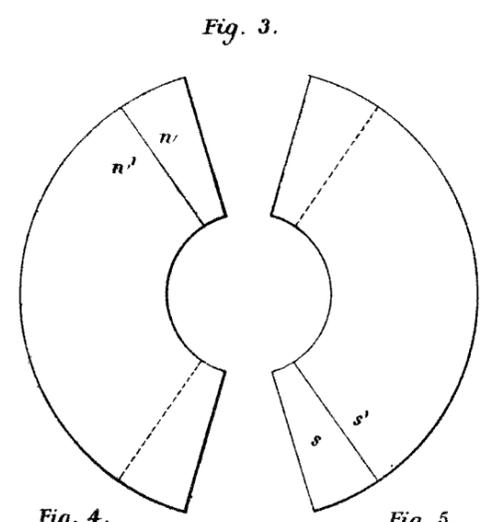
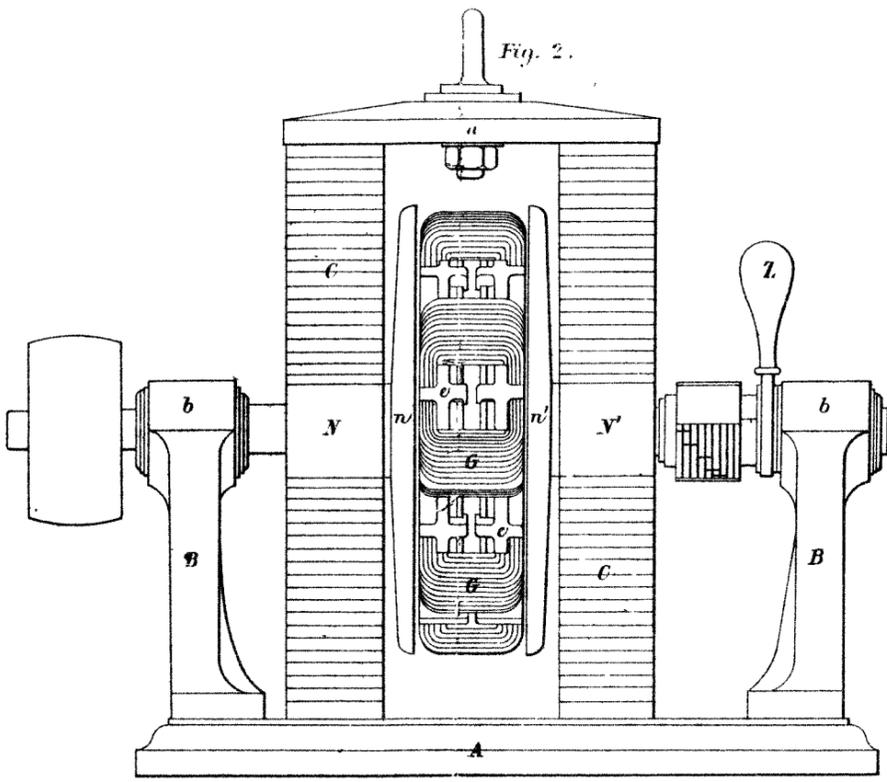
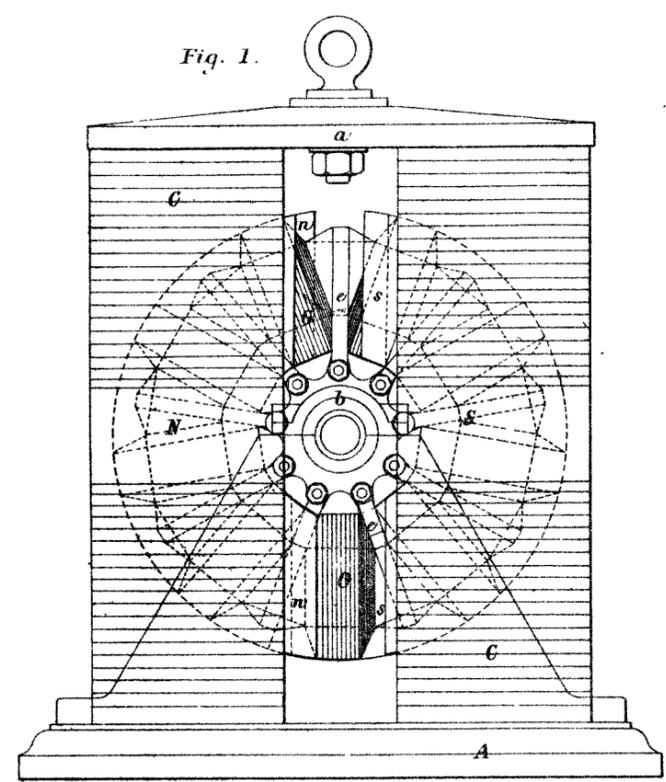
Sydney, 23 August, 1882.

We have, &c.,

E. C. CRACKNELL.
GOTHER K. MANN.

[Drawings—two sheets.]

B.



This is the Sheet of Drawings marked B. referred to in the annexed Letters of Registration granted to Henry Francis Joel, this 27th day of September, A.D. 1882.
 (815-) Augustus Loftus.

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

Fig. 16.

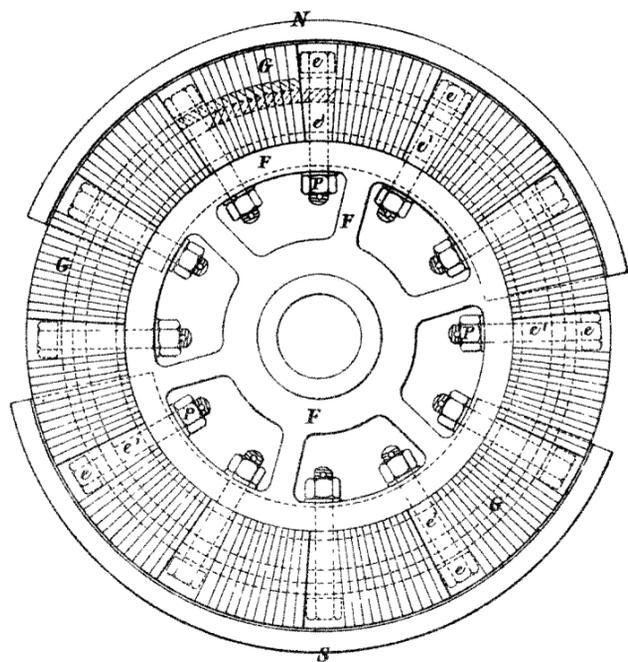


Fig. 17.

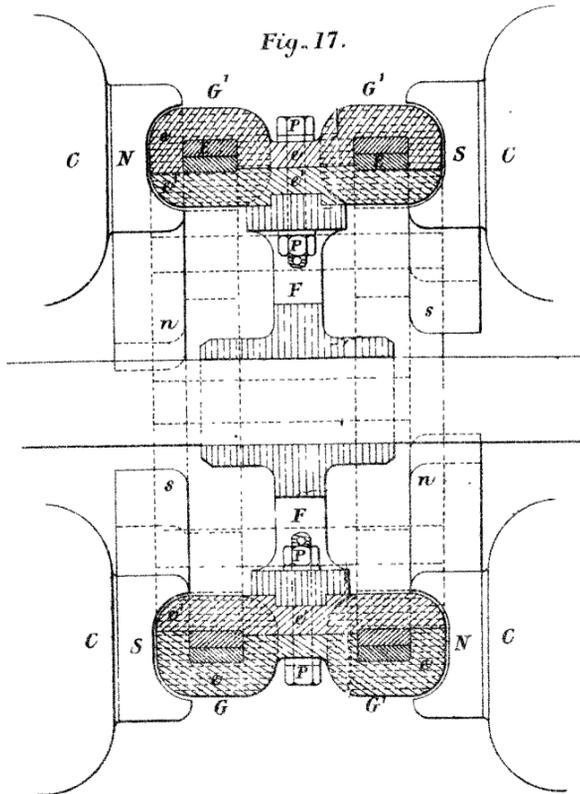


Fig. 22.

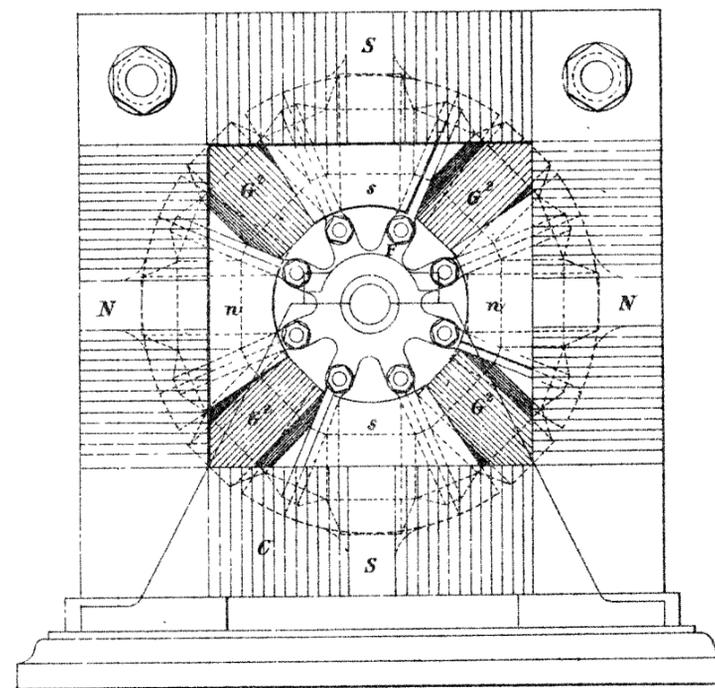


Fig. 19.

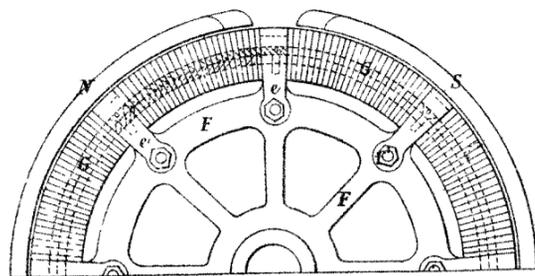


Fig. 21.

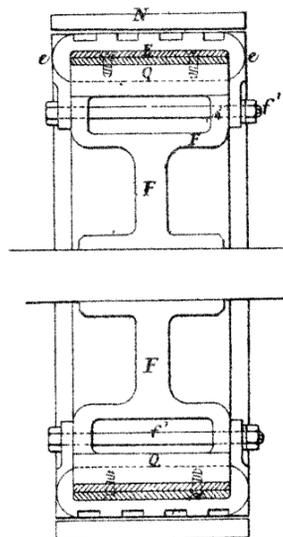


Fig. 18.

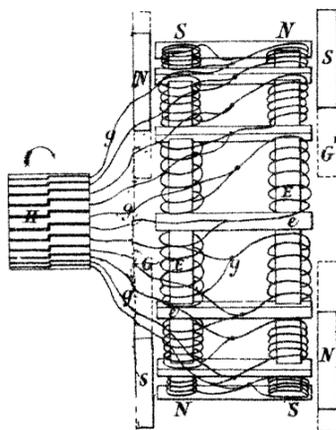


Fig. 20.

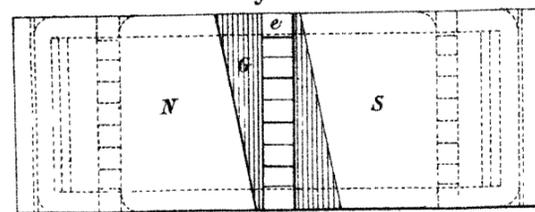
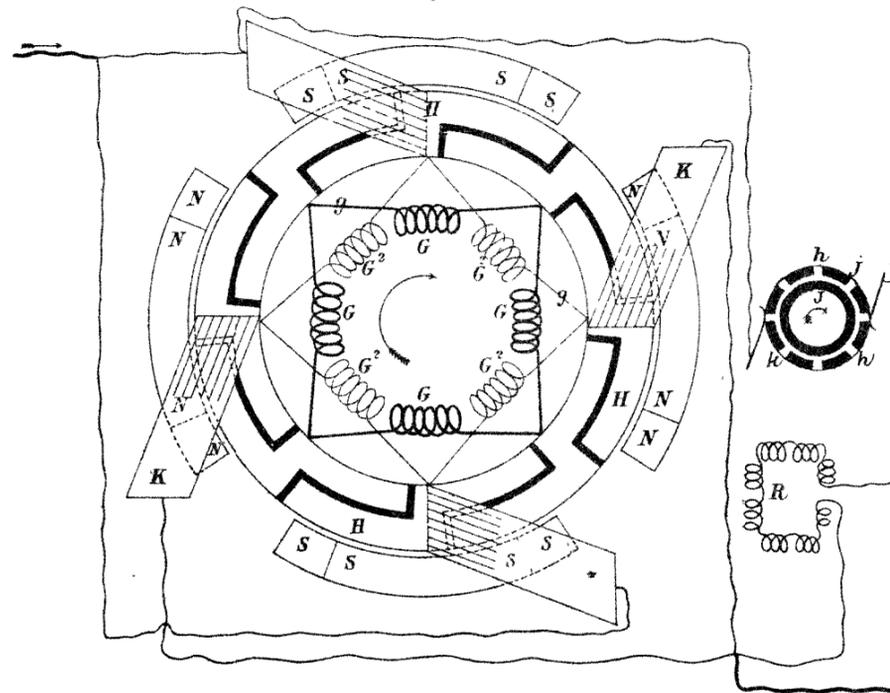


Fig. 23.



This is the Sheet of Drawings marked C. referred to in the annexed Letters of Registration granted to Henry Francis Joel, this 27th day of September, A.D. 1882.

Augustus Loftus



A.D. 1882, 27th September. No. 1133.

A NEW OR IMPROVED ELECTRIC ACCUMULATOR.

LETTERS OF REGISTRATION to Sigismund Cohné, for an improved Electric Accumulator for the storage of electric energy.

[Registered on the 27th day of September, 1882, 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 SIGISMUND COHNE, of Gracechurch-street, in the city of London, 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 entitled "A new or improved Electric Accumulator for the storage of electric energy," 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 Sigismund Cohné, 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 Sigismund Cohné, 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 Sigismund Cohné 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 September, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

A new or improved Electric Accumulator.

SPECIFICATION of SIGISMUND COHNÉ, of Gracechurch-street, in the city of London, England, for
 "A new or improved Electric Accumulator for the storage of electric energy."

THIS invention relates to a new or improved accumulator for the storage of electric energy (commonly called storage of electricity) for the purposes of electric lighting and electro-motive power, whereby I obtain a larger capacity of storage, combined with greater efficiency and durability.

Hitherto the cells of the accumulators in use are liable to polarize themselves, and require considerable volume and weight, or the electrodes are quickly destroyed.

The object, therefore, of my invention is to obviate those defects, and also to simplify the construction of the accumulator, whereby it is more readily applicable to different uses.

According to my invention, I apply on the surface of a sheet of lead of any convenient size (by preference I use one of about a foot square and of about $\frac{1}{16}$ th of an inch thick) a layer of mercuric sulphide (Hg S), say about 6 ounces to the square foot, whether amorphous or crystallized; by preference I use the crystallized Hg S , called cinnabar or vermilion. The mercuric sulphide is applied most conveniently by first making it into a paste, by mixing it with a little diluted sulphuric acid. I bend the coated lead sheet into the form of a box or into the form of a spiral, so that the layer is enclosed by the plate, and thus cannot be detached by the acid. This prepared sheet I use for the electrode at the positive pole; a second sheet of lead, rather less in size, I arrange and prepare in the same way as the first one for the electrode at the negative pole. Both sheets are perforated, and placed so as to be separate and apart from each other, into a jar or box filled with diluted sulphuric acid, and then the cell or cells may be charged by the ordinary electrical process or in any suitable manner.

The following action takes place:—As soon as the current enters hydrogen is liberated, which reduces the mercuric sulphide gradually, causing a deposition of metallic mercury on the surface of the lead. Immediately the effects of polarization are manifested local action disappears, then the amalgam formed, without being destructive to the lead, decomposes the water (a fact well known in chemistry), and in that way hydrogen is always conserved, and travels backwards and forwards as the cells are charged and discharged, and peroxide of lead is thus formed, the precipitated sulphur acting as a resistance. The result is very powerful and constant, polarization lasting many times longer than with any other known accumulator.

I may also use sulphate of mercury ($\text{Hg}^2 \text{O S O}^3$) as a layer instead of mercuric sulphide (Hg S), or I may employ the well-known Sutton accumulator, and substitute for the amalgamated lead, as adopted by him, a layer of mercuric sulphide or one of sulphate of mercury, by which the lead is not destroyed, as is the case in the use of the direct amalgam.

The essential features of my invention are the use of mercuric sulphide (Hg S), whether amorphous or crystallized, called cinnabar or vermilion, also sulphate of mercury ($\text{Hg}^2 \text{O S O}^3$), as a layer on lead, as above described and for the purposes herein mentioned.

CLAIM.

The construction and use of an accumulator for the storage of electric energy, wherein the electrodes, or one of them, consist or consists of lead coated or covered with or enclosing mercuric sulphide or sulphate of mercury, substantially as hereinbefore described.

In witness whereof, I, the said Sigismund Cohné have hereunto set my hand and seal, this twentieth day of May, one thousand eight hundred and eighty-two.

Signed and sealed in the presence of,—

S. COHNÉ.

CHAS. MILLS,
47, Lincoln's Inn Fields, London.

CHAS. JAS. JONES,
47, Lincoln's Inn Fields, London.

This is the specification referred to in the annexed Letters of Registration granted to Sigismund Cohné, this twenty-seventh day of September, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 24 August, 1882.

We do ourselves the honor to report, in reply to your blank cover communication of the 19th instant, No. 9,489, that we are of opinion the prayer of the Petition of Sigismund Cohné, for the registration of "A new or improved Electric Accumulator for the storage of electric energy" may be granted, in the terms of his specification and claim.

We have, &c.,

E. C. CRACKNELL.
GOTHER K. MANN.

The Under Secretary of Justice.



A.D. 1882, 27th September. No. 1134.

AN IMPROVED PROCESS OF PRESERVING MILK.

LETTERS OF REGISTRATION to Heinrich Wilhelm Ludwig Otto von Roden,
for an improved process of preserving Milk.

[Registered on the 27th day of September, 1882, 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 HEINRICH WILHELM LUDWIG OTTO VON RODEN, of Hamburgh, Germany, 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 process of preserving Milk," 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 Heinrich Wilhelm Ludwig Otto von Roden, 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 Heinrich Wilhelm Ludwig Otto von Roden, 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 Heinrich Wilhelm Ludwig Otto von Roden 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 September, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

An improved process of preserving Milk.

SPECIFICATION of HEINRICH WILHELM LUDWIG OTTO VON RODEN, of Hamburg, Germany, for an invention entitled "Improved process of preserving Milk."

HERETOFORE milk has been preserved either in a condensed state or by adding antiseptic chemicals. Both methods injure the taste of milk thus preserved, which can very seldom be used to replace fresh milk.

The object of my invention is to preserve milk in such a manner as not to alter its taste, and to leave it in such a degree of liquidity to allow its immediate use after opening the bottles or vessels containing such milk.

I attain this object by means of the mechanisms illustrated in the accompanying drawings, in which figure 1 is a front elevation, partly in section, of the heating apparatus, and figure 2 a side elevation thereof, also partly in section; figures 3 and 4 are vertical sections of the cylinder or cap for covering the milk vessel during the expulsion of air; figure 5 is a side elevation; and figure 6, a front elevation of the device for holding the stopper during the killing of the fungus spores by the second heating.

Similar letters refer to similar parts throughout the several views.

To carry my invention into effect, I strain fresh milk directly after milking, and fill it in glass bottles or other vessels, with the precaution of not filling full the entire interior of the bottle, but leaving an empty space. Then I add some fine salad oil, just enough to cover the surface of the milk about one-twelfth of an inch, and put the bottles in one of the boxes *g*, which are placed in the heating apparatus.

To avoid the direct contact between milk and oil, the bottle's head, after corking the bottle, may be provided either with a piece of rubber hose, *a*, or with a cylinder, *a*¹, with an inside rubber ring, *a*². In the cup thus formed, oil or any other indifferent liquid is poured to cover the cork entirely. Then the bottle is placed as above, and the apparatus heated by opening the cock *d* corresponding with the story which contains the boxes *g*. The steam entering the apparatus through the orifices in the perforated pipe *e* should produce heat of not less than 158 and of not more than 176 degrees of Fahrenheit. This temperature may be regulated according to the indications of the thermometer *f*.

After about half an hour's heating the entry of steam is stopped, the apparatus slowly cooled to 104 degrees.

After taking away the oil from the milk by means of a siphon or a glass syringe, or by any other convenient apparatus respectively, after removing the rubber hose *a* or the cylinder *a*¹ from the bottle's head, the corks are fastened to the bottle by means of the discs *c* and *c*¹, which are attached to the bottle by the wire *b*. The discs *c* and *c*¹ are provided with spiral projections; the lower disc *c* is kept immovably in horizontal direction by the claws *c*³, whilst the upper disc *c* may be turned round its centre, in which catches the pointed neck *c*² of the wire *b*. By turning the upper disc *c* in the corresponding direction the lower one is pressed on the cork, in consequence of the inclined brims.

Then the bottles are heated again during an hour to 210 to 220 degrees of Fahrenheit, and at last cooled to ordinary temperature inside the apparatus.

Having thus fully described my invention, what I desire to claim and secure by Letters Patent is—

First—The process of preserving milk in vessels closed by oil or by oil-covered corks, then heating the milk to about 220 degrees for an hour, substantially as described.

Second—In the process of preserving milk in bottles or any other vessels, the method of excluding air prior to sealing, which consists in covering the milk with a film or layer of edible oil during the first heating, then removing the same, stoppering, and reheating.

Third—In the process of preserving milk, the application of the hose *a* or cylinder *a*¹, substantially as and for the purpose specified.

Fourth—In a device for fastening the stopper to the bottle, the combination of the wire *b* with the discs *c* and *c*¹, substantially as set forth.

In witness whereof I, the said Heinrich Wilhelm Ludwig Otto von Roden, have hereunto set my hand and seal, this sixth day of June, one thousand eight hundred and eighty-two.

HEINRICH WILHELM LUDWIG OTTO VON RODEN.

This is the specification referred to in the annexed Letters of Registration granted to Heinrich Wilhelm Ludwig Otto von Roden, this twenty-seventh day of September, A.D. 1882.

AUGUSTUS LOFTUS.

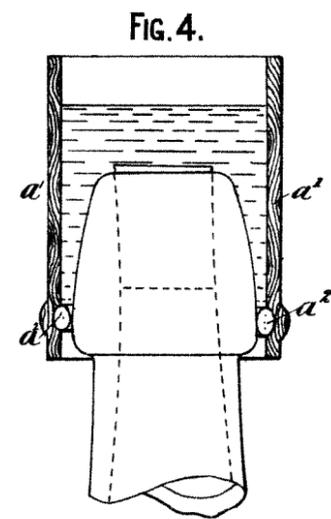
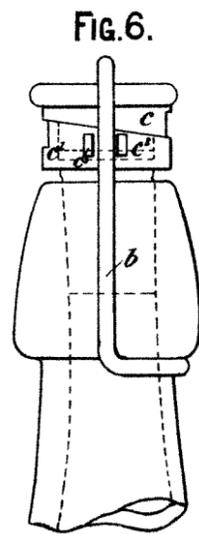
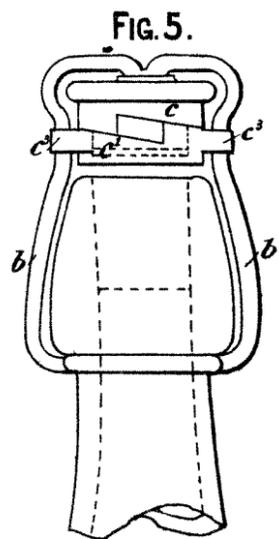
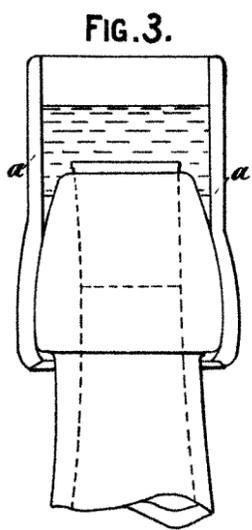
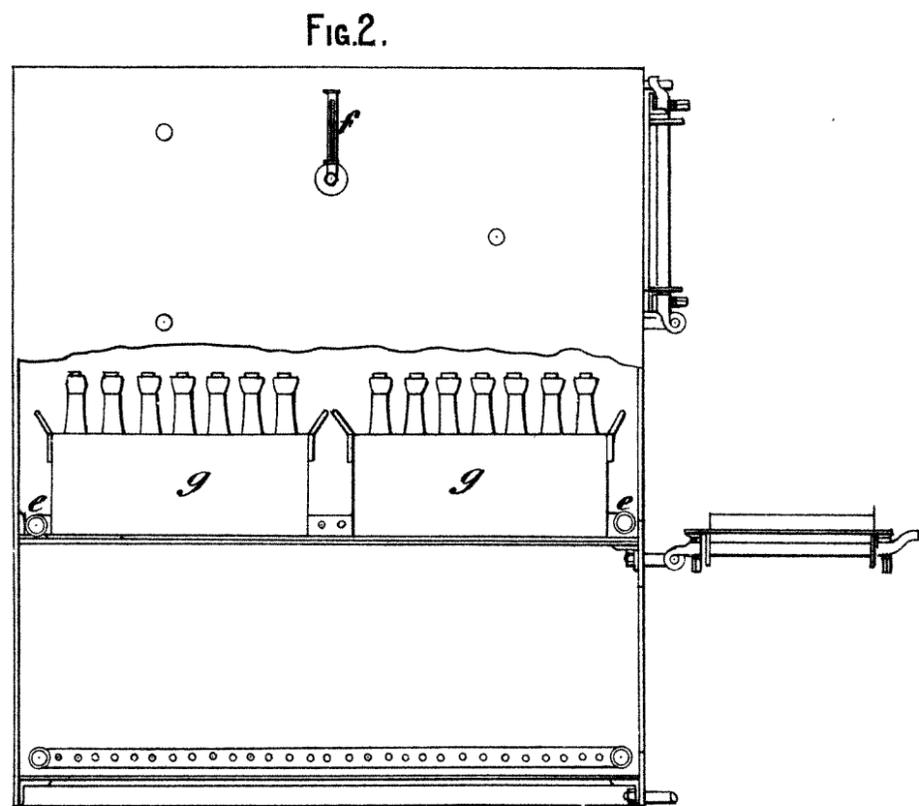
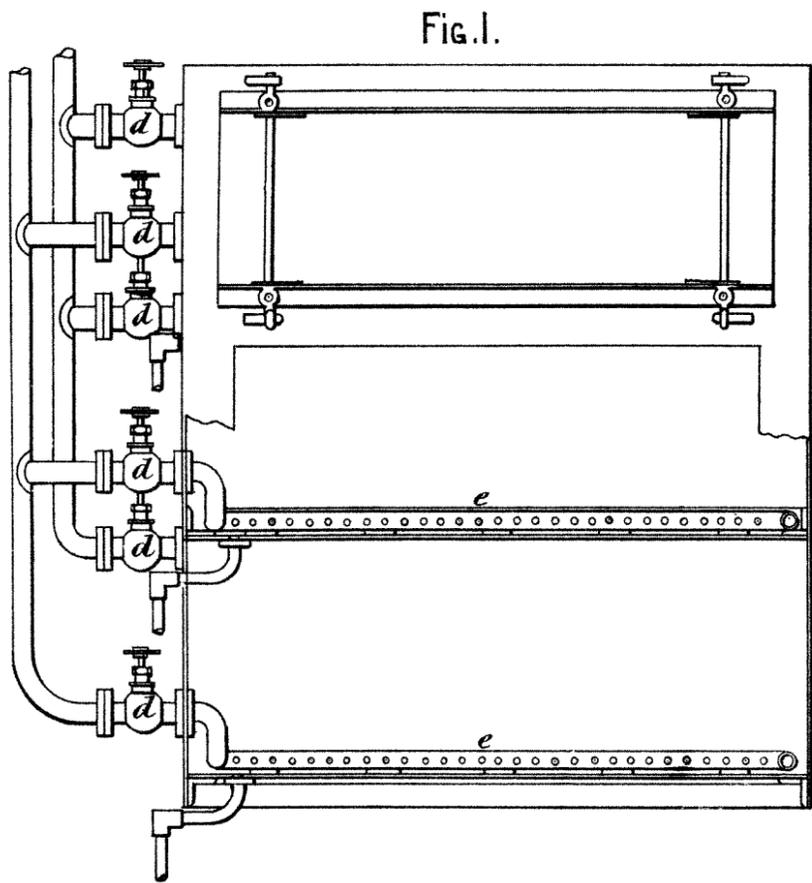
REPORT.

Sir,

The application of Mr. H. W. L. O. von Roden for Letters of Registration, for an invention entitled "An improved process for preserving Milk," 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 the Letters of Registration applied for.

We have, &c.,
EDMUND FOSBERY.
CHAS. WATT.

The Under Secretary of Justice.



*This is the Sheet of Drawings referred to in the annexed
Letters of Registration granted to Henrich Wilhelm Ludwig
Otto Von Roden, this twenty-seventh day of September, A.D.
1882.
Augustus Loftus.*



A.D. 1882, 27th September. No. 1135.

IMPROVED METHOD OF BURNING BRICKS, TILES, &c.

LETTERS OF REGISTRATION to Hugh Giffen M'Kinney, for an improved method of burning bricks, tiles, or other articles of earthenware.

[Registered on the 27th day of September, 1882, 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 HUGH GIFFEN M'KINNEY, of Campbelltown, in the Colony of New South Wales, 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 "Improved method of burning bricks, tiles, or other articles of earthenware," 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 Hugh Giffen M'Kinney, 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 Hugh Giffen M'Kinney, 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 Hugh Giffen M'Kinney 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 September, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improved method of burning bricks, tiles, &c.

AMENDED SPECIFICATION.

Improved method of burning bricks, tiles, or other articles of earthenware.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, HUGH GIFFEN M'KINNEY, civil engineer, of Campbelltown, in the Colony of New South Wales, send greeting :

WHEREAS I, the said Hugh Giffen M'Kinney, 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 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 on which 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 producing greater economy and efficiency in the manufacture of bricks, tiles, pottery, and other articles of earthenware : Now know ye that I, the said Hugh Giffen M'Kinney, do hereby declare the nature of the said invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement or specification and drawings thereof.

SPECIFICATION.

The improved kiln is of such form that, while it affords a continuous passage for heated air, it also gives free access to railway wagons or to carts to both sides throughout its entire length. The form may be circular, elliptical, rectangular, or any other closed figure, so long as it complies with these conditions.

Not only the form but also the dimensions of the kiln will be such that the loading, firing, and unloading of the bricks, tiles, or other articles to be burned will be a continuous and uniform operation, which can be performed at both sides of the kiln. The distinctive features which the kiln possesses, and in which its superiority to other kilns consist, are—

1. That while perfectly continuous in its action, it is accessible on both sides throughout its entire length, to railway wagons or other vehicles. This is managed best by giving the kiln an approximate elliptical form, open at one or both ends, as shown in the plan. The complete continuity of the kiln is preserved by carrying the heated air across the passages, either underground or overhead, in earthenware or other pipes. Where, owing to uneven ground or other causes, it is convenient to have communication with the interior of the kiln by a passage either over the kiln walls or underneath them, the above principle of the kiln would be so far altered as to have no open passages through the walls.

2. Partly by the adoption of a light, portable chimney, which will be moved from place to place as the burning proceeds, and partly by a peculiar arrangement of the bricks, tiles, or other articles to be burned, a practically horizontal current will be generated and maintained within the kiln, without any permanent chimney, without the use of fire-bars, and without any permanent chambers such as are required in other perpetual kilns.

3. By carrying out these principles it is claimed that, while this kiln possesses almost all the advantages of the common intermittent kilns in economy and simplicity of construction, it also possesses all the advantages of the most expensive perpetual kiln in its economy of fuel. In addition, its form and general arrangements ensure an economy of labour which is not attained by any other kiln whether intermittent or perpetual.

4. The vital principles of the kiln are (a) the use of a temporary chimney (by preference a light portable one), which is moved from place to place as the burning proceeds ; (b) the use of such a chimney in combination with the peculiar arrangement of the bricks or other articles, as described in the specification and plan ; and (c) the use of such a kiln as that described, in combination with the temporary chimney and the above-mentioned peculiar arrangement of the bricks or other articles to be burned. The temporary chimney may be of iron, wood, or any other kind of material suitable or economical for use in the manner mentioned, and the form of the kiln may be any variation of the forms mentioned, provided that it be used only in the manner described, in combination with the temporary chimney and the arrangement of the bricks shown in the plan.*

General explanation and description of the plan.

The drawings attached show the following :—*a*, a general plan of the kiln which will best fulfil the conditions mentioned ; *b* and *c*, cross sections of the closing walls at an entrance and an exit passage, showing the arrangement for the conveyance of the heated air below the wagon passage ; *d*, a section on the centre line, showing the arrangement at places where the portable chimney is erected, which will be at every fifth flue ; *e*, a cross section of the kiln, showing the portable chimney in elevation ; *f*, a part plan of the kiln ; and *g* *h* and *i*, the details of the portable chimney and its supports.

In firing, operations should commence from the place marked A in the general plan. The first point requiring attention is to close the pipes at A, so as to prevent a back draught. Then, the kiln having been loaded to ten flues from A, and the portable chimney having been placed over the ten flues from A, firing is commenced and proceeds continuously. When the firing has proceeded to some distance from A and the unloading of the kiln has been commenced, the pipes at A are opened and are not again closed. As the firing proceeds, the chimney is successively shifted to every fifth flue. Under certain circumstances it may be advantageous to provide dampers passing through the pipes from outside the walls or from the top of the kiln. The omission of draught passages under the flues is part of the design. For burning with wood alone, or with wood mixed with a moderate proportion of coal, the presence of fire-bars or of a draught passage below the flues is deemed to be not only useless but pernicious. Perfect combustion of wood can take place on a flat hearth, and a draught passage only provides a receptacle in which much of the heat of the glowing embers is lost. In cases where the nature of the fuel is such that it requires an undercurrent to secure perfect combustion, one course of bricks on edge should be laid under the flues, the bricks being placed in a direction parallel to the centre line of the kiln, and with spaces left between them both longitudinally and transversely.

The

* This paragraph only has been added to the original specification, as a concise statement, in agreement with the report of the Commissioners.

Improved method of burning bricks, tiles, &c.

The kiln as shown in the plan has 80 (eighty) flues, forty in each half. This is the smallest size which the kiln should be made, as it assumes a maximum rate of cooling. Such a kiln will give an out-turn of 72,000 (seven-two thousand) bricks per week. As a kiln of the minimum size requires extra care in its management and allows the minimum period for cooling, it would in most cases be well worth the extra cost to build the kiln with 100 (one hundred) flues, that is, 50 in each half instead of 40.

The kiln in the plan is designed for rails on both sides, and the figure is such that the rails on the inner side would have a radius of three chains.

29th July, 1882.

H. G. M'KINNEY,
Civil Engineer.

This is the amended specification, referred to in the annexed Letters of Registration granted to Hugh Giffen M'Kinney, this twenty-seventh day of September, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 18 July, 1882.

The application of Mr. H. G. M'Kinney for Letters of Registration, for an invention entitled "Improved method of burning bricks, tiles, pipes, and other earthenware," having been referred to us, we have to recommend that such Letters be granted only for the general arrangement and combination of methods already patented, and for the use of the movable chimney.

The Under Secretary of Justice.

We have, &c.,

JAMES BARNET.
WILLIAM C. BENNETT.

NOTE.—The specification having been amended, Letters of Registration were issued accordingly.

[Drawings—one sheet.]



A.D. 1882, 28th September. No. 1136.

HARRISON'S BI-DISC ELECTRIC LAMP.

LETTERS OF REGISTRATION to William Henry Harrison, for an Invention entitled "Harrison's Bi-disc Electric Lamp."

[Registered on the 28th day of September, 1882, 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 137, Dowling-street, William-street, Sydney, 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 Bi-disc Electric Lamp," 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-eighth day of September, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Harrison's Bi-disc Electric Lamp.

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 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 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 the production of the electric light by mechanical contrivances to be designated "Harrison's Electric Lamp"; 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, are particularly described and ascertained by the following statement, that is to say:— I provide two metal standards or rods, on one end of which I affix a disc, of any substance capable of resisting a high temperature—I prefer them of kaolin, steatite, or graphite,—and they may be about 3 inches in diameter and $\frac{1}{8}$ ths of an inch thick. The edges may be bevelled or square, as shown in the diagrams herewith. I attach on one or both sides of the discs a metal plate, one of which is slightly less in diameter than the first-named discs, and they are in contact with the standards; the opposite ends of which latter are furnished with small pinions insulated from the standards. One of the latter is stepped into a bearing on the base of the lamp, and the other is stepped into a bearing provided on one end of a lever-arm, which works on a fulcrum-pin, the opposite end of which lever-arm is furnished with an iron armature, which is actuated by an electro-magnet in such a manner that when the magnet is active the keeper is pulled down and the standard is raised up any required height by a set-screw through the lever. I enclose each standard in a hollow pillar, the bottoms of which are secured to the base of the lamp, and slotted out to permit the pinions to gear into a driving toothed wheel placed midway; this latter driving-wheel is fitted on to a spindle which carries an armature, and placed so as to rotate before the poles of one or more pairs of electro-magnets. Near the upper part of the hollow pillars (and to each) I attach a reservoir, slotted out so that the discs, when revolving, shall pass their edges through the reservoirs. Inside the reservoirs, I provide to each a buffing-pad or brush, impinging on the edges of the discs. These reservoirs I provide with plumbago, graphite, or other conducting media, and metallic or other salts, which shall produce, during combustion, their colour, as copper, arsenic, cobalt, chrome, strontia, antimony, &c., the object being to produce thereby any desired coloured light. These may be used either in a dry or more or less moist condition. I may use also any hydrocarbon, either in a dry, liquid, or gaseous state. I may also use a form of lamp having only one upright standard enclosed and stepped on a lever-arm, as above described; but from the hollow tube a bearing-arm is attached carrying a short shaft, carrying a disc at right-angles to the first-named; on the said shaft I provide a bevel-wheel gearing into its fellow on the upright rod or spindle. These are provided, as already described, with the cisterns, for carrying the media above named. I may make the discs also of carbon, in the form of a cylinder, as shown at fig. 5 on the sheet of drawings herewith. I may use one or more pairs of discs to each lamp, as shown at fig. 4 of drawings herewith.

The manner of the action of the within-claimed patent is as follows:—I supply the cisterns with a conducting medium, as above described, and cause the discs to revolve by electro-magnets, clock-work, or other motive power. A current of electricity is caused to pass through the pillars and discs, which latter, if of non-conducting material, must be made on the edges and sides conducting, so that when the discs are in contact a closed circuit is established; at the same instant the keeper on the lever-arm is drawn to the magnet, and the upper disc raised from the other, effecting thereby separation. As the discs revolve they are supplied with a constant quantity of combustibles, thus dispensing with carbon or other points. In using hydrocarbon in a gaseous state I place a small pipe conveying such gases between the points of contact of the discs, and thereby producing a light or electric arc through which a stream of the said gas is caused to burn, as shown at fig. 3.

I claim the use of discs being caused to revolve so that their edges may be in contact and such contact broken at will. I claim the reservoirs for holding salts of metals and other substances which shall colour the light produced by a current of electricity. I claim the means of effecting separation of the points of the discs, as shown in figs. 1 and 2 of the drawings herewith. I claim that the discs may be of a cylindrical form, as shown at fig. 5. I claim the use of hydrocarbons and metallic salts for augmenting and colouring the arc. One sheet of drawings herewith shows the nature and action of the said invention, as follows:—Fig. 1: *a a*, discs revolving in reservoirs *b b*; *c c*, arms connecting ditto to hollow pillars *e e*; *f f*, standards carrying discs, one of which is stepped at *p* into lever-arm; *j*, armature of ditto; *i*, magnet; *h h*, armature actuated by *i i* magnets; *g g g g*, spindle of armature-break, and pinions actuating *f f*; *K*, box or base of lamp. Figure 2 shows only one pillar and standard; *a a*, discs at right-angles to each other; *b b*, reservoirs; *c c*, bevel-wheels; *d*, standard, stepped into lever-arm at *p*; *g*, lever-arm, actuated by magnet *h*; *i*, base of lamp. Fig. 3: *a a*, discs and standards; *b*, lamp or tube conveying hydrocarbon gas to point of contact at *c*. Fig. 4 shows more than one pair of discs. Fig. 5, cylindrical discs of carbon; *a a a*, cylinder, and top or end, carrying standard *b*; *c*, cross-arm, to keep cylinder steady. Fig. 6: plan of discs and reservoirs of fig. 1; set-screw, shown on fig. 1, at *m*.

And I do hereby, for myself, my heirs, administrators, and assigns, covenant with Her Majesty, and 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 than myself is the first and true inventor of the said invention, and that I will not leave 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 fifth day of August, one thousand eight hundred and eighty-two.

WILLIAM HENRY HARRISON.

This

Harrison's Bi-disc Electric Lamp.

This is the amended specification referred to in the annexed Letters of Registration granted to William Henry Harrison, this twenty-eighth day of September, A.D. 1882.

AUGUSTUS LOFTUS.

REPORTS.

Sir,

Sydney, 6 July, 1882.

We do ourselves the honor to report that we should have had no hesitation in recommending the registration of Mr. W. H. Harrison's Bi-disc Electric Lamp, in accordance with his drawings and specification, had he not attached thereto an application for the registration of claims that we consider inadmissible. We therefore suggest that Mr. Harrison be afforded an opportunity of revising his application.

We have, &c.,

E. C. CRACKNELL.
GOTHER K. MANN.

The Under Secretary of Justice.

Sir,

Sydney, 16 August, 1882.

We do ourselves the honor to report that we are of opinion the prayer of Mr. William Henry Harrison's Petition may now be granted, in terms of his revised specification and claim, transmitted for our further report, under your blank cover communication of the 5th instant.

We have, &c.,

E. C. CRACKNELL.
GOTHER K. MANN.

The Under Secretary of Justice.

[Drawings—one sheet.]

HARRISON'S DISCAL ELECTRIC LAMP.

Fig. 1.

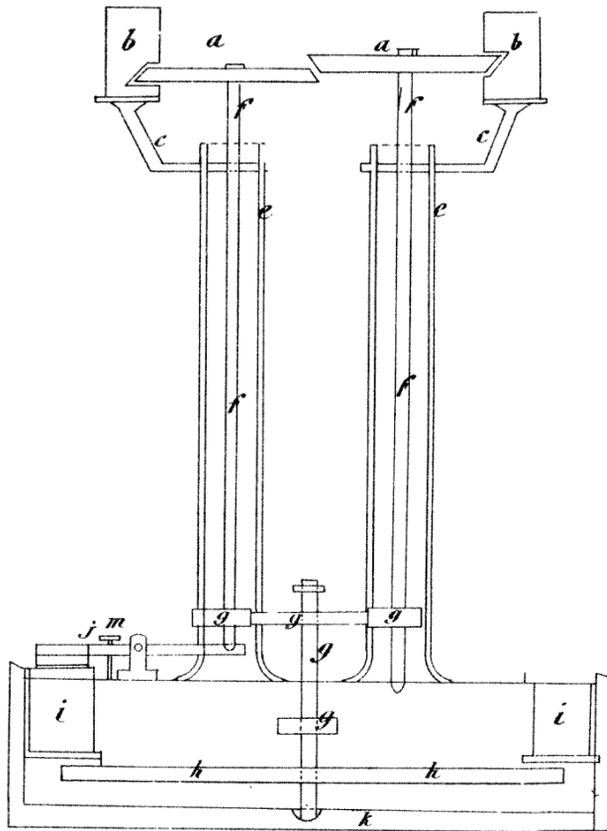


Fig. 2.

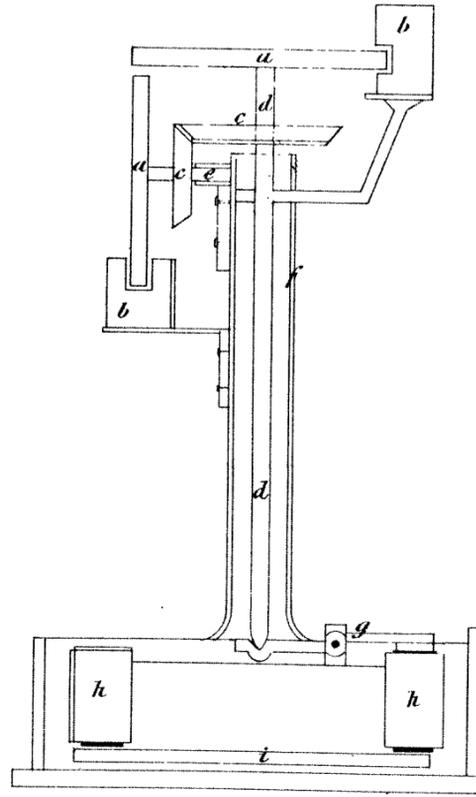


Fig. 3.

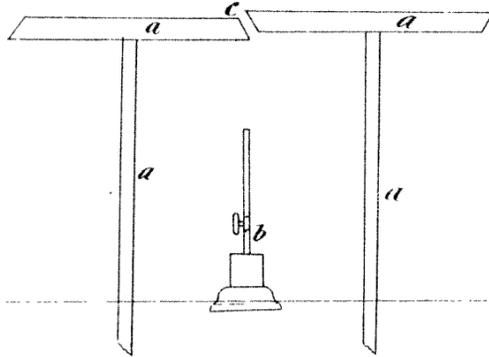


Fig. 5.

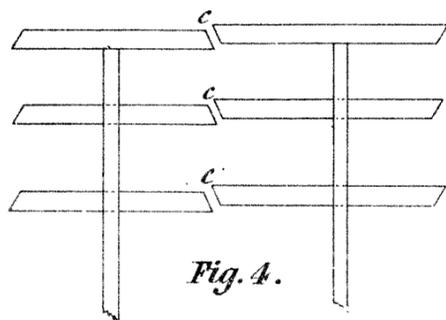
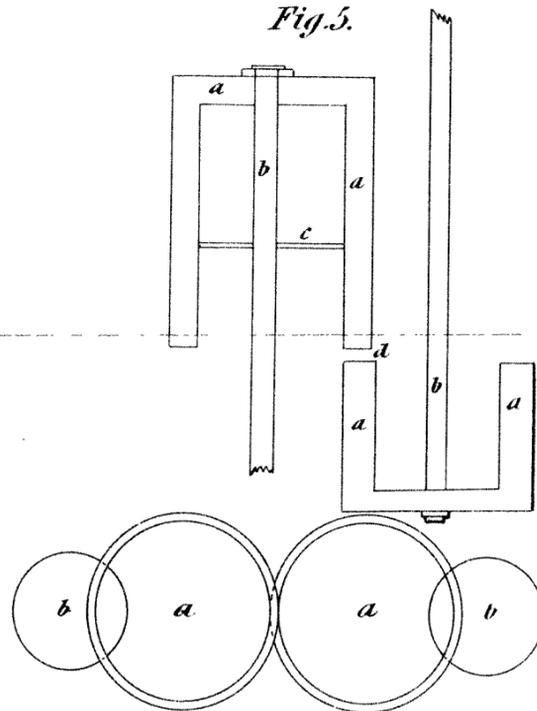


Fig. 4.

Fig. 6.

W. H. Harrison
Amended Specification.

*This is the Sheet of Drawings referred to in the annexed
Letters of Registration granted to William Henry Harrison
this 28th day of September, A.D. 1882.*

Augustus Loftus.



A.D. 1882, 3rd October. No. 1137.

AN IMPROVEMENT IN THE MANUFACTURE AND USE OF SULPHUROUS ACID.

LETTERS OF REGISTRATION to Léon Ehrmann, for an Improvement in the manufacture and use of Sulphurous Acid by a new apparatus.

[Registered on the 3rd day of October, 1882, 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 EHRMANN, of Port Louis, in the Colony of Mauritius, 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 "An improvement in the manufacture and use of Sulphurous Acid by a new 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 Leon Ehrmann, 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 Ehrmann, 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 Ehrmann 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 October, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

An Improvement in the manufacture and use of Sulphurous Acid.

SPECIFICATION accompanying an application for Letters Patent for "An Apparatus intended for the production and use of Sulphurous Acid," invented by LEON EHRMANN, chemist and manager of the Mauritius Engrais Chimiques Coy., of Port Louis, Mauritius.

THE apparatus, my invention, consists of three parts: a combustion chamber, an extractor of the products of combustion, and an apparatus for receiving these products.

These three parts of my apparatus, which will be described further on, may vary in form according to the work they have to perform, and may even be formed of portions of apparatus already in use in the arts; but the subject of my application is a new arrangement, intended to carry away, by means of a jet of steam, water, or any liquid (raw or defecated cane-juice or other liquid), the sulphurous vapours produced in the chamber, and force them into a receiver, either in the gaseous state in complete contact with liquids or bodies on which they are intended to act, or in a state of solution.

The apparatus may assume various forms, according to the kind of work it has to perform; for instance, the combustion chamber may act in conjunction with a worm or other condenser or receiver of any form, according as it may be desirable to obtain cold sulphurous acid vapours, a solution of sulphurous acid, or the absorption of sulphurous acid in any liquid, or even without worm, when it is considered advantageous to send the hot vapours into the liquid to be saturated.

COMBUSTION CHAMBER.

The combustion chamber may be formed of a furnace of any form; as an example, I will instance the following pattern:—It is composed of an outer shell, C C, made of metal, fire-brick, or any other suitable material. This outer shell contains a furnace, B, which may be supported in any suitable manner; the shell may be placed in a box or vessel, R R, which, being provided with an inlet and outlet pipe, can be filled with and traversed by a current of water or of the liquid to be acted upon, so as to prevent the over-heating of the furnace. The cover A A has an opening in its centre, which is provided with a conical tube, E, intended to carry the current of air into the surface of the burning sulphur contained in the furnace B. The aperture in this cover, by which sulphur is added to the furnace, is closed by a movable plate, F, by which the admission of air can be regulated. This apparatus is connected by a pipe with the extractor of the sulphurous vapours.

A prismatic or cylindrical cast-iron pan may be also used, into which the sulphur is introduced through an opening in the top, which can be closed by a plug.

In the front part of this pan is an air inlet, which can be opened or closed by means of a valve.

EXTRACTION OF THE VAPOURS.

The sulphurous vapours pass through the pipe T T¹ into the extractor. The combustion chamber is connected to this pipe either horizontally or vertically. The sulphurous vapours are drawn away by a jet of steam supplied by the pipe H, opening into the extractor opposite the outlet by which the vapours reach the receiver.

The steam pipe is provided with a cock to regulate the admission of steam, and may be also provided with a drain cock to draw off the condensed water. The tube H may have a nozzle, H¹, with one hole or several holes in the form of a rose, opposite to which is placed another nozzle, which forms the entrance of the discharge pipe.

RECEIVING APPARATUS.

This third part of the apparatus may be any form of condenser, either a worm or a closed vessel of any shape, where the steam and sulphurous acid are condensed and absorbed by any liquid which may be placed in this condenser.

The sulphurous vapours may be made to issue into a tank, reservoir, or channel, in which the sulphurous acid gas meets the liquid (cane-juice, raw or defecated, or any other liquid), which it is intended to submit to its action by a pipe drilled full of holes.

The extractor may also be applied to the sulphurous acid apparatus already in use, with a view of increasing their production.

Steam, which is used in the extractor to produce draught and forcing action, may be replaced by air or any other gas or liquid under pressure.

This apparatus, as a producer of sulphurous acid, may also be applied to the direct or indirect manufacture of sulphites or bi-sulphites, or to any other use where sulphurous acid or its compounds are applied.

If it be desirable to purify completely the sulphurous acid gas, a washer or purifying apparatus may be interposed between the sulphur furnace and the tank in which are placed the liquids to be treated. This purifying apparatus is so arranged that the impure sulphurous gas is forced through a layer of solid bodies or liquids, which retain mechanically or chemically the impurities which the gas carries over. I give as an example of the solids, fragments of lime or carbonate of lime, and of the liquids, water, either alone or holding in solution or suspension, lime or any other alkali.

The constructive arrangements of the gas-washer, which may also be placed in the cooling tank, may be of any suitable nature.

LEON EHRMANN,
(By his Attorney, R. A. JOSEPH).

This is the specification referred to in the annexed Letters of Registration granted to Léon Ehrmann, this third day of October, A.D. 1882.

AUGUSTUS LOFTUS.

An Improvement in the manufacture and use of Sulphurous Acid.

REPORT.

Sir, The application of Mr. Léon Ehrmann for Letters of Registration, for "An apparatus intended for the production and use of Sulphurous Acid," having been referred to us, we have examined the same, and have the honor to report that we see no objection to the issue of Letters of Registration in accordance with his specification and drawing.

Sydney, 28 August, 1882.

We have, &c.,

CHAS. WATT.

A. LEIBIUS.

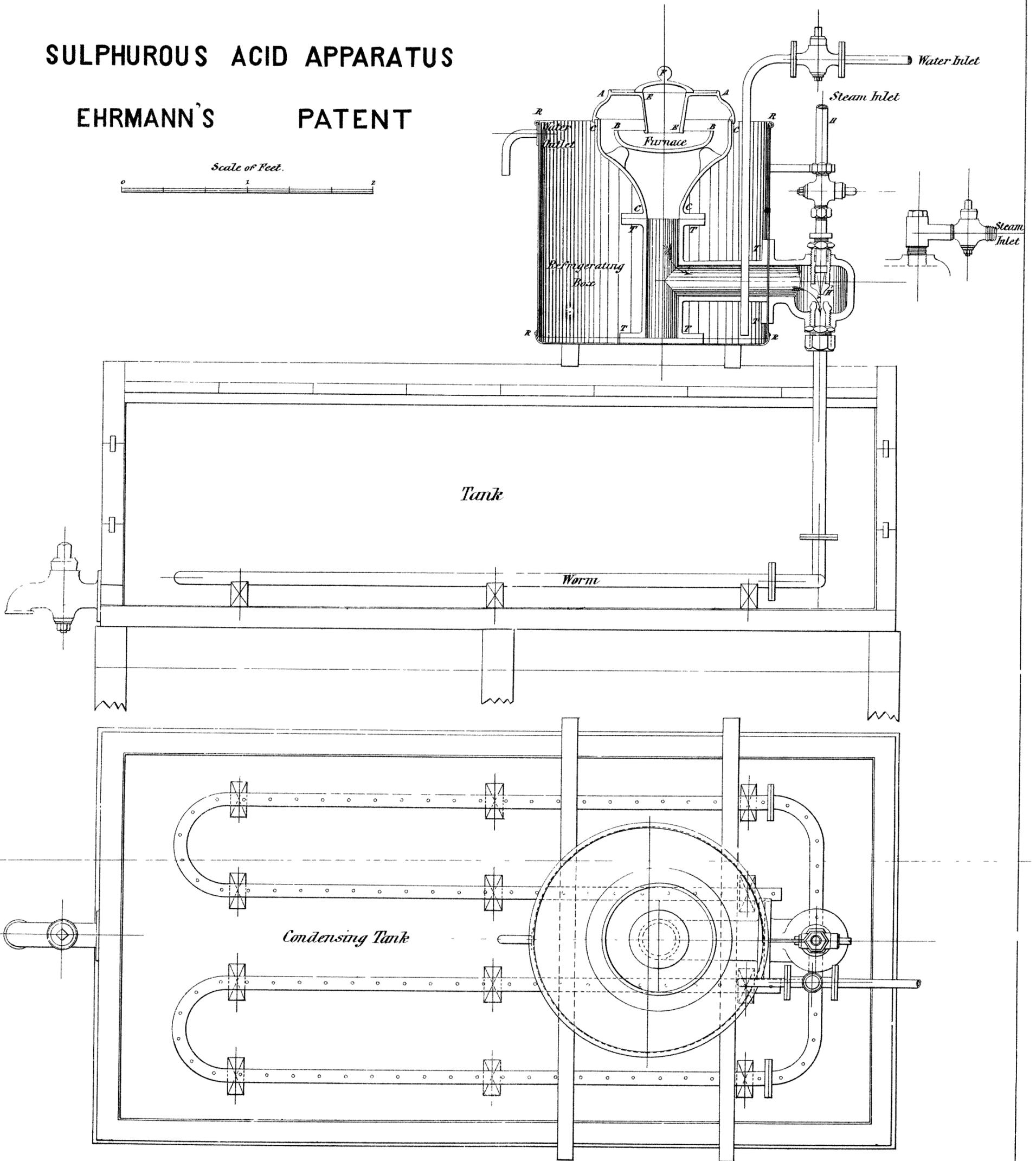
The Under Secretary of Justice.

[Drawings--one sheet.]

SULPHUROUS ACID APPARATUS

EHRMANN'S PATENT

Scale of Feet.



*This is the Sheet of Drawings referred to in the
 annexed Letters of Registration granted to
 Leon Ehrmann this third day of October A.D. 1882.
 Augustus Loftus*

Leon Ehrmann by W. A. W. Attorney



A.D. 1882, 3rd October. No. 1138.

IMPROVEMENTS IN BLASTING CARTRIDGES.

LETTERS OF REGISTRATION to Fritz Koenemann, for Improvements in
Blasting Cartridges.

[Registered on the 4th day of October, 1882, 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 FRITZ KOENEMANN, of "Kelso Cottage," Dawson-street, Ballarat, 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 "Improvements in Blasting Cartridges," 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 Fritz Koenemann, 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 Fritz Koenemann, 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 Fritz Koenemann 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 October, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

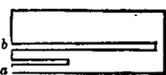
Improvements in Blasting Cartridges.

SPECIFICATION of FRITZ KOENEMANN, of "Kelso Cottage," Dawson-street, Ballarat, in the Colony of Victoria, merchant, for an invention entitled "Improvements in Blasting Cartridges."

It is well known that there are various chemicals which it would be exceedingly desirable to use as ingredients in explosive compounds, if it were not for the danger which attends their admixture with the other ingredients necessary to form such compounds. Such a chemical is chlorate of potash. Now by my invention I overcome this difficulty, and utilize all the valuable explosive properties of such an ingredient without incurring any risk of accidental explosion from its presence, the principle I adopt being its insulation from all the other ingredients with which it is mixed until the act of explosion. In some cases, however, as in the case of chlorate of potash, I add a little powdered white sugar to increase its inflammability, but even this may be omitted if desired, and the chlorate be used quite alone.

Putting this principle into practice, I reduce the following ingredients to powder and mix them together, preferably in the proportions stated, that is to say:—50 pounds of nitrate of soda; 23 pounds of nitrate of potash, Calcutta saltpetre; 10 pounds of wood charcoal; 5 pounds of coal-dust; 12 pounds of sulphur. I then provide a little water saturated with sugar, and with this I moisten the powdered mixture to a sufficient extent to reduce it to a proper condition for making into cartridges. Other explosive ingredients may be substituted for these, or their proportions may be altered, without departing from the nature and principle of my invention, but I prefer the above formula.

The cartridges I make of any shape or size, so long as provision is made first for the reception of the fuse, and second, for the ingredient to be insulated, such as chlorate of potash. I prefer to make them in

this shape  the shorter hole or socket *a* being for the fuse, and the longer one *b* for the

ingredient to be insulated. In order to preserve the insulation of the latter I put it into a glass tube, and when it takes the form of chlorate of potash I add to it about one-half its weight of powdered white sugar, in order to increase its inflammability. This tube must be tightly closed, to preserve the insulation of its contents, and is not put into position until after the other part of the cartridge has been pressed into shape and dried. The quantity of the insulated ingredients are quite matters of choice, depending upon their explosive capacities and upon the degree of strength which it may be desirable to impart to the explosive in order to suit the character of the rock to be blasted. In the case of chlorate of potash and white sugar, I prefer to make the socket which receives it about one-fifth of the diameter of the cartridge, to make the glass tube tightly fit it, and to fill it two-thirds with chlorate of potash and one-third with powdered white sugar. The cartridge thus made I wrap in water-tight materials, such as oil-cloth, or fit it into water-tight cases, leaving a hole in either case for the entrance of the fuse, as is well understood.

Cartridges thus made are free from the danger of premature explosion so commonly attaching to explosive compounds in which chlorate of potash (or one of its substitutes as hereinbefore explained) is present, and are yet possessed of all the advantages derivable from its presence.

Having thus described the nature of my invention, and the manner of putting it into practice, I would have it understood that I am aware there is nothing new in the combination of ingredients mentioned above, and of which my cartridges are made, but that the essential novelty lies in the method of combining them. I therefore claim as my invention—

First—The special method herein described of combining chlorate of potash or its substitutes, as hereinbefore explained, with other explosive ingredients in the manufacture of blasting cartridges, that is to say, upon the principle of insulating the chlorate of potash or its substitutes from the other ingredients until the act of explosion.

Second—The special method of insulating, herein set forth and described, that is to say, in a tight glass tube running nearly the whole length of the cartridge.

In witness whereof, I the said Fritz Koenemann have hereto set my hand and seal, this eighth day of August, one thousand eight hundred and eighty-two.

Witness—

J. CLAYTON, J.P.

FRITZ KOENEMANN.

This is the specification referred to in the annexed Letters of Registration granted to Fritz Koenemann, this third day of October, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

The application of Mr. Fritz Koenemann for Letters of Registration for an invention entitled "Improvements in Blasting Cartridges," 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.,

JAMES BARNET.
EDMUND FOSBERY.

The Under Secretary of Justice.

Sydney, 28 August, 1882.



A.D. 1882, 6th October. No. 1139.

**IMPROVEMENTS IN CURRENT-GOVERNORS FOR DYNAMO-ELECTRIC
MACHINES.**

LETTERS OF REGISTRATION to The Brush Electric Light and Power Company of Australasia (Limited), for Improvements in Current-governors for Dynamo-electric Machines.

[Registered on the 6th day of October, 1882, 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 BRUSH ELECTRIC LIGHT AND POWER COMPANY OF AUSTRALASIA (Limited), of London, in England, hath by its Petition humbly represented to me that it is 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 Current-governors for Dynamo-electric Machines," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed ; and that 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 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 said Brush Electric Light and Power Company of Australasia (Limited), its successors 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 Brush Electric Light and Power Company of Australasia (Limited), its successors 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 Brush Electric Light and Power Company of Australasia (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 sixth day of October, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Current-governors for Dynamo-electric Machines.

SPECIFICATION of THE BRUSH ELECTRIC LIGHT AND POWER COMPANY OF AUSTRALASIA, (Limited), of London, in England, for "Improvements in Current-governors for Dynamo-electric Machines."

REFERRING to the drawings—figure 1 shows modifications of and additions to old devices; figure 2 shows a form of apparatus wherein a pile of carbon plates, H, or similar resistance, is employed in a manual apparatus; figure 3 represents present device as connected and applied to a dynamo-electric machine.

In figure 1 of the drawings, H H are piles of carbon or other suitable plates, enclosed loosely within glass or other insulating supports. The piles rest upon blocks of carbon or metal electrically connected, carried by a bar of wood or metal, which is pivoted to and supported by the lever D. The upper ends of the insulating tubes are loosely closed by plugs of carbon or metal, supported by the frame of the apparatus, and insulated from each other. The supports enclosing the piles H may be of metal (to absorb and radiate the heat generated) lined with mica or other insulator.

The magnet helix E consists of two separate coils of wire, one located in the shunt circuit, the other in the main circuit, both as shown.

Within the helix E is a movable iron core, pivoted to the lever D. This lever, pivoted at one end, as shown, also carries a movable and therefore adjustable weight, c. The free end of the lever D also carries the body of a dash-pot, F, and a thumb-screw, d, by which the downward movement of the lever is adjusted. The piston of the dash-pot F is attached to the framework of the apparatus by means of its rod, as shown, and is provided with a valve opening downward. When the dash-pot is filled with glycerine, or other suitable liquid, its piston and valve allow the lever D to move downward freely, but retard its upward movement.

The operation of the whole device is as follows:—The binding posts *p n* forming the terminal of the shunt circuit are connected with the field magnets of a dynamo-electric machine. The course of the shunt circuit is then from the post *p* through to the piles H H, outer portion of helix E, to post *n*. The binding posts P N are put in the main or working circuit of the machine, in such a manner that the main current shall pass through the helix E in the same direction as the shunt current. The weight *c* is so adjusted that, when the machine is working to its full capacity, and the normal working current is passing through its portion of the helix E, the enclosed iron core, lifted by the axial magnetism developed in the helix, shall just sustain the lever D and parts connected therewith, while subjecting the piles H to little or no pressure. Since, in this condition of affairs, the piles H perform no function, the circuit through them may be entirely broken by dropping the lever D sufficiently. This, however, is not essential. The office of the thumb-screw *d* is now apparent. If now the resistance of the working circuit of the dynamo-machine be lessened from any cause, the current will be correspondingly increased in the helix E, and the enclosed core will be drawn upward, raising the lever D, and subjecting the resistance-piles H to a pressure corresponding to the increase of current in the main circuit; current will then be shunted from the field magnets of the dynamo-machine until the main current is reduced to nearly its original strength. Some increase of current strength is however required, in order to maintain a suitable pressure in the piles H H. It is in order to render this necessary excess of main current as small as possible that the shunted current is made to pass through a portion of the helix E. The shunted current thus assists in maintaining a suitable pressure on the resistance-piles H H, and the apparatus is thereby enabled to respond to very much smaller variations in the strength of the main current than it otherwise could do. When the carbon poles H H are subjected to pressure, their conducting power increases less rapidly than the pressure applied; hence the apparatus is not liable to get into the condition of "unstable equilibrium."

The office of the dash-pot F has been already described, but the function of the valve in its piston has not been indicated. Suppose a number of voltaic arc lamps are operated in the main circuit, and the latter, as often occurs in practice, becomes for an instant broken, then, owing to the valve in the piston rod of the dash-pot, the lever D drops at once and the shunt resistance increases, so that when the carbons in the lamps have come together and completed the main circuit again, the full power of the dynamo-machine will be available to separate the carbons in the lamps, and owing to the slow upward motion of the lever D allowed by the dash-pot, sufficient time is given for the carbons in the lamps to become fully separated before the shunt can act; but if the lever D had not been allowed to fall materially during the instant the main circuit was broken, the abnormally great current developed when the circuit was closed, and before the carbons in the lamps had time to separate, would further raise the lever D and unfit the dynamo-machine for developing its normal current. An appreciable length of time would then be required for the resistance apparatus and the lamps to again adjust themselves. Again, if the resistance of the main circuit is suddenly increased, the valve in the dash-pot allows the lever D to fall at once, and thus the dynamo-machine is quickly adapted to the new condition of circuit.

Figure 2 shows a method whereby a pile of carbon plates H, or similar resistance, may be employed in a manual apparatus. Pressure is applied to the pile by means of a screw actuated by the lever D, as shown. This lever moves over a graduated circle, and acts as an index of the pressure applied to the carbon pile H, so that a pressure suitable for a given condition of external resistance having been once determined, it may be found again without experiment.

A spring, S, may be interposed between the screw and the pile, as shown, to allow greater movement of the screw than might otherwise be admissible.

CLAIMS.

First—In a current-governor constructed to operate in connection with a dynamo-electric machine, an electro-magnet excited by two helices, one helix included within the main circuit, and the other within a shunt circuit, within which said shunt circuit is placed an adjustable resistance, substantially as shown.

Second—The combination in an electric current-governor of an adjustable or variable resistance mechanism, to vary said resistance, substantially as specified, and a dash-pot or equivalent for modifying the motion of said resistance-varying mechanism, substantially as shown.

Third—

Improvements in Current-governors for Dynamo-electric Machines.

Third—In a current governor constructed to operate in connection with a dynamo-electric machine, as shown, a dash-pot or any equivalent device or mechanism that shall interpose a retarding influence or action in one direction only, substantially as shown.

Fourth—In a current governor constructed to operate in connection with a dynamo-electric machine an arm or lever D in combination, first, with an adjustable resistance constructed to be varied through the movement of said lever; second, with an electric magnet, through the influence of which motion is imparted to said arm or lever; and third, with any suitable mechanism (such as the dash-pot or its equivalent) for governing or modifying the movements of said arm or lever, substantially as shown.

Fifth—In a current governor constructed to operate in connection with a dynamo-electric machine, two or more resistance piles H or their equivalents, electrically-connected in series, and a device associated with each pile for varying its electrical resistance, substantially as shown.

This is the specification referred to in the annexed Letters of Registration granted to The Brush Electric Light and Power Company of Australasia, (Limited), this sixth day of October, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

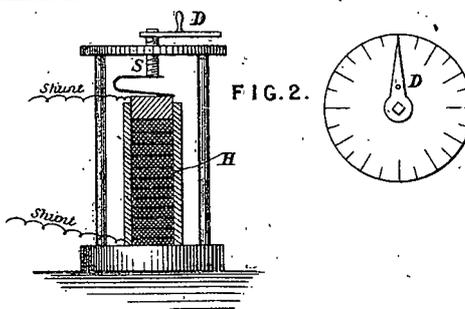
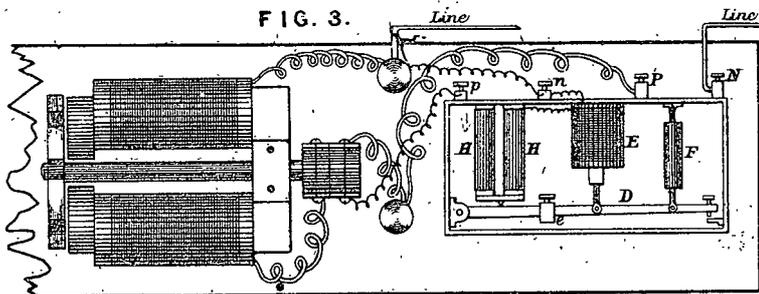
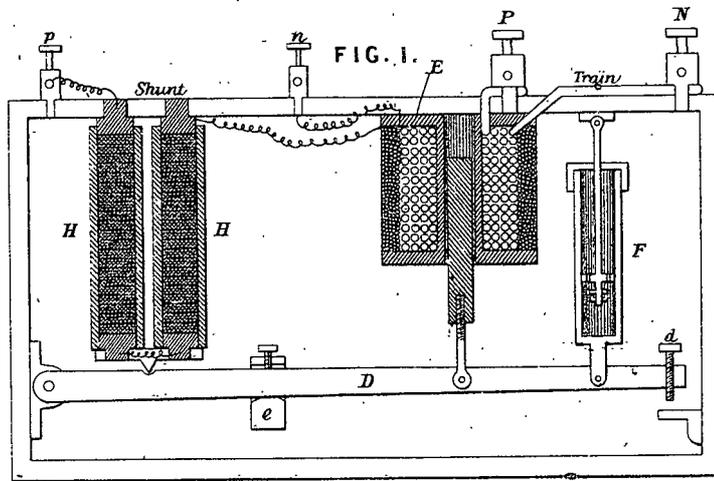
We do ourselves the honor to state that we are of opinion the prayer of the Petition of The Brush Electric Light and Power Company of Australasia, for the registration of an invention entitled "Improvements in Current-governors for Dynamo-electric Machines," may be granted, in terms of the specification, drawings, and claim, transmitted for our report, under your blank cover communication of the 17th instant, No. 9,749.

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 The Brush Electric Light and Power Company of Australasia Limited this sixth day of October A.D. 1882.

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

Augustus Loftus.

Sig. 875.



A.D. 1882, 6th October. No. 1140.

IMPROVEMENTS IN REFLECTORS.

LETTERS OF REGISTRATION to The Brush Electric Light and Power Company of Australasia (Limited), for Improvements in Reflectors.

[Registered on the 6th day of October, 1882, 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 BRUSH ELECTRIC LIGHT AND POWER COMPANY OF AUSTRALASIA (Limited), of London, in England, hath by its Petition humbly represented to me that it is 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 Reflectors," which is more particularly described in the amended specification and the sheet of drawings which are hereunto annexed; and that 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 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 said Brush Electric Light and Power Company of Australasia (Limited), its successors 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 Brush Electric Light and Power Company of Australasia (Limited), its successors 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 Brush Electric Light and Power Company of Australasia (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 sixth day of October, in the year of our Lord one thousand eight hundred and eighty-two.

[L.s.]

AUGUSTUS LOFTUS.

Improvements in Reflectors.

SPECIFICATION of THE BRUSH ELECTRIC LIGHT AND POWER COMPANY OF AUSTRALASIA (Limited), of London, in England, for "Improvements in Reflectors."

REFERRING to the drawings—figure 1 represents a front quarter view of improved reflector; figure 2, a side elevation of same; figure 3, a plan view of same; figure 4, a view similar to that shown in figure 1, illustrating a modified form of invention; figure 5 is a plan view of the device shown in figure 4; figure 6, a front view of the said modified device; figure 7, a view of device in side elevation, showing the position and relation of the cut-off plates; figure 8, a front view of the device shown in figure 7; figure 9, a combined section and plan view of the same, showing the shape of the cut-off plates; figure 10 is a cross section through the axis of an ordinary parabolic reflector provided with a device for carrying out the invention; figure 11 shows a front view of the same; figure 12 shows a shallow spherical reflector provided with a device for accomplishing the desired result; figures 13 and 14 show modified forms of construction.

As sufficiently indicated in the drawings, the reflector combines the characteristics of a cylinder and parabola, such as could be produced by curving a flat sheet of metal to the form of a parabola, as shown in figures 1 and 2. When the light is placed in the focus of this parabola, the reflector will be in the form substantially of a horizontal sheet extending through an arc of 180 degrees, more or less, according to the adjustment or peculiar construction of the reflector. This is indicated in figures 2 and 3 of the drawings, which show the direction of the light rays.

In the form of reflector shown in figures 1, 2, and 3, the illuminating carbons will cast their shadow, and where this would be undesirable, the modified form illustrated in figures 4, 5, and 6 may be adopted. This modification consists merely in constructing the back of the reflector in an angular fashion, as shown in figures 4, 5, and 6, instead of straight, as shown in figures 1 and 3.

Cut-off plates A are provided. They are held by any suitable supports in substantially the position and relation indicated in the drawings.

In figure 2, which shows these cut-off plates omitted, it will be seen how the direct rays of light diverge in front of the reflectors, and figure 7 illustrates how these rays are cut off by the provision of the cut-off plates A. These plates, in order to intercept no more rays than desirable, should have a form substantially as shown in plan view in figure 9, but this form will vary with different curves given the reflector to accord with reflectors of varying depths.

The shape of the edges *a* should conform suitably with the definite parabolic curve imparted to the reflecting surface, as these edges of the plates A intercept the direct lateral rays.

The front edge *a* may be made circular in form, and this will intercept the direct rays that would escape beyond the upper and lower front edges of the reflector, which are straight.

If it is desired to intercept the light rays in one direction only, then a single cut-off plate, say the upper one, will be sufficient to arrest the rays in that direction.

B, figures 10 and 11, is a parabolic reflector, provided with openings in the usual manner, through which the carbons *b b* of an electric lamp pass, uniting at or near the focus *e* of the reflector.

C is a tube of thin metal, open at both ends, and having its axis co-incident with the axis of the reflector. This tube is placed sufficiently near the luminous point to obstruct the cone of light *d f*, which would otherwise issue unreflected from the parabola, but not sufficiently near to intercept rays of light which would fall within the reflector.

The tube C may be supported in position by any suitable means, one method being shown in the figures.

Figure 12 shows a device adapted to a shallow reflector. Here the tube C necessarily extends slightly back of the carbons, and is provided with suitable openings through which the carbons pass, as shown.

The tube C should not have a reflecting surface inside, because if reflecting the cone of light entering it will after several reflections emerge as the same cone diminished in intensity, however, by the reflections it has undergone.

Figure 13 shows a disc *c*, substituted for the tube C, figure 1.

Figure 14 shows a disc and tube *i*, substituted for the tube C, figure 3.

CLAIMS.

First—A reflector having a concave face, such as would have been formed by bending a flat sheet, substantially as shown, so that it would have in cross section the form of a parabola.

Second—The combination with a reflector having a concave face, such as would be formed by curving a flat sheet in one direction only of one or more cut-off plates A, suitably shaped to accord with the curve of said reflector, substantially as and for the purpose shown.

Third—The combination with a concave reflector of a cut-off tube, having a non-reflecting inner surface, said tube located in such proximity to the light or flame as to intercept and cut off the direct rays of light, substantially as shown and described.

This is the amended specification referred to in the annexed Letters of Registration granted to The Brush Electric Light and Power Company of Australasia (Limited), this sixth day of October, A.D. 1882.

AUGUSTUS LOFTUS.

REPORTS.

Improvements in Reflectors.

REPORTS.

Sir,

Sydney, 2 August, 1882.

We do ourselves the honor to report, in reply to your blank cover communication of the 28th ultimo, No. 8,797, that the Brush Electric Light and Power Company's Petition for the registration of "Improvements in Reflectors and in Current-governors for Dynamo-electric Machines," specifies no distinct matters; and as such combined specifications tend to complicate the recorded detail of inventions, we suggest that the applicants be requested to revise their specifications, inasmuch as that the portion pertaining to Reflectors, set forth in No. 1 sheet of drawings, &c., and claims Nos. 1, 2, and 3, form a distinct registration from that portion relating to Current-governors in connection with "Dynamo-electric Machines," as set forth on sheet No. 2 of drawings, &c., and claims 4, 5, 6, 7, and 8. With this revision we are of opinion the registration might be granted.

We have, &c.,

E. C. CRACKNELL.
GOTHEB K. MANN.

The Under Secretary of Justice.

Sir,

Sydney, 22 August, 1882.

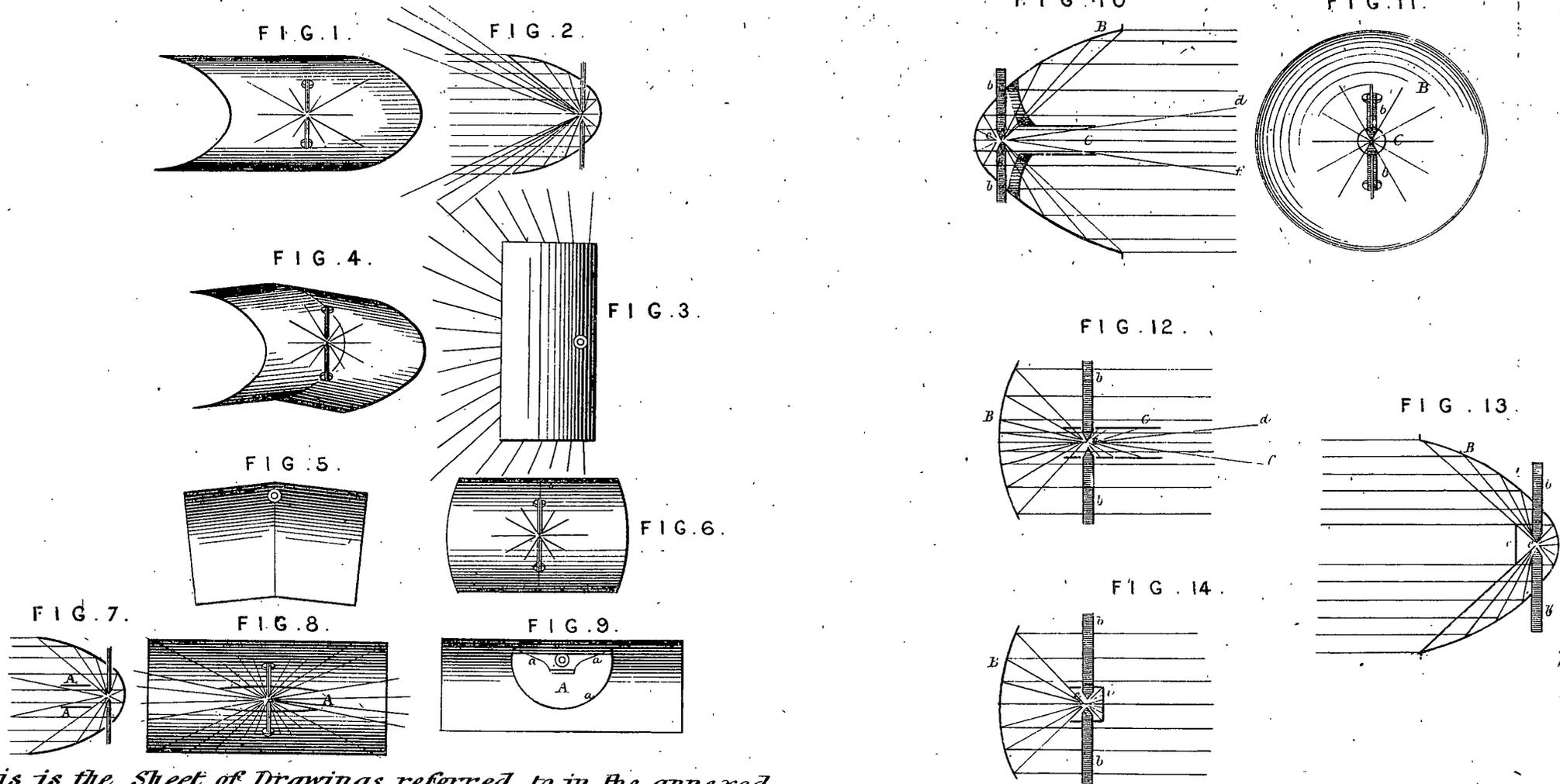
We do ourselves the honor to state that we are of opinion the prayer of the Petition of the Brush Electric Light and Power Company of Australasia, for the registration of an invention entitled "Improvements in Reflectors," may be granted, in terms of the specification, drawings, and claim transmitted for our report, under your blank cover communication of the 17th instant, No. 9,751.

We have, &c.,

E. C. CRACKNELL.
GOTHEB 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 "The Brush Electric Light and Power Company of Australasia Limited," this Sixth day of October, A.D. 1882.

(875-)

Augustus Loftus.



A.D. 1882, 6th October. No. 1141.

RUTHERFORD'S ELECTRO-PLATED GOLD-SAVER.

LETTERS OF REGISTRATION to James Rutherford, for an invention entitled
 "Rutherford's Electro-plated Gold-saver."

[Registered on the 7th day of October, 1882, 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 RUTHERFORD, of Bathurst, in the Colony of New South Wales, coach proprietor, hath by his Petition humbly represented to me that he is the assignee of one William Roberts, who is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Rutherford's Electro-plated Gold-saver," 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 James Rutherford, 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 Rutherford, 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 Rutherford 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 sixth day of October, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Rutherford's Electro-plated Gold-saver.

SPECIFICATION.

TO ALL TO WHOM THESE PRESENTS SHALL COME: I, JAMES RUTHERFORD, of Bathurst, in the Colony of New South Wales, coach proprietor, 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 "Rutherford's Electro-plated Gold-saver"; 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:—

Such invention is for an improved coating for metallic plates used in mining crushing batteries, and for further extraction and saving of gold obtained from the ore, and is performed and perfected as follows:—

1. Upon the copper or other metal plates in use in batteries for gold-mining purposes I place, in the usual way of electro-plating, a silver surface of any thickness.
2. On the surface so silvered I spread quicksilver in the usual way, and as formerly applied on the copper.
3. The object of this improvement upon the battery plates used in gold-mining operations is practical application of the discovery that water passing over such electro-plate induced an electric current, which adds greatly to the assistance of the mercury in saving gold.

I claim as novelty in this my invention—the electro-plating of the metallic plates with silver previously to giving same a surface of quicksilver; and for that novelty I claim the utility of increased gold, &c., saved thereby.

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 introducer 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.

In witness whereof I have hereunto set my hand and seal, this twentieth day of June, one thousand eight hundred and eighty-two.

J. RUTHERFORD.

Signed, sealed, and delivered by the said }
James Rutherford, in the presence of— }

JAS. HINGSTON,
Notary, &c., Melbourne.

This is the specification referred to in the annexed Letters of Registration granted to James Rutherford, this sixth day of October, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 13 July, 1882.

The application of Mr. James Rutherford, for Letters of Registration for an invention called "Rutherford's Patent Electro-plated Gold-saver," having been submitted to us, we have the honor to state that we see no objection to the issue of Letters of Registration, but deem it our duty to call the attention of the legal authorities to the fact that Mr. Rutherford describes himself as the "inventor" in his Petition, and as "introducer" in the specification, the word "inventor" having evidently been scratched out in the latter.

We have, &c.,

A. LEIBIUS.
CHAS. WATT.

The Under Secretary of Justice.



A.D. 1882, 13th October. No. 1142.

IMPROVEMENTS IN WATER-WHEELS AND PADDLE-WHEELS.

LETTERS OF REGISTRATION to Augustus Figge, for Improvements in Water-wheels and Paddle-wheels.

[Registered on the 13th day of October, 1882, 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 AUGUSTUS FIGGE, of No. 14, Baker-street, in the county of Middlesex, 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 Water-wheels and Paddle-wheels," 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 Augustus Figge, 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 Augustus Figge, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and until 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 Augustus Figge 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 October, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Water-wheels and Paddle-wheels.

SPECIFICATION of AUGUSTUS FEGEE, of No. 14, Baker-street, in the county of Middlesex, England, civil engineer, for an invention entitled, "Improvements in Water-wheels and Paddle-wheels."

THIS invention has for its object improvements in water-wheels and paddle-wheels.

The purpose which I have in view is more especially to obtain motive-power from the flow of water in rivers by means of water-wheels of peculiar construction, carried upon floats, floating structures, or otherwise. The motive-power can be advantageously applied in pumping water for irrigation, and in generating electricity to be applied to operate ploughs, or for other purposes. My improved wheel can also be used as a propeller.

The wheel is provided with floats analogous to those of an ordinary paddle-wheel, but they are free to turn upon axes or pivots. They are weighted so as to preponderate slightly one side over the other, and tend consequently to assume a vertical position.

I make the floats of large area, and in order to secure lightness I form them of rectangular frames of iron tube covered with canvas, or they may be of other suitable shape and material.

Each pivot or axis is provided with a short cross-head, armed at its extremities with small wheels or pulleys, to lessen friction against the guides by which the floats are controlled. There are two guides, one on either side of the wheel. Each consists of a fixed plate formed to the curvature of the wheel, and extending around it or around the lower half of it. The plate is provided along its edges with inwardly-directed flanges. The cross-heads upon the pivots or axes of the floats enter between the flanges of the guides, at about the level of the main axis, and before the floats enter the water. The flanges are here at a distance apart exceeding the length of the cross-heads, so that the friction-wheels or pulleys do not at once come into contact with the guide flanges. In descending, however, the flanges approach each other, and when the float is directly under the axis of the wheel, in the most efficient position to be acted upon by the stream, it is controlled by parts of the flanges, which are so close together that there is but just room for the friction-wheels or pulleys of the cross-head to pass between them, and consequently the float is compelled to retain its vertical position. But nearly to this point the distance between the guide-flanges is such that a certain freedom is left to the float to admit of its accommodating itself to the stream in entering and leaving the water, so that it may do so with as little disturbance and expenditure of power as is possible.

The guides may consist of rails fixed against the sides of the pontoon or floating structure.

In some cases, in place of providing the axes or pivots of the floats with cross-heads, I provide simple arms carrying but one friction-wheel or pulley, which works in a guide-course set eccentrically to the axis of the wheel. This is the form which is most suitable when the wheel is used as a propeller.

The water into which the floats of the wheel dip is contained in a watercourse, which is closed on both sides and at the bottom. This is the case both with water-wheels and paddle-wheels or propellers.

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 sectional side elevation, and figure 2 is a front elevation of a stream-wheel constructed according to my invention. Similar wheels may be used as propellers.

A is the main shaft, upon which the wheel is mounted, and through which the power is conveyed to the machinery which it is intended to drive; B B are the bearings of the main shaft upon the pontoon or barge, or other structure; C C are the arms and rings which compose the framework of the wheel; D D are the floats held by their pivots D' D' to the outer rings or periphery of the wheel. The floats are so weighted or hung that they tend to assume a vertical position. E E are cross-heads upon the pivots, and E' E' wheels or pulleys, with which the cross-heads may be provided to reduce friction. F F are the fixed guide-plates on either side of the wheel, and F' F' their flanges by which they act upon the wheels or pulleys E' E' and control the floats. The guides do not interfere with the floats so long as they maintain the vertical position which the preponderance of their lower ends tends to bring about, but the guides prevent any deviation from this position at the time when the floats pass beneath the shaft and are in efficient action. In this arrangement there is very little friction in the guides. Figures 3 and 4 show the arrangement in which, in place of the cross-heads E E, there are arms, E* E*, each carrying a single friction-wheel or pulley.

A corresponding alteration is made in the form of the guide-course.

When I mount my wheels upon floating pontoons, the arrangement which I adopt is that indicated by the figures 5 and 6. Figure 5 shows to a small scale a transverse section of the pontoon, and figure 6 shows an horizontal section. As will be seen, the wheel works in a watercourse which is provided through the body of the pontoon, and this watercourse is bounded at the bottom and sides by compartments, which give buoyancy to the structure.

The entrance to this watercourse and the exit from it are widened out so as, on the entrance side, to lead the water in, and, on the exit side, to deliver this water with as little disturbance as possible. With the same objects I also provide at each end of the pontoon a hinged platform, which, when raised, closes the mouth, but when lowered forms a continuation of the bottom. This platform also is provided with sides forming continuations of the fixed sides of the mouth, and increasing the width of the opening.

Where great regularity of motion is required, as when using dynamo-electric machines for electric light, I arrange the wheels to work pumps, raising water into elevated tanks upon the pontoon, and from these tanks I draw water to actuate turbines which drive the dynamo-electric machines.

I arrange the dynamo-electric machines vertically, so that they may more readily be driven from the vertical shaft of the turbine.

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 improved water-wheel or propeller, in which the floats preponderate on one side of the pivots and tend to set themselves vertically, and are so held and kept by guides when in position for efficient action, substantially as described.

Second—

Improvements in Water-wheels and Paddle-wheels.

Second—My improved water-wheel or propeller, with floats working in a watercourse which is closed at the sides and at the bottom, substantially as described and represented in the annexed drawings.

Third—The improved water-wheels or propellers; substantially as described and represented in the annexed drawings.

In witness whereof, I the said Augustus Figge have hereunto set my hand and seal, this seventh day of June, 1882.

AUGUSTUS FIGGE.

This is the specification referred to in the annexed Letters of Registration granted to Augustus Figge, this thirteenth day of October, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 31 August, 1882.

In reply to your communication of the 26th instant, we have the honor to report that we have examined Mr. Augustus Figge's plans and specifications for improvements in water-wheels and paddle-wheels, and see no reason why his application should not be granted.

We have, &c.,

FRANCIS HIXSON.
H. BRODERICK.

The Under Secretary of Justice.

[Drawings—one sheet.]

Fig. 1.

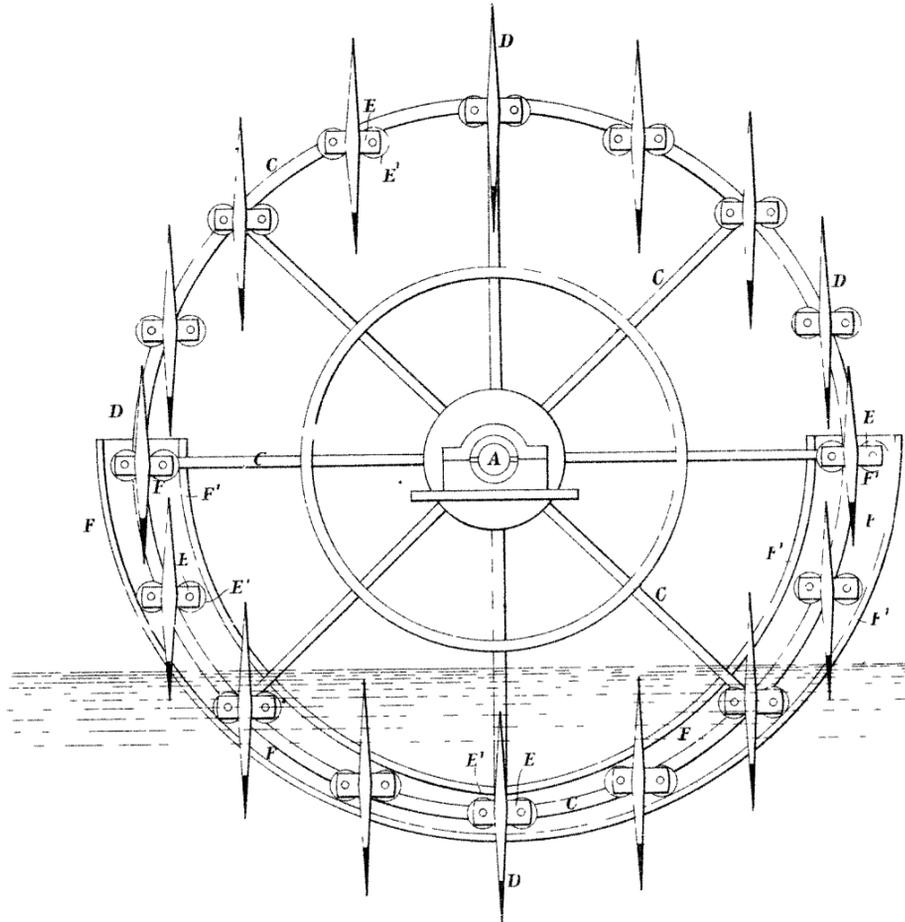


Fig. 2.

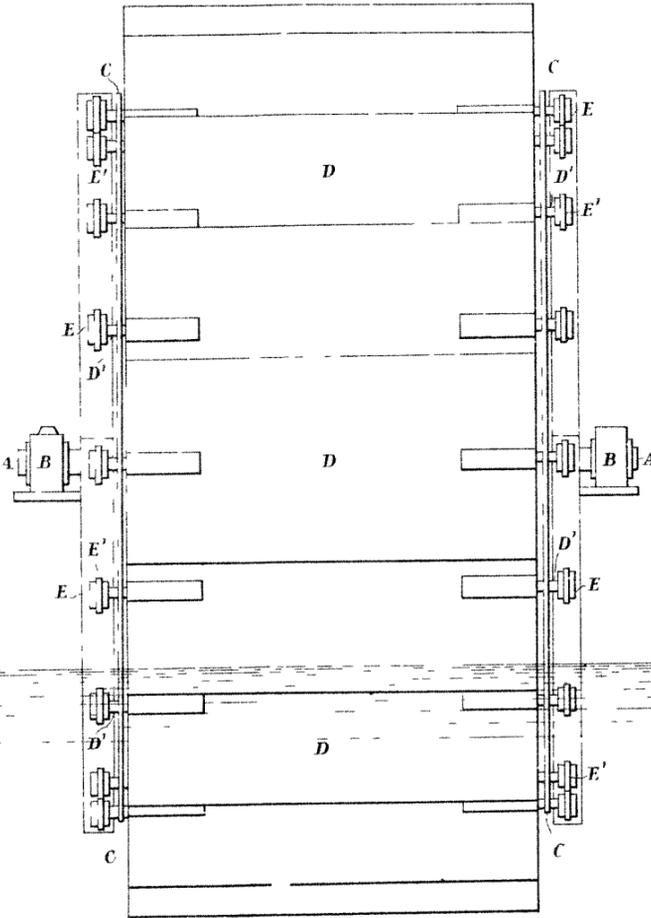


Fig. 3.

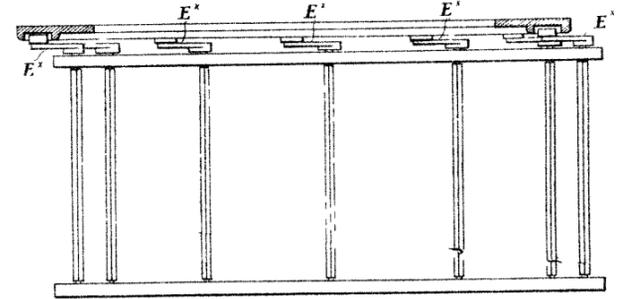


Fig. 4.

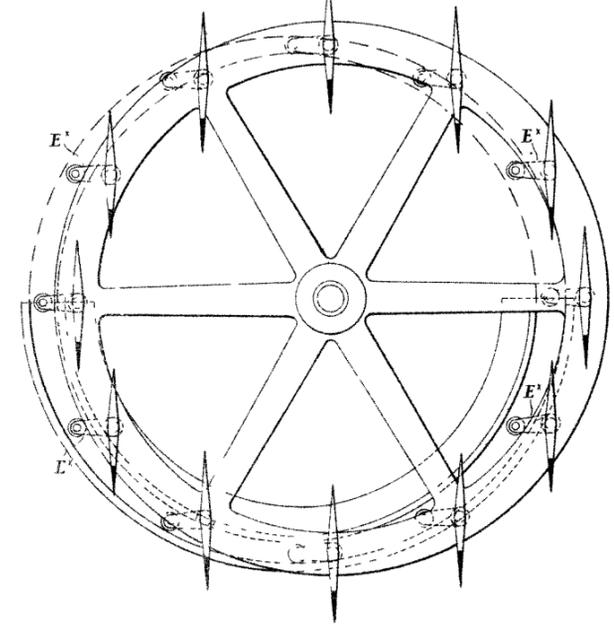


Fig. 5.

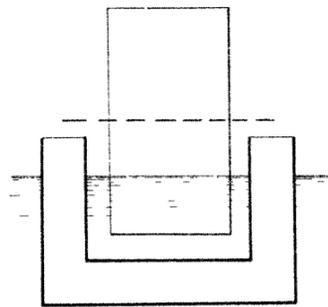
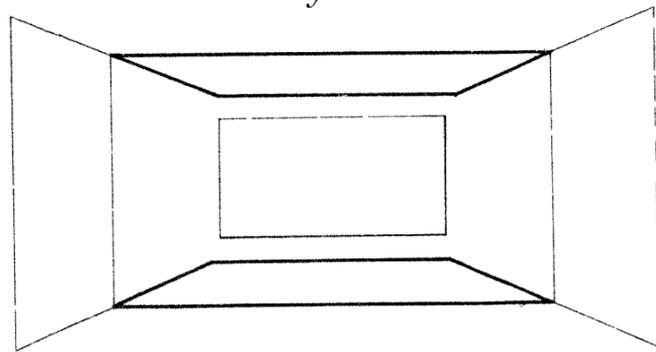


Fig. 6.



This is the Sheet of Drawings referred to in the annexed Letters of Registration granted to Augustus Figge, this thirteenth day of October, A. D. 1882.

Augustus Loftus.



A.D. 1882, 18th October. No. 1144.

IMPROVEMENTS IN PLOUGHS AND OTHER TILLING IMPLEMENTS.

LETTERS OF REGISTRATION to James Howard and Edward Tenney Bousfield,
for Improvements in Ploughs and other tilling instruments.

[Registered on the 18th day of October, 1882, 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 HOWARD, of Bedford, in the County of Bedford, agricultural engineer, and EDWARD TENNEY BOUSFIELD, of the same place, engineer, 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 Ploughs and other tilling implements," 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 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 Howard and Edward Tenney Bousfield, 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 Howard and Edward Tenney Bousfield, 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 Howard and Edward Tenney Bousfield 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 eighteenth day of October, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Ploughs and other tilling implements.

A.

SPECIFICATION of JAMES HOWARD, of Bedford, in the county of Bedford, agricultural engineer, and EDWARD TENNEY BOUSFIELD, of the same place, engineer, for an invention entitled "Improvements in Ploughs and other tilling implements."

OUR improvements in ploughs and other tilling implements relate, firstly, to that class of implements in which a brake or brakes on one or both of the travelling wheels is employed for lifting the shares or tines out of the ground, and consists in a novel mode of mounting the land wheel of single or multiple ploughs for the purpose of facilitating its adjustment, and also in novel means for adjusting the depth of working, and for applying the brake or brakes for locking the travelling wheels to the crank shaft.

The invention relates, secondly, to a novel arrangement of plough which is capable of being used either as a two or a three furrow plough, its frame being composed of readily detachable beams.

In sheet I of the accompanying drawings, figure 1 is a plan view, and figure 2 a side elevation of a two-furrow plough, upon which the attendant ordinarily rides, to which an adjustable land wheel is adapted according to our invention.

In these figures, A A¹ are the travelling wheels, which run loosely upon studs firmly secured to arms, B B¹, carried by the shaft C, and thus forming virtually parts of the crank shaft C.

The arm B on the land side has a sliding motion in sockets formed on one end of the main axle C. This sliding action is performed by a screw, D, worked by a handle, E, under the control of the driver, from his seat, and serves to raise or lower the land wheel, by lengthening or shortening the crank arm upon which the wheel stud is fixed. The arm B¹ carrying the furrow wheel is securely fixed to the other end of the shaft C. This shaft, which supports the plough, is attached to its frame by suitable bearings, G G, and in these bearings it is free to turn. Upon the end of the shaft C, extending beyond the arm B¹, as at H, a lever, I, is pivoted, one arm of which is a lever within reach of the driver's hand; the other arm, P, forms a brake that on pulling up the hand lever is brought to bear upon the rim of the adjacent travelling wheel A¹.

Affixed to the arm B¹ is a sector, L, which carries an adjustable stop, K, for determining the amount of depression to be given to the plough-frame.

When the plough is in work, the crank arms B B¹ are in the position shown by drawn lines, that is, inclined towards the ground, and they are retained in this position by the stop K coming in contact with the bearing G.

When it is desired to raise the plough out of work, the attendant from his seat raises the lever I, which brings the brake P upon the rim of the wheel A¹. This virtually locks the wheel to the axle C, and by a partial rotation of the wheel in the onward movement of the plough, the crank arms are brought to a nearly upright position, as shown in dotted lines, and the frame carrying the plough bodies is brought at the same time to the position shown also in dotted lines.

Sheet II shows an improved lifting arrangement applied to a three-furrow plough, behind which the attendant ordinarily walks; fig. 3 being a side elevation, and fig. 4 a plan of the same. A A¹ are the travelling wheels; A² is the advanced furrow wheel, adjustable in the ordinary manner; and C is the cranked axle, mounted in bearings carried by the plough frame B. The travelling wheel A¹ is in the furrow, but does not necessarily touch the bottom of it, and may even run clear above it. The locking of the land wheel A is relied on for lifting the plough out of work. F is a brake, which is centred or fulcrumed upon the end of the shaft C, and is connected at its tail end with a rod, F¹, to a hand lever, F², which is used to apply the brake. This lever is fulcrumed on the centre line of a hand lever, F³, forming a continuation of the crank arm which carries the wheel A. The lever F² has a long arm, provided with a handle and a short arm having a pendent hooked extension. On the upper side of the hand lever F³ is fulcrumed a lever, F⁴, for working a spring catch that takes into a notched quadrant, G, secured to the frame of the plough. The lever F⁴ has a tail-piece below its fulcrum in contact with the hooked extension of the hand lever F².

When it is desired to raise the plough out of work, the attendant pulls the lever F², which brings the brake upon the rim of the wheel, and by its pendent hook acting upon the tail of the lever F⁴, releases the catch from the quadrant G. The plough is then free to be lifted by the main lever F³, as described in the previous example, to the position shown by dotted lines.

This arrangement allows the spring catch to be withdrawn from the quadrant G, by pressing the lever F⁴ without operating the brake.

Sheet III shows our improved brake apparatus applied to a cultivator or harrow for loosening the ground and clearing it of weeds. Fig. 5 is a side elevation; and fig. 6, a plan view of the implement.

In this instance both the travelling wheels A are fitted with brakes B, and the wheels are mounted, as above explained, on a crank axle, C. The brake levers are keyed on to the opposite ends of a shaft, B¹, which has its bearings in prolongations of the crank arms of the shaft C. The brakes are operated by an arm, B², forged solid with the shaft B¹, and situate midway between the brake levers. The arrangement of levers for putting on the brake, and unlocking the spring catch is similar to that described with reference to sheet II, the hand lever F³ being firmly keyed to the shaft C. Thus the rod F¹ pendent from the lever F² connects with the arm B² of the brake-shaft, B¹. The lever F² mounted on the main lever F³ acts as a tripping lever to the lever F⁴, also mounted on the main lever F³, and causes it to release the locking catch, which fixes the elevation of the frame of the implement. Attached to the frame which carries the tilling instruments D D is a fore carriage, having a pair of wheels, E, and through the axle of these wheels the steering of the implement is effected by the draught horses attached thereto.

Sheet 4 shows the brake apparatus applied to a modification of our improved self-lifting plough, which is capable of being used either on a two or a three furrow plough. Fig. 7 is a plan view, and fig. 8 a side elevation of the same.

A, B, and C are three plough beams, fitted each with a plough body and coulter, and capable of being adjusted laterally to suit different widths of furrow.

The beam C is so connected to the adjacent beam B as to allow of its ready removal with its plough body, to enable the implement to be used as a two-furrow plough.

The

Improvements in Ploughs and other tilling instruments.

The manner of connecting the beams together will be readily understood by reference to fig. 7. which shows the beam A formed of flat bar iron, and bent round at its rear end towards beam B.

This beam, which is longer than the beam A, is preferably formed of bar iron rolled to an H section, to give it increased stiffness. At its opposite ends the flanges are cut away, to enable the beam ends to be bent round, the one towards the beam A and the other towards the beam C.

Similarly, the beam C, made of flat bar iron, has its forward end bent round towards the beam B. The object of thus forming the beams with bent ends is that they shall receive, through bolt-holes made in their bent ends, fixed bolts projecting from the adjacent beams. Thus the beam A has a fixed bolt, a , projecting through holes in the forward end of the beam B, and made fast thereto by a screwed loop, a^* , through which the bolt is passed, the screwed end of such loop projecting through the bent end of the beam B, and being tightened up by a nut.

In like manner the beam B is provided with two such fixed bolts, b and b^1 , the former projecting through holes made in the bent rear end of the beam A, and being secured thereto by a threaded loop and nut, b^* .

The fixed bolt b^1 passes through the bent forward end of the beam C, and is secured thereto by a screwed loop and nut, b^* .

Projecting inwards from the beam C is a fixed bolt, c , which passes through bolt-holes made in the bent rear end of the beam B, and is secured thereto by a threaded loop and nut, c^* .

It will now be understood that by simply slackening the nuts of the threaded loops the beams will be disconnected. We provide, however, besides these attachments, adjusting screw-bolts, d , which are fitted with double nuts, and serve to space out the beams to suit the width of furrow required by the ploughman.

The axles for carrying the travelling wheels are mounted upon the beams as described in previous examples, as also the brake arrangement and means for applying it, when it is desired to raise the plough out of work.

Having now described the nature of our invention, we wish it to be understood that we claim,—

First—The means described with reference to sheet I of the drawings for adjusting the land wheel of ploughs, also the lever I and brake I¹ for locking the travelling wheel and causing the plough to rise clear of the ground by the progress of the draught horses.

Second—The application to ploughs and cultivators of the arrangement of levers described with reference to sheets II, III, and IV of the drawings, for simultaneously withdrawing a locking-bolt which fixes the depth of tillage, and applying a brake or brakes for locking the travelling wheel or wheels so that the cultivating instruments will rise clear of the ground by the progress of the draught horses.

Third—The construction of ploughs, with shifting and detachable beams fitted and secured in position as described, and illustrated in sheet IV of the drawings.

In witness whereof, we, the said James Howard and Edward Tenney Bousfield, have hereto set our hands and seals, this twelfth day of June, 1882.

Witness—

J. F. NUTTER,
Bedford, Private Secretary.

JAMES HOWARD.
E. T. BOUSFIELD.

This is the specification, marked A, referred to in the annexed Letters of Registration, granted to James Howard and Edward Tenney Bousfield, this 18th day of October, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 23 August, 1882.

The application of Messrs. Howard and Bousfield for Letters of Registration, for an invention entitled "Improvements in Ploughs and other implements" having been referred to us for report, we have examined the plans and specification accompanying the same, and have now the honor to report that we see no objection to the issue of Letters of Registration for the machine in question, provided that the different novel inventions therein can legally be covered by one registration.

We have, &c.,

ARCH. FRASER.
THOS. RICHARDS.

The Under Secretary of Justice.

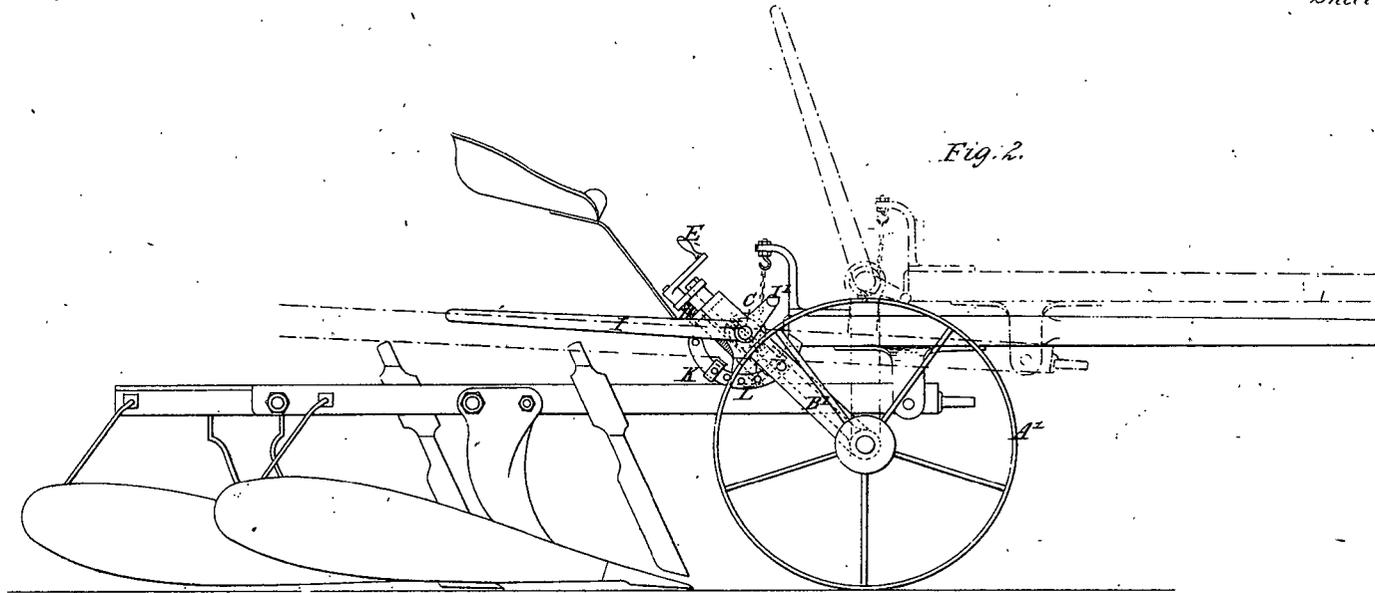


Fig. 2.

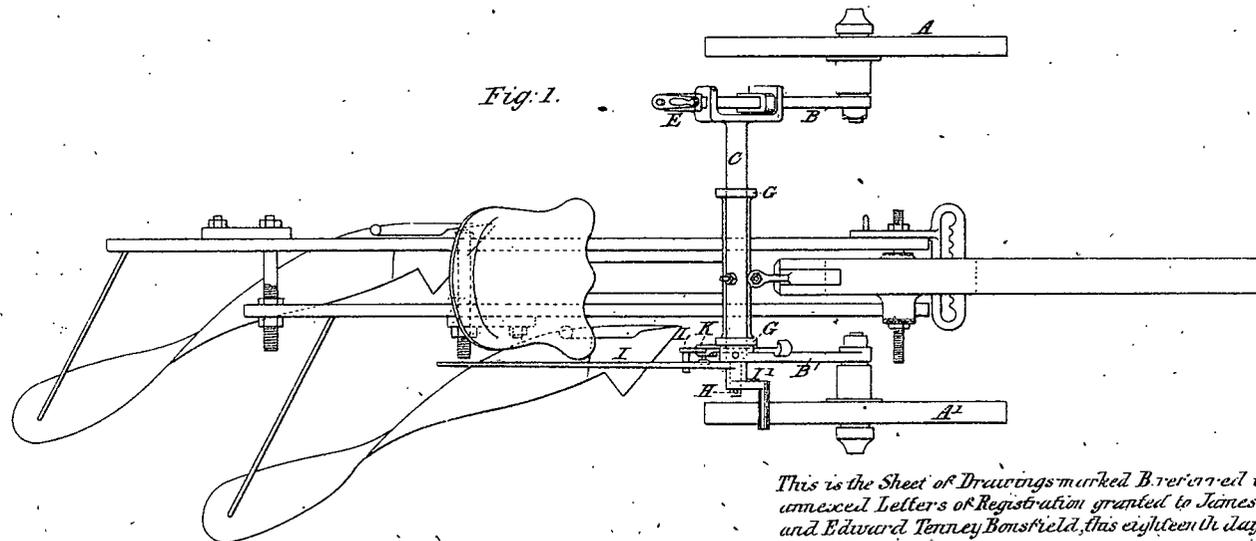


Fig. 1.

This is the Sheet of Drawings marked B referred to in the
 annexed Letters of Registration granted to James Howard,
 and Edward Tenney Bonsfield, this eighteenth day of October,
 A.D. 1887.
 Augustus Loftus.

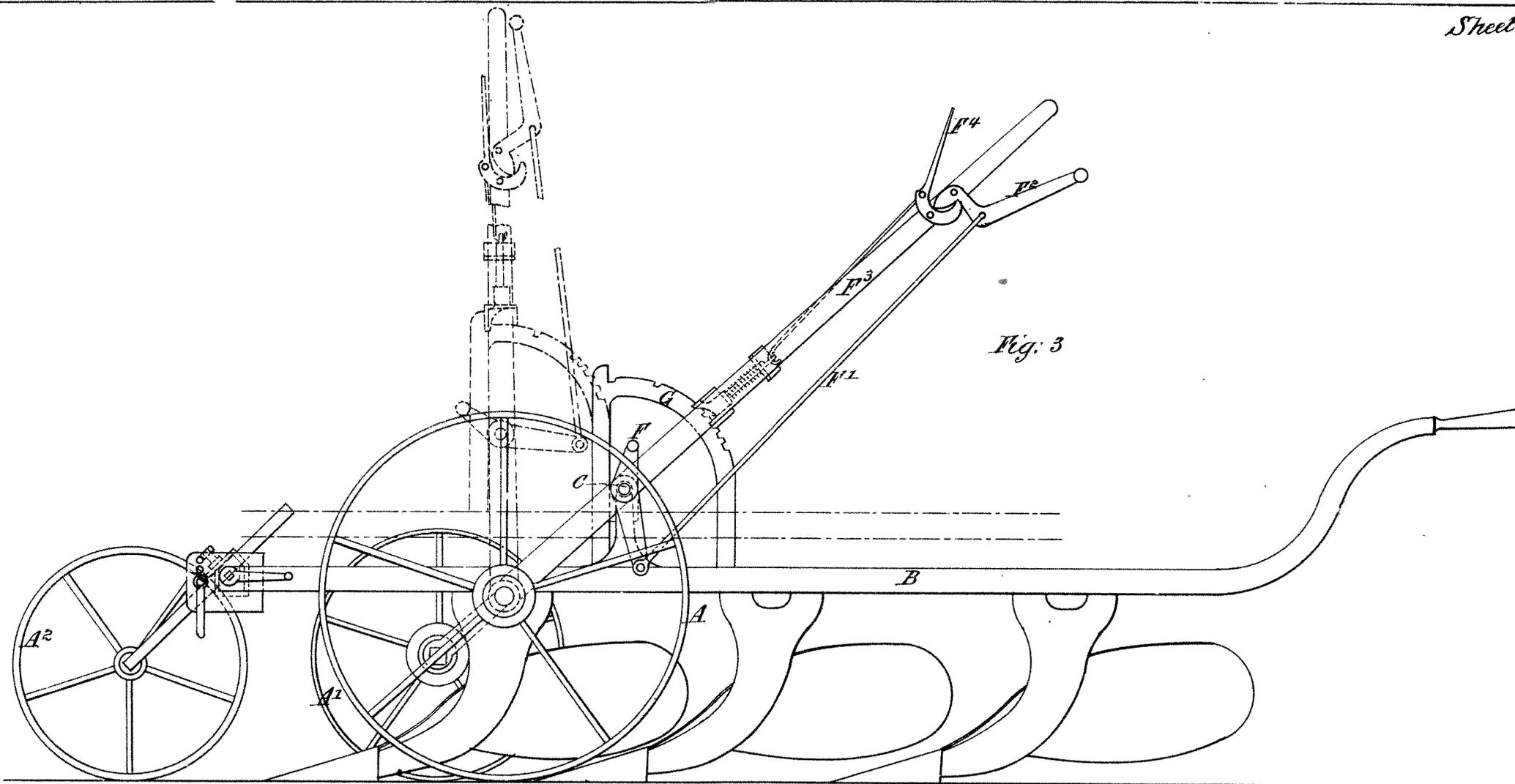


Fig: 3

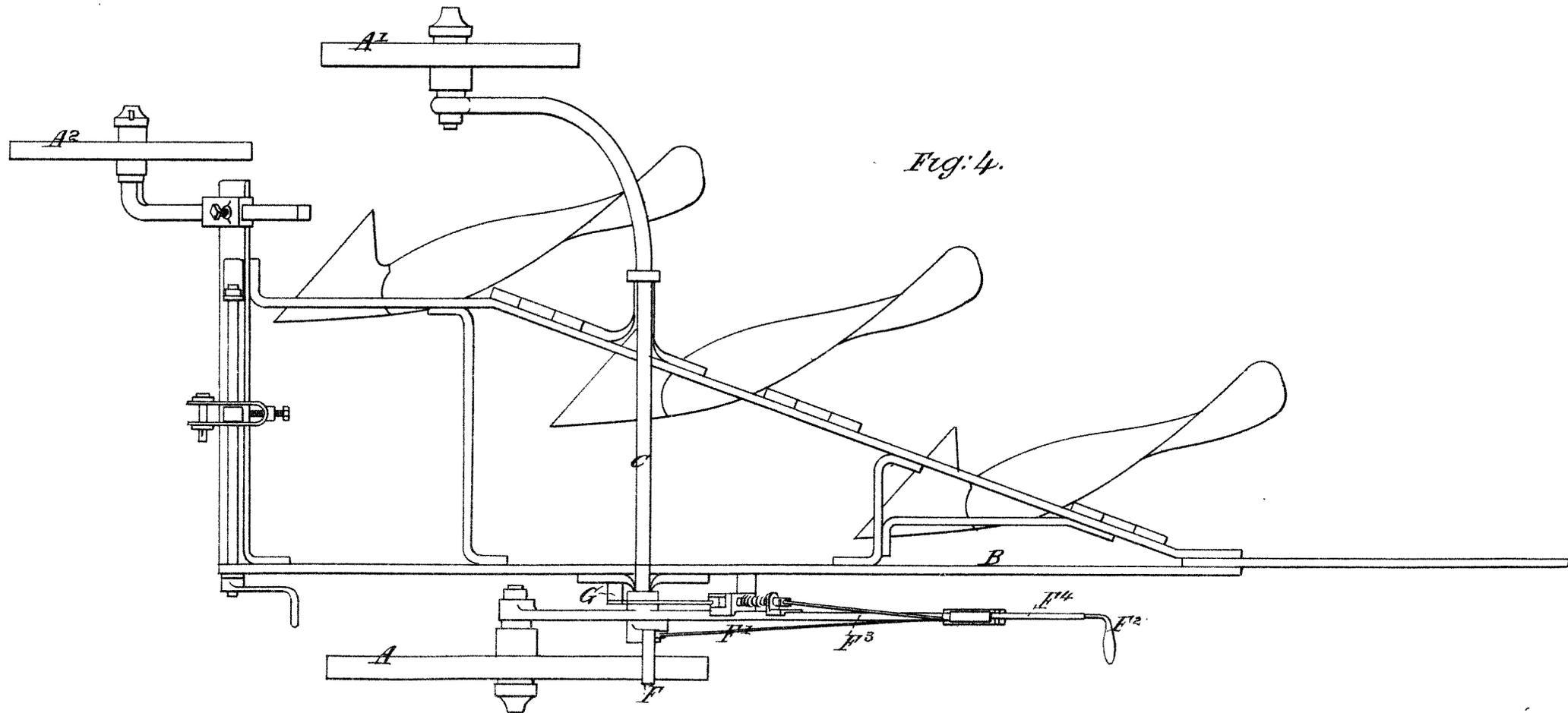


Fig: 4.

875.) This is the Sheet of Drawings marked C. referred to in the annexed Letters of Registration granted to James Howard and Edward Tenney Bousfield this 18th day of October A.D. 1882.

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

Augustus Loftus.

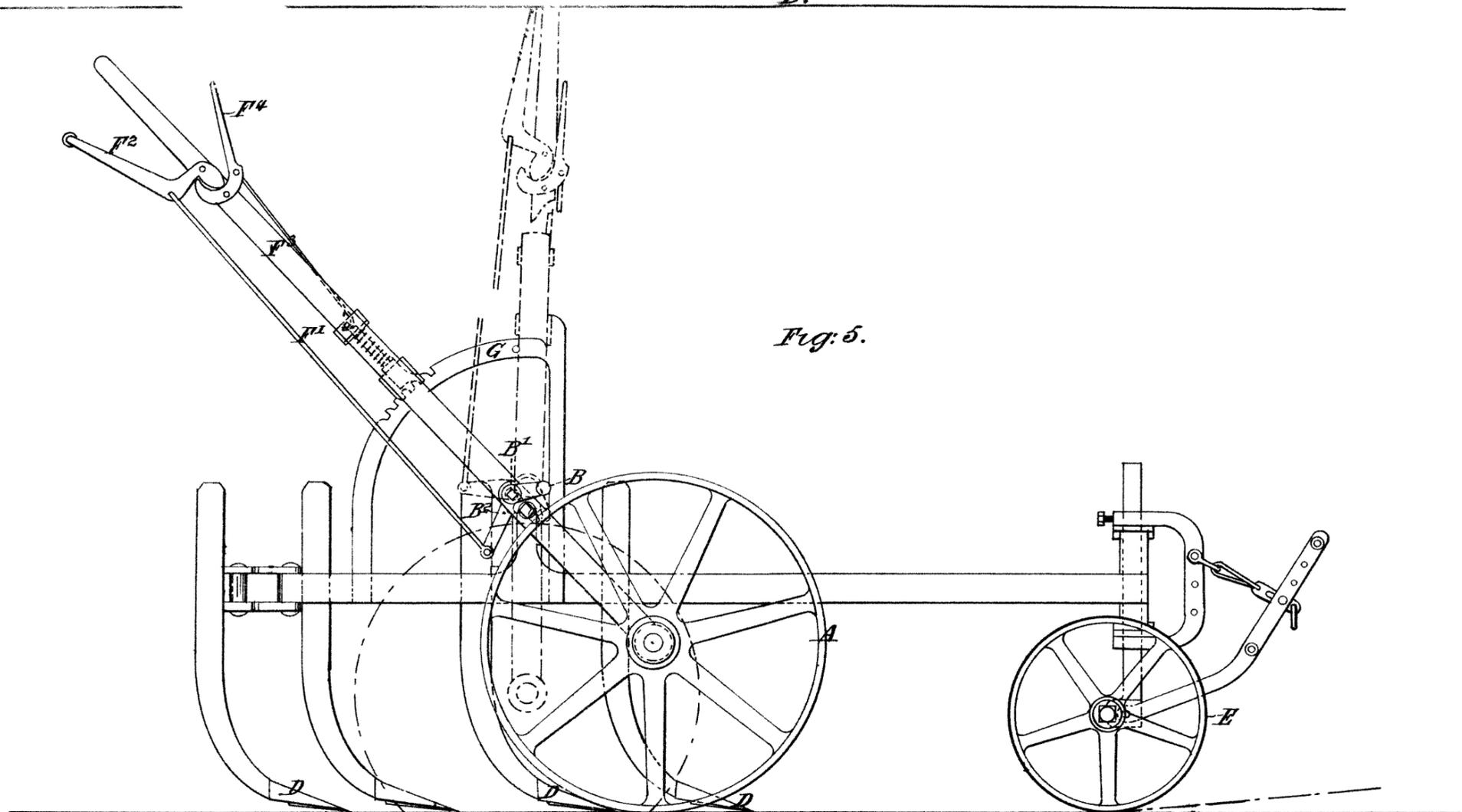


Fig. 5.

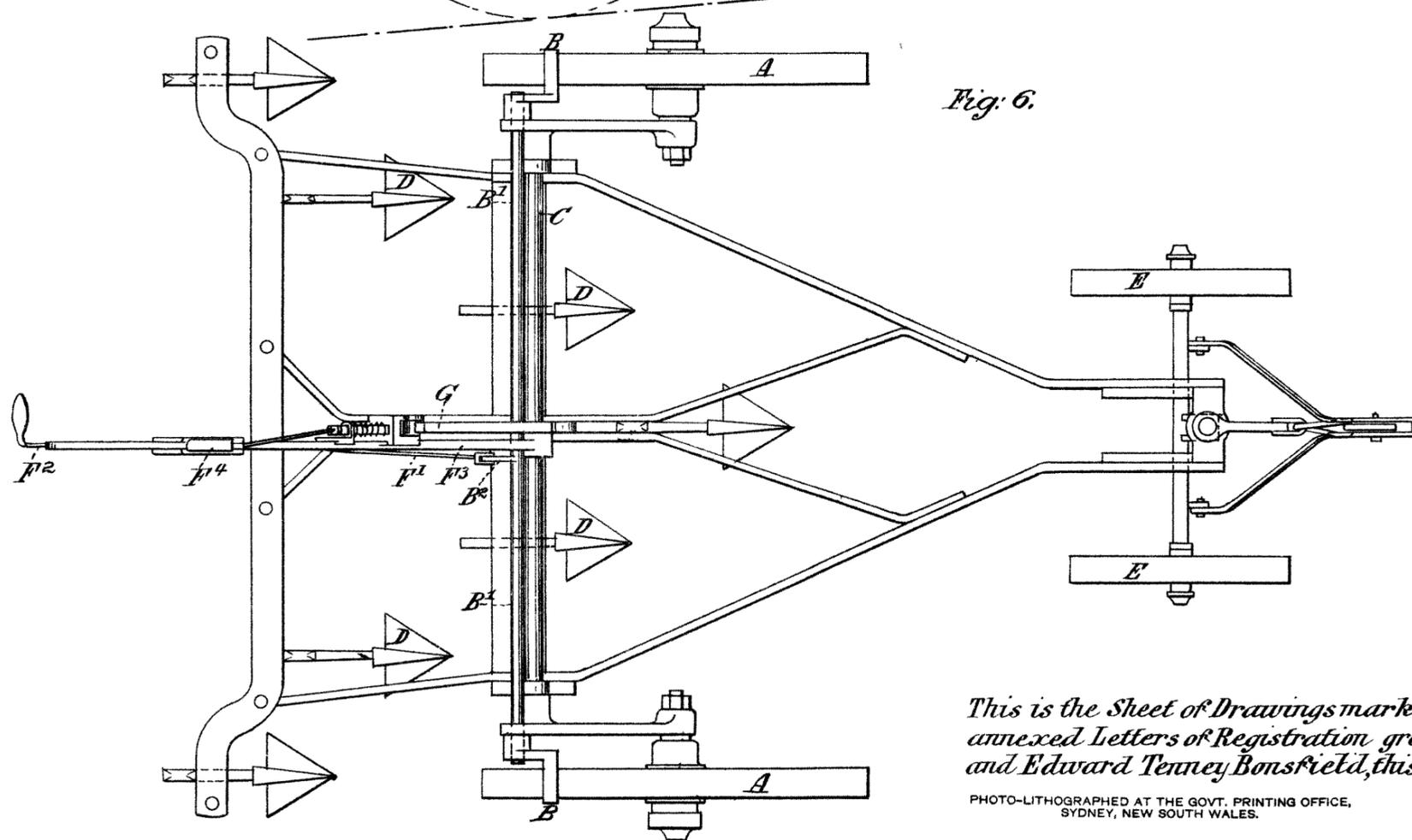


Fig. 6.

This is the Sheet of Drawings marked D. referred to in the annexed Letters of Registration granted to James Howard, and Edward Tenney Bonsfield, this 18th day of October A.D. 1882.

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

Augustus Loftus



A.D. 1882, 18th October. No. 1145.

PROCESS FOR THE MANUFACTURE OF FIBRES.

LETTERS OF REGISTRATION to Paul de Puydt, for a Process for the manufacture of Fibres, by the treatment of textile materials and fibrous plants.

[Registered on the 18th day of October, 1882, 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 DE PUYDT, of Brussels, in the Kingdom of Belgium, 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 "Process for the manufacture of Fibres by the treatment of textile materials and fibrous plants, whereby a product is obtained capable of being employed for the manufacture of fabrics, cloths, felts, and cordage of all kinds," 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 Paul de Puydt, 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 de Puydt, 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 de Puydt 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 eighteenth day of October, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Process for the manufacture of Fibres.

SPECIFICATION of PAUL DE PUYDT, of Brussels, in the Kingdom of Belgium, engineer.

PROCESS for the manufacture of fibres by the treatment of textile materials and fibrous plants, whereby a product is obtained capable of being employed for the manufacture of fabrics, cloths, felts, and cordage of all kinds.

The object of the succession of operations hereafter described is to separate the vegetable textile fabrics from the incrustated materials which they contain, to isolate them completely from all the glutinous, mucilaginous, resinous, and silicious parts which surround them, and to give them a texture suitable for mixing them with wools or silks, or what is better, to make from fabrics possessing the qualities of wool, flax, and silks and for the production of cloths, cordage, or ropes, having a very great resistance and strength.

The first operation consists in disintegrating the incrusting materials, or in certain cases in dissolving them completely, without altering the fibres, according to the nature, the texture, the more or less solidity of the cohesion of the stalk, green or dry, from its fibrous envelope already partially isolated by the ordinary known methods of treatment. The materials employed in this latter operation are pure or mixed, and vary in the proportions employed, as experience alone can determine the proportions and mixtures employed to obtain exactly and commercially the desired results.

It is impossible to describe each particular case; a test trial made with small quantities shows the dose, the time necessary for the preparation, the degree of heat to be maintained during the different phases of the operation.

I recapitulate then exactly the materials employed, and I give as an example the doses that are suitable.

These materials are alkalies, alkaline earths, cyanures, and alkaline sulphurs; alkalies, potass, soda, ammoniac, either in a hydrate, carbonate, cyanate, or sulphuret state; alkaline earths, lime, baryta, hydrate or sulphuret. As an example, I will suppose about a hundred kilogrammes (two hundred pounds) of flax or grass (*ramie*) is to be treated, from which the wood has been removed by passing it through a suitable machine. This may be effected before or after the chemical decortication.

In a wood or metal vessel, heated by steam or open fire, I place two cubic feet of water, the linen or grass (*ramie*) is immersed in the water, and two kilogrammes (about four pounds) of caustic potash are added, or a quantity equivalent in alkalimetric degree of products above mentioned. Then it is gradually brought to boiling-points and there maintained until the material under treatment appears to be sufficiently isolated from its incrustations, or that the fibres become easily detached. This boiling should last about two hours. Certain plants possessing a texture of greater resistance require treating at a higher temperature; in this case steamers are employed, the plants being immersed in the alkaline solution are there submitted to the action of steam at different pressures.

Ammoniacal vapours may also be introduced in a similar steamer, or the steam may be produced in the steamer itself.

The material being removed from the vessels or from the steamer, is washed, rinsed, dried, then it is submitted to the action of machines which finishes the action of the chemicals materials.

After the foregoing operations the material is boiled in oleate of soda, washed, wrung, and dried again it is submitted to the ordinary operation of bleaching or dyeing.

CLAIM.

The production of fibrous materials by the successive operations above described, that is to say, the employment of alkalies, earthy alkalines, cyanures, and alkaline sulphurs, employed in varying doses, either pure or mixed, being completed by a sufficiently prolonged boiling in a solution of oleate of soda, the whole for the purpose of obtaining the special products above indicated and as set forth.

PAUL DE PUYDT.

This is the specification referred to in the annexed Letters of Registration granted to Paul de Puydt, this eighteenth day of October, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

We have carefully read the accompanying Petition of Mr. Paul de Puydt's, for Letters of Registration for an invention entitled "Process for the manufacture of Fibre by the treatment of textile materials"; and although the means proposed to be employed for this purpose cannot be considered to be of a very novel character, yet much improvement can be made in the successful application of these in separating fibre from vegetable substances. It is in this respect that Mr. Paul de Puydt's process no doubt excels. We think, therefore, that the Letters of Registration applied for may be granted.

We have, &c.,

CHARLES MOORE.
JAMES BARNET.

The Under Secretary of Justice.

Sydney, 4 September, 1882.



A.D. 1882, 18th October. No. 1146.

IMPROVEMENTS IN SECONDARY CELLS AND BATTERIES.

LETTERS OF REGISTRATION to Joseph Wilson Swan, for Improvements in Secondary Cells and Batteries or Apparatus for storing electricity.

[Registered on the 18th day of October, 1882, 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 JOSEPH WILSON SWAN, of the town and county of Newcastle-on-Tyne, 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 Secondary Cells and Batteries or apparatus for storing electricity," 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 Joseph Wilson Swan, 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 Joseph Wilson Swan, his executors, administrators, and assigns, the exclusive enjoyment and advantage thereof, for and during and until 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 Joseph Wilson Swan 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 eighteenth day of October, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Secondary Cells and Batteries.

SPECIFICATION of JOSEPH WILSON SWAN, of the town and county of Newcastle-on-Tyne, for
 "Improvements in Secondary Cells and Batteries or Apparatus for storing electricity."

My said invention has for its objects the facilitating the construction of so-called secondary voltaic piles or batteries, and aims at the production of plates having surfaces more suitable for holding spongy lead, or lead in a finely divided form, and also the preparation of lead plates to be used in the construction of cells for secondary batteries, upon the principle proposed by Planté, with a view to diminish the time usually occupied in their preparation.

According to my invention, I prepare plates of lead having a cellular, corrugated, or grooved surface or surfaces, of such a character as to be capable of retaining in the cells, grooves, corrugations, or interstices, spongy or finely divided lead.

The accompanying drawings illustrate by way of example two forms of plates constructed according to my said invention.

Figures 1 and 2 are respectively a front elevation and transverse vertical section of a cellular plate, and figures 3 and 4 are respectively a front elevation and transverse vertical section of a corrugated or grooved plate; figures 2^a and 4^a illustrate modifications of the plates shown in figures 1 and 2 and figures 3 and 4 respectively.

The plate shown in figures 1 and 2 is constructed with cells or cavities, *a*, for the reception and retention of spongy lead, or lead in a finely divided form, and the outer surface of the walls *b* of the cells may also be covered or coated with the spongy or finely divided lead. The cells may be closed on one side, as shown at *C* in fig. 2^a. The plate shown in figures 3 and 4 is constructed with grooves, *a*, to be filled with spongy lead or lead in a finely divided condition, and the outer surfaces of the ridges *b* may also be covered or coated with lead in that condition. The ridges may be formed on one side only of the plate, as shown in fig. 4^a.

It should be understood that the form of the cells, corrugations, or grooves, may be greatly varied without departing from the principle of my said invention, the object being to obtain an interstitial construction of plate capable of affording a very large amount of acting surface in a small compass, and to prevent the coating of oxide or spongy lead from falling away from the plate, as it would from a plain vertical surface, unless held in position by some material external to the said coating.

When intended for use, a pair or a series of these plates may be placed in a suitable vessel, and arranged and charged after the well-known manner of arranging and charging secondary piles or batteries, so as to act as means of conserving or storing energy.

According to a further part of my invention, I take plates of lead of any suitable form, but preferably with cellular, corrugated, or grooved surfaces, so as to be capable of retaining in the cells, grooves, corrugations, or interstices, spongy or finely divided lead, and I expose the plates, as above described, to the combined action of acetic acid, carbonic acid, and atmospheric air, as in the well-known process of making white lead, which action results in the formation of carbonate of lead on the lead plates. This formation may extend to a depth greater or less, according to the time such plates are subjected to the action of the vapours and gases. After this action has taken place to a sufficient depth, a portion of the plate being generally allowed to remain unacted upon, I subject the treated plates to the action of electrolytic hydrogen, by making them the cathode of an electric generator, which may either be a voltaic battery, a dynamo or magneto-electric machine, or thermo pile, or any other suitable electricity-generator, in a suitable electrolyte. When the carbonate of lead has been transformed into metallic lead by the said electrolytic action, I arrange and use the plates so treated in the well-known manner of arranging and using lead plates in the construction and charging and use of Planté's secondary cells.

In carrying out this part of my invention, I do not limit myself to the use of the corrugated, grooved, cellular, or perforated plates above referred to, but may use lead plates with a plain surface. In treating such lead plates, I in some cases protect portions of the surface from the action of the acid vapours by the application of paint, varnish, or other suitable "resist," painted, printed on, or otherwise applied to the plates, in such a form or design as in effect to leave the acted-upon portions of the plate framed or walled in in sections by the unacted-upon portions of the plate; and I also propose, by the application of paint, varnish, or other suitable "resist," to prevent the corrosion of any portions of the plates which I may desire to preserve. The result of the exposure of the lead plates to the carbonating process, and the subsequent reduction to a metallic form of the crust of carbonate of lead, is the production of an open and porous form of lead, peculiarly adapted for the storage of a large amount of electro-chemical energy.

CLAIM.

1. Constructing the plates of secondary batteries or apparatus for storing or conserving electricity or electro-chemical energy, with cells, corrugations, grooves, or interstices, substantially as and for the purposes hereinbefore described.

In witness whereof, I the said Joseph Wilson Swan have to this my specification set my hand and seal, this eleventh day of March, one thousand eight hundred and eighty-two.

JOSEPH WILSON SWAN.

Signed and sealed in the presence of—

JOHN JAMES,
47, Lincoln's Inn Fields.

CHAS. MILLS,
74, Lincoln's Inn Fields, London.

This is the amended specification referred to in the annexed Letters of Registration granted to Joseph Wilson Swan, this eighteenth day of October, A.D. 1882.

AUGUSTUS LOFTUS.

REPORTS.

Improvements in Secondary Cells and Batteries.

REPORTS.

Sir,

Sydney, 16 May, 1882.

We do ourselves the honor to report, in reply to your B.C. communication of the 6th instant, No. 5,650, that, after careful examination of Mr. J. W. Swan's specification of an invention entitled "Improvements in Secondary Cells and Batteries or Apparatus for storing electricity," we are of opinion that Mr. J. W. Swan's claim No. 1 can only be recommended for registration.

We have, &c.,
GOTHER K. MANN.
E. C. CRACKNELL.

The Under Secretary of Justice.

Sir,

Sydney, 8 September, 1882.

We do ourselves the honor to report, in reply to your blank cover communication of the 30th ultimo, No. 10,264, that we are of opinion Mr. Joseph Wilson Swan's Petition for the registration of "Improvements in Secondary Cells and Batteries or Apparatus for storing electricity" may now be granted, in terms of his revised claim.

We have, &c.,
E. C. CRACKNELL.
GOTHER K. MANN.

The Under Secretary of Justice.

[Drawings.—one sheet.]

Fig.1.

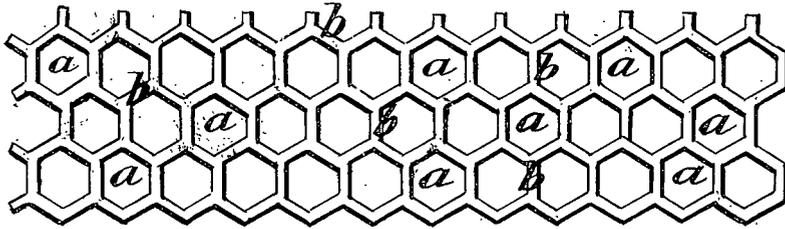
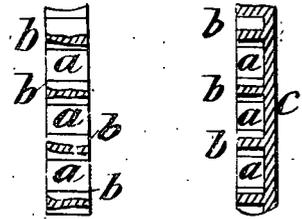
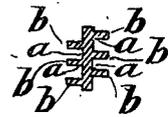
Fig.2. Fig.2.^a

Fig.3.



Fig.4.

Fig.4.^a

*This is the Sheet of Drawings referred to in the
annexed Letters of Registration granted to
Joseph Wilson Swan, this eighteenth day of
October A.D. 1882.*

Augustus Loftus.



A.D. 1882, 18th October. No. 1147.

AN IMPROVED MACHINE FOR CLEARING SCRUB LANDS.

LETTERS OF REGISTRATION to Robert Officer, for an Improved Machine for clearing scrub lands.

[Registered on the 18th day of October, 1882, 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 OFFICER, of Murray Downs, in the Colony of New South Wales, 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 Machine for clearing scrub lands," 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 Officer, 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 Officer, 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 Officer 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 eighteenth day of October, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

An improved Machine for clearing scrub lands.

SPECIFICATION of ROBERT OFFICER, of Murray Downs, in the Colony of New South Wales, station manager, for an invention entitled "An improved Machine for clearing scrub lands."

THIS invention consists of an improved machine by which scrub lands may be effectively and economically cleared by horse or other draught power.

My machine consists essentially of a series of V-shaped forks or prongs, which are firmly supported with their outer or front end, the lower between finger-bars having a sharp nose. These prongs and finger-bars are fixed to a cross-beam supported at either end by a small roller, and a skeleton frame carries a harnessing-pole at one side of the machine.

The drawings hereto attached illustrate a machine constructed according to my invention, figures 1, 2, and 3 showing respectively side and front elevations and plan thereof.

A A are the prongs or forks; A¹, the sharp-nosed finger-bars; B, the main cross-beam; B¹ B¹, the rollers thereof; C, the pole on skeleton frame, C¹ having also sharp-nose under-frame; C² B² is stay from frame C¹ to beam; B, B³, and C³ are iron stays.

The mode of operation is as follows:—The "polers," horses or bullocks as the case may be, are harnessed to pole C, and as many more attached to the end thereof as may be necessary to draw the machine through the scrub land. While being drawn through it, the finger-bars A divide the scrub close to the ground, and the divided portions pass into the open ends of the forks A, and are crowded into the apex of said forks, where they are held tightly and pulled up by the roots and then dropped, the angle at which the prongs or forks are set materially assisting in the pull.

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 original, and therefore claim in my improved machine for clearing scrub lands, is—

The combination and arrangement of a series of V-shaped forks or prongs and a series of finger-bars, with the necessary framing for carrying such contrivances, substantially as herein described and explained.

In witness whereof, I the said Robert Officer have hereto set my hand and seal, this seventeenth day of August, one thousand eight hundred and eighty-two.

ROBERT OFFICER,
(By his Attorney, W. R. LOOKER).

Witness—

EDWD. WATERS,
Melbourne, Patent Agent.

This is the specification referred to in the annexed Letters of Registration granted to Robert Officer, this eighteenth day of October, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 31 August, 1882.

The application of Mr. Robert Officer for Letters of Registration, for an invention entitled "An improved Machine for clearing scrub lands," having been referred to us, we have examined the plans and 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.,
JAMES BARNET.
WILLIAM C. BENNETT.

The Under Secretary of Justice.

[Drawings—one sheet.]

R. OFFICER'S PATENT.

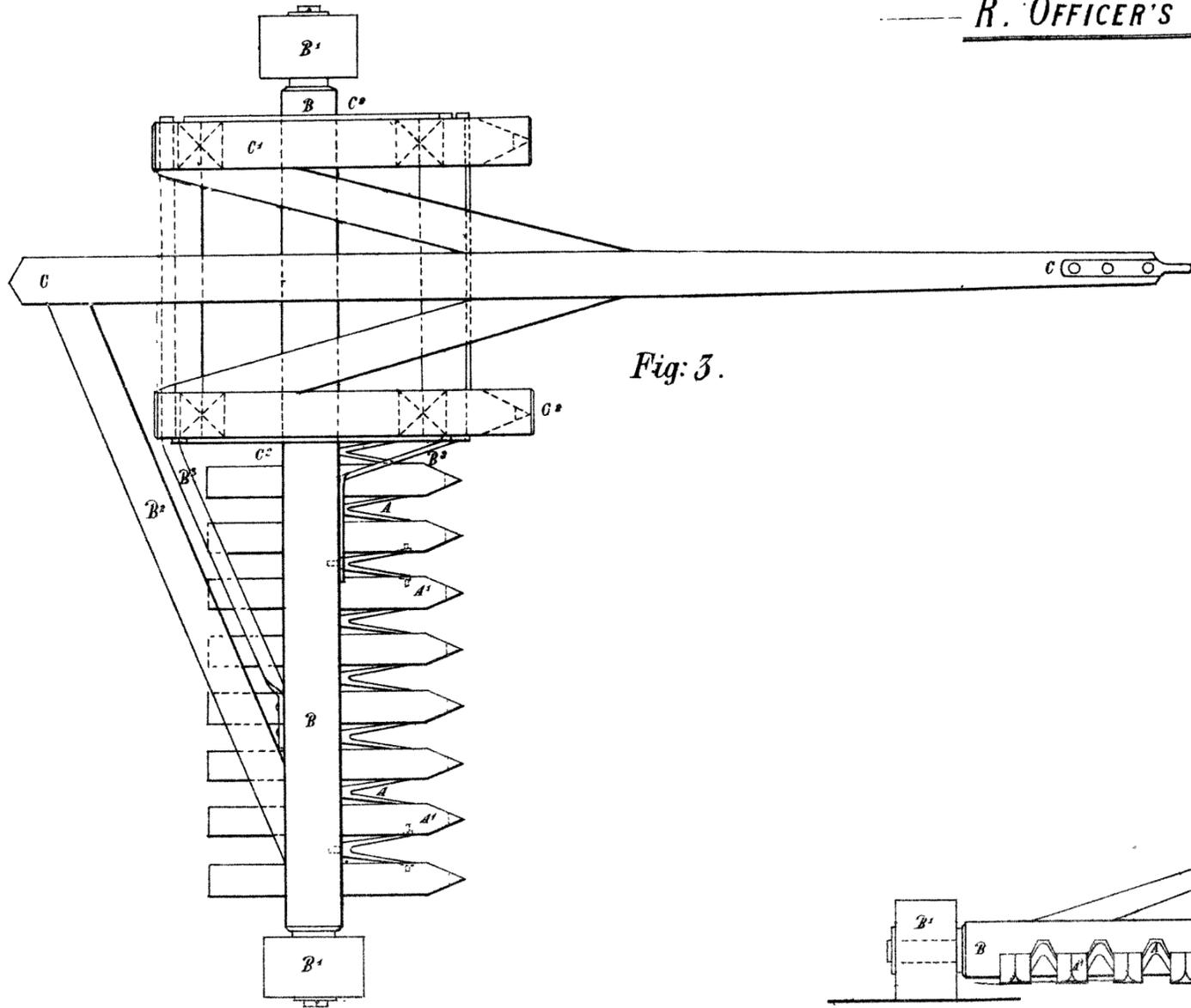


Fig: 3.

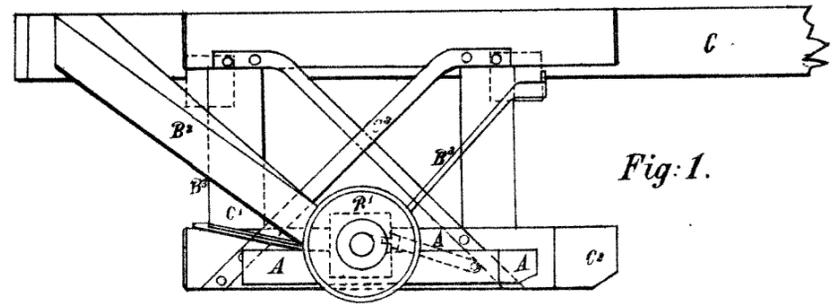


Fig: 1.

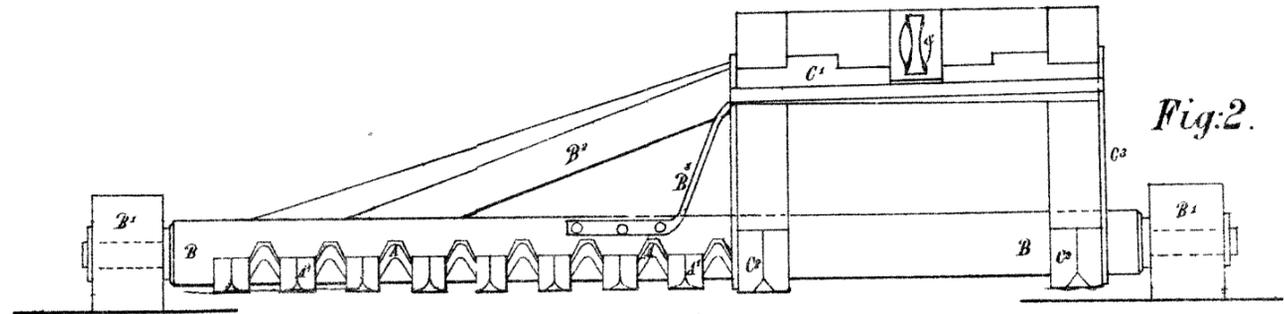


Fig: 2.

This is the Sheet of Drawings referred to in the annexed Letters of Registration granted to Robert Officer; this eighteenth day of October, A. D. 1882.

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

Augustus Loftus.



A.D. 1882, 18th October. No. 1148.

IMPROVEMENTS IN APPARATUS FOR THE EXTRACTION OF GOLD, &c.

LETTERS OF REGISTRATION to John Alves and John Logan, for Improvements in Apparatus for the extraction of Gold and the concentration of gold-bearing material, such as Pyrites, from finely divided auriferous material.

[Registered on the 18th day of October, 1882, 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 George-street, Dunedin, in the Colony of New Zealand, engineer, and JOHN LOGAN, of London-street, Dunedin, aforesaid, gentleman, have by their Petition humbly represented to me that the said John Alves 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 extraction of Gold and the concentration of gold-bearing material, such as Pyrites, from finely divided auriferous material," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed; and that the said John Logan is the assignee of the said John Alves of one-half share of and in the said invention; 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 Alves and John Logan, 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 Alves and John Logan, 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 Alves and John Logan 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 eighteenth day of October, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Apparatus for the extraction of Gold, &c.

SPECIFICATION of JOHN ALVES, of George-street, Dunedin, in the Colony of New Zealand, engineer, for an invention entitled "Improvements in Apparatus for the extraction of Gold and the concentration of gold-bearing material, such as Pyrites, from finely divided auriferous material."

THE apparatus which I use for the extraction of gold and for the concentration of gold-bearing material, such as pyrites, from finely divided auriferous material, consists of two main parts, the first of which I call an amalgamator, and the second the washer or concentrator, part of the contrivances in which latter also act as an amalgamator.

My amalgamator is of peculiar construction, and has a peculiar motion imparted to it. It consists of a series of boxes, one for each stamp in the battery, connected together and enclosed in one common casing. Each box contains one, two, three, or more sets of contrivances, one below the other, as may be preferred; each of these sets of contrivances is made up, first, of a top plate having one or more rows of holes or perforations along its longitudinal centre, below which is a series of vertical amalgamating plates resting upon a curved bottom, thus forming a series of troughs, the only exit from each of which is through a hole in the centre of each plate, so as to provide a passage from the centre to each side of these sets of contrivances, where downward passages conduct to a second set of contrivances identical with those just described; and under the second there may be a third, and so on, multiplying them as much as may be desired, although I have found five of these sets a useful and practicable number; the lowermost of these sets discharges on to a distributing table, and from thence on to an endless travelling blanket table which forms part of my washer or concentrator. If preferred the distributing table might be dispensed with, and the amalgamator discharge itself directly on to the blanket table.

My washer or concentrator is in part of novel construction and in part a novel arrangement of well-known contrivances. It consists of an oblong casing in which there travels an endless blanket table, the upper portion of which travels up an incline out of the water and in an opposite direction to the flow from the batteries, and the lower portion of which travels under the surface of the water and in the same direction as the flow from the batteries, there being in the distributing table and under the lower part of the head of the blanket table novel contrivances in the shape of cylindrical cylinders, *open at both ends*, which dip constantly or at intervals, as may be arranged, into pockets or troughs of mercury. There are also other novel contrivances for periodically shaking the blanket when under the water.

In order, however, that my invention may be clearly understood, I will now proceed to describe the drawings attached hereto, in which figure 1 shows side elevation of one of my amalgamators; figure 2, transverse section of a part of same; figure 3, longitudinal section, showing face view of the amalgamating plates; figure 4, plan of one set of contrivances in amalgamator; figures 5 and 6, plan and longitudinal section of my separator and concentrator; and figure 7, cross section of amalgamator, with end view of separator and concentrator underneath.

Referring to figure 1, *a* is the framing; *b*, the amalgamating box; *c*, the rocking pin of box; *d*, the swinging bars of box; *e*, the hangers of swinging bars; *f*, the joint piece to take the end of connecting rod; *g*, the fulcrum rod to give the rocking motion to the amalgamator box; *h h*, the connecting rod to crank; *i*, a crank plate or eccentric.

Referring to figure 2, which is a transverse section of wooden support A, for amalgamating plates, *b b* are the amalgamating plates, set vertically, thus utilizing both sides; *c*, the line of discharge through holes in them; *d*, horizontal amalgamating plate to cover in the vertical plates; *e e*, openings or holes to let the feed enter the amalgamator; *f f*, passages to allow the overflow to escape on each side from the amalgamator; *g g*, perforated plates to convey the overflow into the centre of the amalgamator below; *h h*, fillets to keep the wooden supports A in position, and to allow them to be drawn out when required; *i i*, sides of amalgamator box; *k k*, fillets to hold the perforated plate in position.

Referring to figure 3, *b b* is one of the vertical amalgamating plates, and *b'* its ends; *c c*, discharge apertures in plates and in the sides of amalgamator; *d*, amalgamating plate (horizontal) on top of vertical plates; *f*, passage to allow the overflow to escape from the amalgamator; *i*, ends of amalgamator box.

Referring to figure 4, *b b* are the vertical amalgamating plates, and *c c*, the line of discharge through them; *g g* are the perforations through the plate above the vertical plates to allow the feed to pass through along the centre; *f f*, passages to allow the overflow to escape from the amalgamator; *i i*, sides and ends of the amalgamator box; *m m*, slots to allow the vertical plates to drop into position, so as to admit of their being easily taken out to clean off the amalgam; *n*, door to allow the amalgamators to be drawn out of the amalgamator box when required.

Referring to figures 5 and 6, A is an amalgamator box for five stamps; *a*, baize or blanket table laid on canvas or other suitable material divided by ropes sewn on to it, the baize being tacked on after; *b*, upper bearing rollers; *c*, driving rollers; *d*, washing rollers; *e* and *e'*, inside and outside cranks; *f*, connecting rod; *g*, water tank; *i*, under-guide rollers; *m*, tank under amalgam cylinders; *n*, ropes on table; *o*, cylindrical amalgamated plates, open at each end so as to amalgamate on both sides, inside and out; *p*, quicksilver pockets; *r*, tailings shoot; *s* is also a cylindrical amalgamated plate open at each end; *v*, movable shoot to tank *m*; *w*, amalgam pockets which draw out for cleaning up; *x*, frame for travelling table to lift up from lower end to allow the tank *g* to be emptied; *y*, lining under upper table to carry waste sand to *r*; *z*, water level in tank *g*.

Referring to figure 7, A is the amalgamator box with amalgamators in position; *b*, the upper bearing rollers; *d*, the washing rollers; *e*, the inside cranks; *e'*, the outside crank; *g*, the water tank; *i*, the under-guide rollers; *o*, cylinders open at both ends; *p*, quicksilver pockets underneath them; *s*, another amalgamating cylinder open at both ends; *t*, distributing trough at top of amalgamator box to regulate the feed into each compartment; *x*, frame of travelling table; *y*, lining under upper table to carry waste or drip to *r*, figure 6.

The mode of operation is as follows:—The whole apparatus is so set as that the discharge of each stamp in a battery is conducted to the top of one of the compartments in my amalgamating box, and so as that the discharge from the amalgamator boxes is received on the distributing table (see figures 5 and 6), by which it is conducted to the upper face of the endless travelling blanket table in my washer or concentrator. Provision is also made for revolving the spindle of crank pin disc *i*, figure 1, roller *c*, figure

Improvements in Apparatus for the extraction of Gold, &c.

figure 6, and bell-crank e and e' , also in figure 6. When thus ready for working, the crushed material from the stampers flows with a regular supply of water into the top of the amalgamators, runs through the perforations g , along the centre of the top plate d , and falls into the central troughs e , between the vertical amalgamating plates b . In these troughs it is swayed about by the motion of the amalgamator as a whole, and passing from trough to trough, either way in regular succession, is finally discharged into the passage f on to plate g , through perforations in the centre of which it discharges into a similar set of contrivances to those just described, and from this set to a third, and so on to as many as may be thought desirable, although I have found five sets, as shown in the drawing figure 7 to work admirably. This discharge from each compartment of my amalgamator is received on a distributing table B (see figure 6), from whence it passes under cylindrical amalgamating plate s and through opening B' on to the surface of endless fabric table a in an opposite direction to the travel of such table. By this table it is carried to and partly discharged down hopper V into receptacle m , while the rest is carried to other cylindrical amalgamating plates o , which dip into mercury recesses or grooves, p , and that which is still left is carried, as shown, into the lower part of, and underneath the water in the washer or separator; here it is conducted between two rollers, $d d$, which give to it a shaking or up-and-down motion, so as to facilitate the deposit of any material it may yet have on its face. The waste material is carried from the upper face to the waste launder, r , by the current of water supplied with the material to be treated. When the amalgamator or the washer is sufficiently charged it must be cleaned out, and if the amalgamating plates become dirty they must be cleaned and renewed, or re-silvered, as the case may be, the gold in the form of amalgam being found mostly on the vertical plates of the amalgamators, and on the cylindrical amalgamating plates of the washer, whilst the pyrites and other valuable material will be found deposited in the bottom of the washer.

If so preferred, the feed might be at the side of each compartment of the amalgamator instead of in the middle as hereinbefore described, and the material would then have to travel to the opposite side of the box before it could be discharged; this of course would give it a longer time for treatment. And again, the motion imparted to the amalgamator as a whole and the contrivances for giving such motion might be altered or varied, but as regards each of these variations I prefer the mode shown in my drawings and hereinbefore described.

Having thus described the nature of my invention and the method of putting it into practical operation, I would have it understood that what I claim as my improvements in apparatus for the extraction of gold and the concentration of gold-bearing materials, such as pyrites, from finely divided auriferous material, is—

- First—The use of amalgamating plates which amalgamate on both their surfaces, especially when they are placed vertically, as in my amalgamator (see figure 2), where they are marked b , and when they are made into cylinders (see figure 6), where they are marked s and o .
- Second—Combining and arranging such vertical plates so that the material to be treated by them shall pass through central openings in them (see c , figures 2 and 3) from between one pair to another pair, and finally be discharged through passages at either or both sides (see f in figure 2), that is with the feed in the centre as shown, or at either side as described but not shown.
- Third—Combining and arranging a series of such vertical amalgamating plates with top plate d (inclining towards its longitudinal centre, where it is perforated), curved bottom, side passages f , and lower plate g , as illustrated in figure 2 of my drawings.
- Fourth—Combining and arranging a number of the contrivances set forth in claim 3 one under the other, so as to form one compartment in an amalgamator, and combining and arranging a number of such compartments side by side in one case, as shown in figure 7.
- Fifth—Imparting to amalgamators the double motion of oscillation and rocking, as illustrated in figure 1, and especially to amalgamators arranged and constructed in the manner herein set forth and described.
- Sixth—Combining and arranging cylindrical amalgamating plates so that they will revolve constantly or intermittently in mercury troughs, as shown in figure 6, where they are marked s and o .
- Seventh—Giving a final shaking motion to an endless travelling fabric table when it is under the water in the separator, and the special contrivances marked d , e , and e' for giving this motion, as and for the purpose herein described, and as shown in figures 5 and 6 of my drawings.
- Eighth—The combination and arrangement of the whole of the contrivances shown in figures 5 and 6, in the manner and for the purposes herein described and explained.

In witness whereof, I the said John Alves have hereto set my hand and seal, this twenty-third day of August, one thousand eight hundred and eighty-two.

Witness—
ARCHIBALD HILSON ROSS.

JOHN ALVES.

This is the specification referred to in the annexed Letters of Registration granted to John Alves and John Logan, this eighteenth day of October, A.D. 1882.

AUGUSTUS LOFTUS.

Improvements in Apparatus for the extraction of Gold, &c.

REPORT.

Sir,

Sydney, 11 September, 1882.
The Petition of Messrs. Alves and Logan for Letters of Registration, for an invention entitled "Improvements in Apparatus for the extraction of Gold and the concentration of gold-bearing material, such as Pyrites, from finely divided auriferous material," 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 granting of the same.

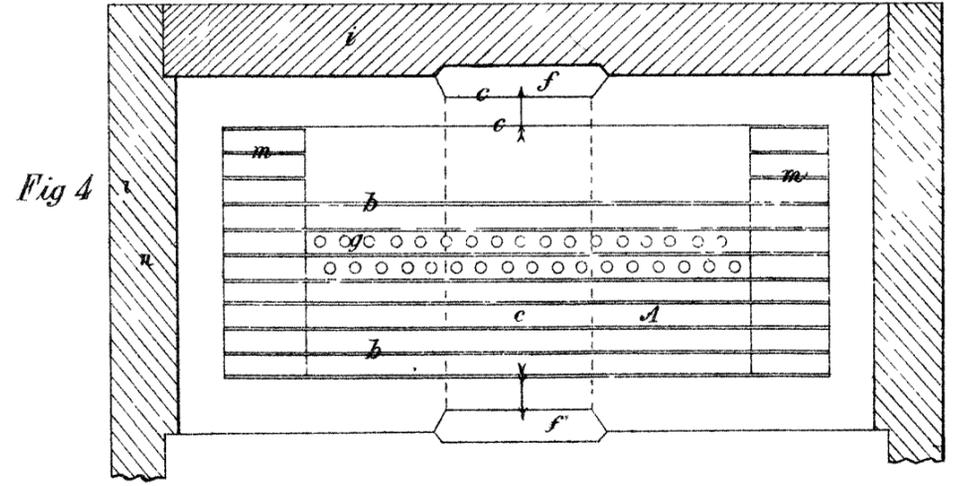
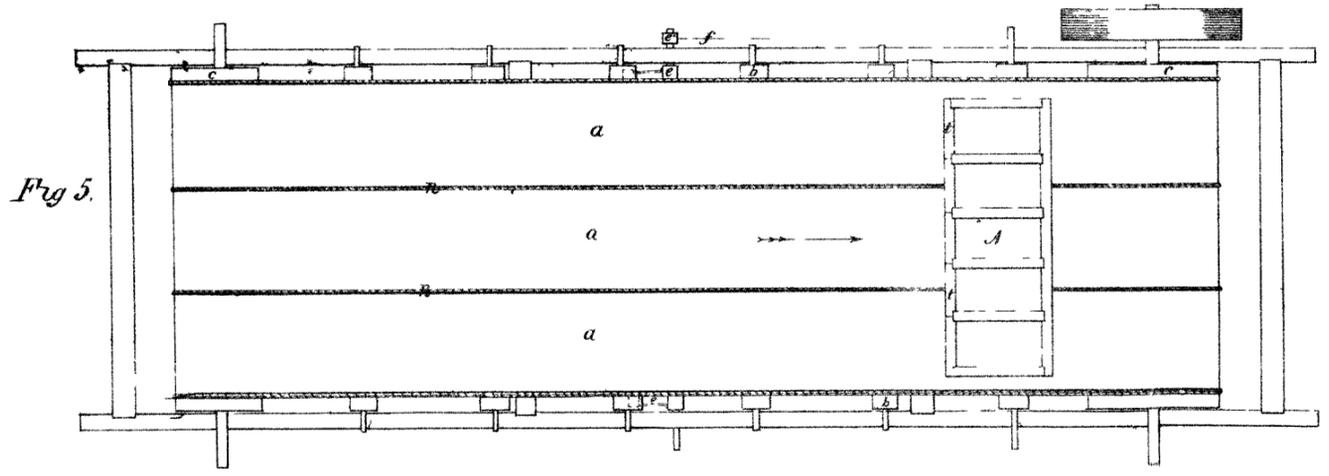
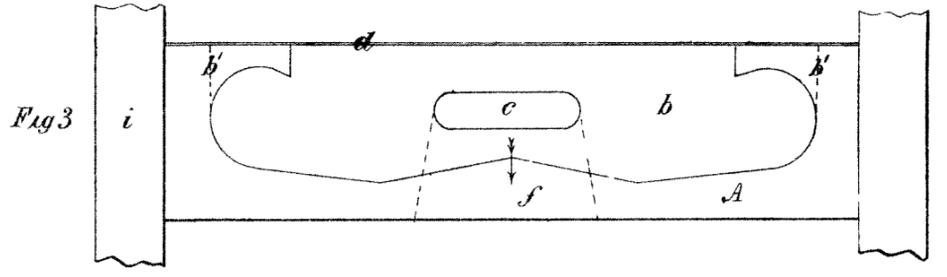
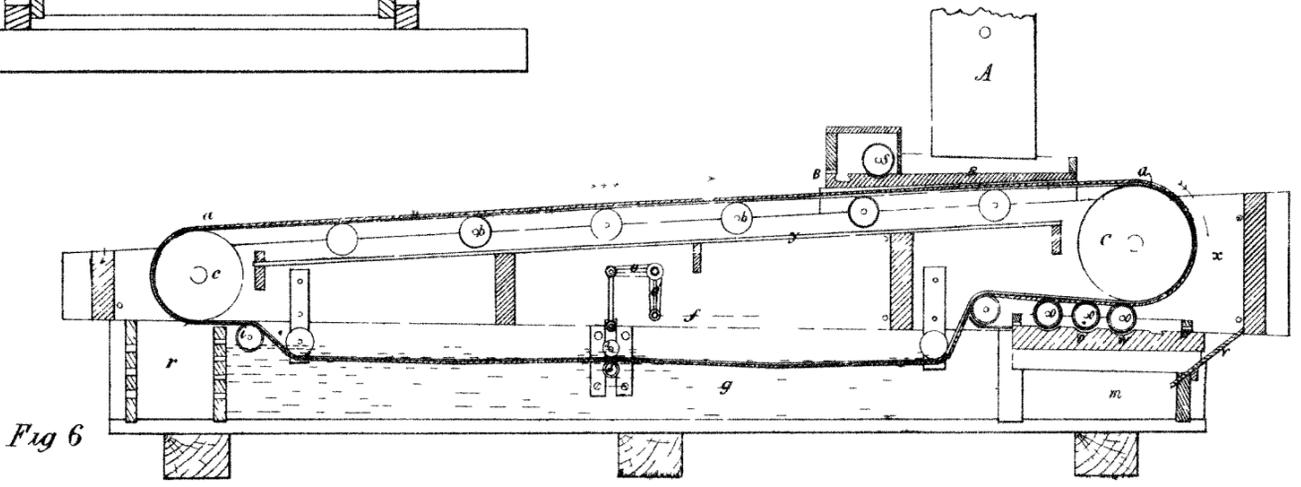
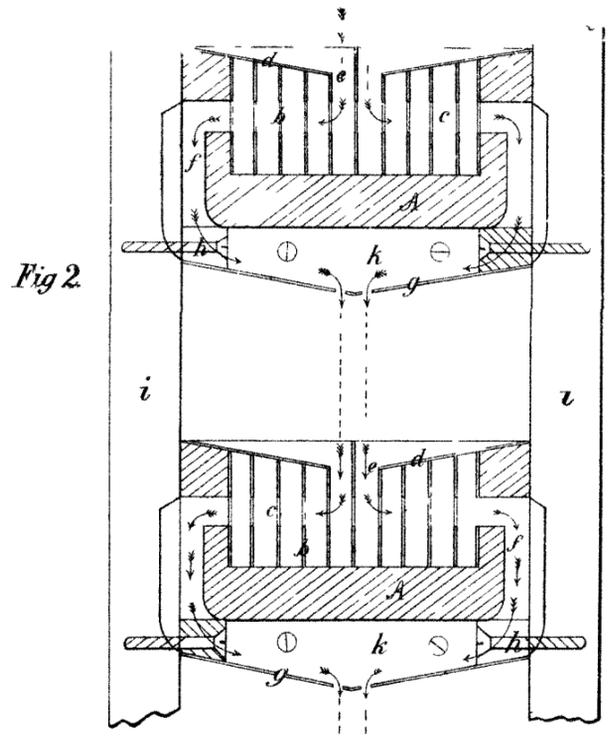
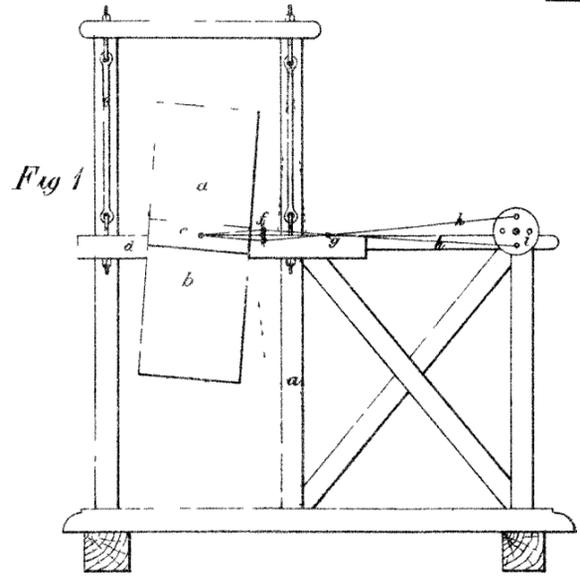
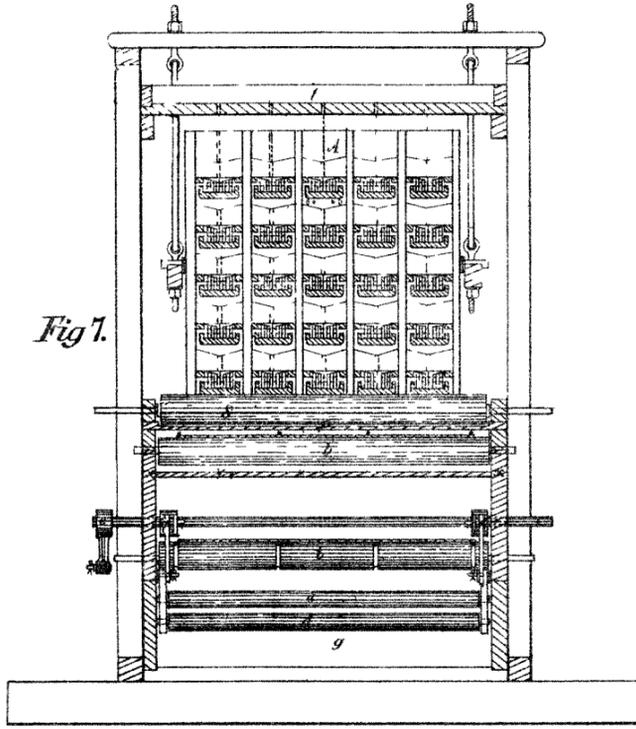
We have, &c.,

A. LEIBIUS.
CHARLES WATT.

The Under Secretary of Justice.

[Drawings—one sheet.]

— ALVES' PATENT —



This is the Sheet of Drawings referred to in the annexed Letters of Registration granted to John Alves and John Logan, this 18th day of October, A.D. 1882.

(875.)

Augustus Loftus.



A.D. 1882, 27th October. No. 1149.

IMPROVEMENTS IN MACHINERY FOR CUTTING CLOTH, &c.

LETTERS OF REGISTRATION to Joshua Alexander Kay and David Beath, for Improvements in Machinery for cutting cloth, leather, rubber, pasteboard, &c.

[Registered on the 27th day of October, 1882, 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 JOSHUA ALEXANDER KAY, mechanical engineer, and DAVID BEATH, merchant warehouseman, both of Flinders-lane, in the city of Melbourne and Colony of Victoria, 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 Machinery for cutting cloth, leather, rubber, pasteboard, &c.," 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 Joshua Alexander Kay and David Beath, 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 Joshua Alexander Kay and David Beath, 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 Joshua Alexander Kay and David Beath 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 October, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Machinery for cutting cloth, &c.

SPECIFICATION of JOSHUA ALEXANDER KAY, mechanical engineer, and DAVID BEATH, merchant warehouseman, both of Flinders-lane, in the city of Melbourne and Colony of Victoria, for an invention entitled "Improvements in Machinery for cutting cloth, leather, rubber, pasteboard, &c."

OUR invention relates to cutting machines, with their endless band and other knives, as used in factories, for cutting cloth, leather, pasteboard, &c., and consists,—

First—Of a novel improvement in the cutting edge of knives, whereby greater cutting power is obtained; the cutting edge of band or other knife being so cut or formed that it is interstitial or wave-edged, and thus offers less resistance when cutting through tough gritty material than the ordinary plain straight-edged knives heretofore in use. The advantages thus gained are, a much greater number of thicknesses of strong mole cloth can be cut, with considerably less frictional resistance; no difficulty whatever experienced in keeping with great exactness to the line mark. A thinner blade can be used, with less risk of breaking, the resistance being so considerably lessened, and a keen cutting edge more rapidly produced. The wave-spaces tend to gather the fluff and other refuse, throwing it off as the knife passes through the material. A current of air is continually being conveyed along with the knife through the material operated upon, which helps to reduce friction and keep the edge of knife cool. The wave-edge may be either sharp or flat curved, or other form, to render it interstitial. We do not confine ourselves to size or form of wave, so long as the principle of our invention is maintained. The broad part of knife may have holes punched or bored through, which for various reasons might enable it to pass through its work more freely.

Second—In having four or more band pulleys to carry and propel the blade, thus giving the optional power of setting the machine, so that the upward and downward portions of the blade may be as close or wide apart as required.

The accompanying drawings will illustrate what we mean. No. 1 shows one form of wave-edge on endless band knife. No. 2 is a hand knife for cross-cutting the long layers of cloth into convenient blocks for handling at machine. No. 3 shows the endless blade around the four extension pulleys; A being the endless blade, and B the extension pulleys.

The novelty of our invention is the application of the wave-edge in endless or other knives, as heretofore stated, and in having four or more band extension pulleys, instead of two or three, as in other machines, which renders them fixed in distance and position, giving only cutting space equal to the diameter of lower pulley.

We claim—

First—The novelty of a wave-edge for knives to cut cloth, &c., by machine or hand power.

Second—The application of four extension band-carrying and propelling pulleys, as hereinbefore described, and as shown on our drawings.

In witness whereof, we, the said Joshua Alexander Kay and David Beath, herewith set our hands and seals, this twenty-sixth day of July, A.D. 1882.

JOSHUA ALEXANDER KAY.
DAVID BEATH.

In the presence of us—

E. BURCHILL,
W. M'CALMAN,

Clerks to Beath, Schiess, & Co., Melbourne.

This is the specification referred to in the annexed Letters of Registration granted to Joshua Alexander Kay and David Beath, this twenty-seventh day of October, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

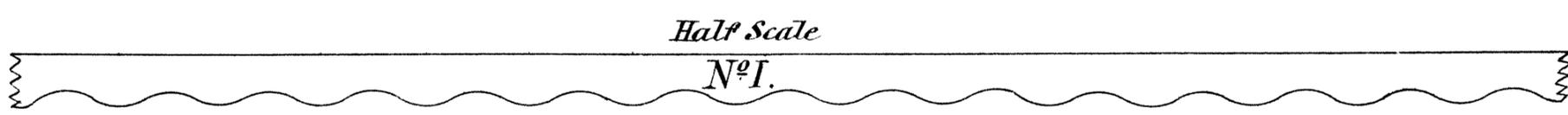
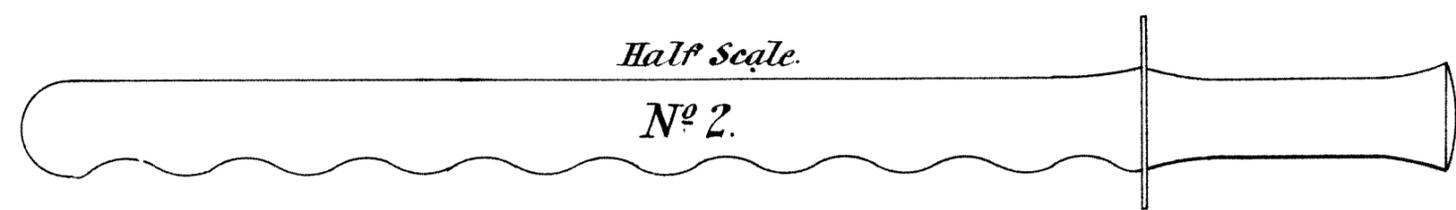
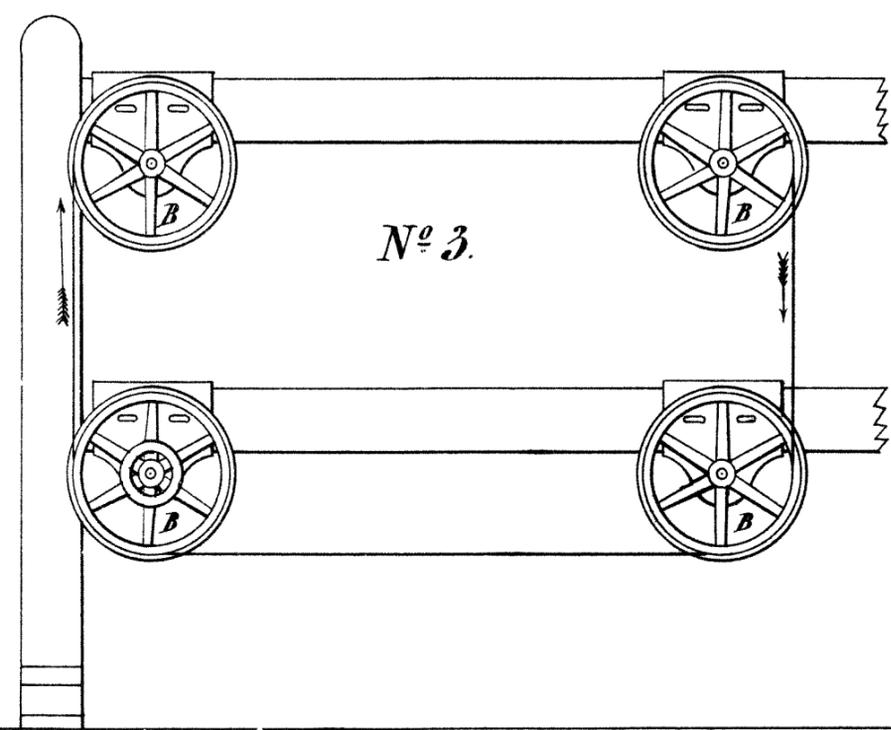
Sydney, 16 September, 1882.

The application of Messrs. Kay and Beath for Letters of Registration, for an invention entitled "Improvements in Machinery for cutting leather, cloth, rubber, pasteboard, &c.," having been referred to us for report, we have examined the specification accompanying the same, and have now the honor to state that we see no objection to the issue of Letters of Registration as applied for.

We have, &c.,

ARCH. FRASER.
THOS. RICHARDS.

The Under Secretary of Justice.



*This is the Sheet of Drawings referred to in the annexed
Letters of Registration granted to Joshua Alexander Kay,
and David Beath, this twenty seventh day of October;
A.D. 1882.*

Augustus Loftus.

*Joshua Alexander Kay
David Beath*





A.D. 1882, 27th October. No. 1150.

IMPROVEMENTS IN SECONDARY BATTERIES OR MAGAZINES OF ELECTRICITY.

LETTERS OF REGISTRATION to John Scudamore Sellon, for Improvements in
Secondary Batteries or Magazines of Electricity.

[Registered on the 27th day of October, 1882, 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 SCUDAMORE SELLON, of Hatton Garden, 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 Secondary Batteries or Magazines of Electricity," 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 John Scudamore Sellon, 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 Scudamore Sellon, 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 Scudamore Sellon 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 October, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Secondary Batteries or Magazines of Electricity.

SPECIFICATION of JOHN SCUDAMORE SELLON, of Hatton Garden, in the county of Middlesex, England, for "Improvements in Secondary Batteries or Magazines of Electricity."

My said invention relates to improvements in Secondary Batteries or Magazines of Electricity, composed of plates of lead or of other suitable material, which are or may be coated with or have attached to or packed therein or thereon, spongy, precipitated, or reduced lead, or other spongy, reduced, or precipitated metal or metallic matter, such plates being immersed in cells, vessels, or receptacles containing acidulated water or other suitable liquid; my invention having for its object the providing the maximum of active surface in the minimum space, so as to obtain a battery of great strength, and contained in or occupying a small compass comparatively with its efficiency.

In carrying out my invention, in order to effect this object, I form the plates with suitable perforations and roughened, serrated, or indented on their surface or surfaces, or any combination of these arrangements, construct such perforated plates with corrugations, grooves, or other suitable section presenting an extended surface. Into, on, or against such or other surfaces or irregularities I place or introduce a layer of metal, metallic salts, oxides or compounds, and the same may, if necessary, be retained in the desired position by means of sheets of felt or other porous material, or I may apply a coating of metals, metallic salts, oxides, or compounds to the ridges as well as on the surfaces or in the grooves, corrugations, or indentations, or cavities, and if necessary secure the retention of either one or more of the before-mentioned metals, metallic oxides or compounds, by means of a sheet of felt or other porous material, as before-mentioned, or other arrangements may be adopted for that purpose. Pairs of elements thus arranged are then placed in communication with a source of electricity, and charged in the usual manner. Or in lieu of the above, described constructions, the plates or elements may be formed or composed of lead or other suitable metallic wire, tubing, or strips, when either woven, plaited, braided, or otherwise interwoven into a metallic fabric presenting a large retaining surface.

My invention further consists in the employment for such batteries of elements and plates of any of the above described forms, composed of lead and antimony, and either consisting of plates or sheets of metals made to adhere by mechanical pressure or other suitable means, or in the employment of metallic plates consisting of alloys of lead and antimony.

In carrying out this part of my invention, I use for the manufacture of these plates, alloys of lead, with antimony, for the purpose of giving increased durability and also increased hardness, in order to prevent the contortions or changes of shape which the plates (especially those used as positives) undergo during their formation. For the above-named purposes I prefer to add a percentage of antimony, say 5 to 25 per cent., but a greater or less percentage may be employed.

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 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 represents a perspective view of a perforated battery plate, formed of dovetail section, in accordance with one part of my said invention, such form being especially favourable for the retention of the spongy or other material to be packed therein; and figures 2 and 3 show respectively a transverse section and end view of the same without the attachment hereinafter to be described. Figure 4 shows the section of a portion of a perforated plate, formed with angular projections or grooves, which may also be rounded, squared, or of any suitable form; and figures 5 and 6 illustrate its application to a circular and rectangular battery respectively. Figure 7 represents a front perspective view of a compound battery plate, formed of two or more perforated plates, having flat surfaces; while figure 8 shows an irregular section of plate, which may be, as well as any varied section that may be suitable (as, for example, at figure 8^a), employed in lieu of those with flat surfaces.

Figures 9, 10, and 10^a show one form of indented plate, *i.e.*, a plate cast with projections, and made with slits or perforations; 9 shows a section of such a plate when first cast; 10, when the projections have been somewhat flattened at the points, and to give a retended form; and 10^a a front view.

Figure 11 represents a side elevation of an element or plate of a secondary battery, composed of a number of perforated lead strips (having suitable surfaces) or of metal fabric, in accordance with another part of my said invention; figure 12 shows a modified arrangement of the above, in which the perforated lead strips or metallic fabric are strung or affixed to carbon rods or other suitable supports; and figure 13 illustrates a further modification in which the battery element or plate is composed of a number of perforated lead tubes of any suitable section.

It should be understood that all these forms of plates have either left on them in process of manufacture, or have subsequently attached to them, at and along their ends, sides, or tops and bottoms, partially or entirely, or in whatsoever other position may be desirable (by fixing, soldering, casting, or otherwise), solid strips or pieces of metal, X, to act as conductors for the electric current, or in some cases to give to them desirable strength or rigidity.

A are perforated sheets or plates of lead, platinum, or other suitable material, cast or otherwise conveniently formed, and I so arrange or fix them that a large quantity of spongy or finely divided lead, or of salts or oxides of lead or other suitable compounds, c, may be retained or held in, on, or against them in such a manner as to be readily acted upon by the electric current. The plates may be formed of perforated lead, or of lead cast with holes, a, either plain or with flutes, corrugations, indentations, shelves, or projections, b, in or on to which the material c, already prepared or to be rendered active, can be packed or placed. The plates of lead may also be roughened on one or both sides, by means of suitable tools, whether by pressure or striking, or by any chemical or metallurgical process giving an equivalent result, in such a manner that, to a suitable depth on each side of the plate, a spongy layer or projecting points or surfaces are produced, which are either suitable for retaining the material hereafter to be made active, or for obtaining a more rapid formation of the plates, if used without such packing. The plates so prepared may be either simply packed in their roughened surfaces, perforations, or interstices a with the necessary material a; or if it is desired to cover their surfaces, they may be wrapped with or have in any way attached to them any suitable material, such as parchment paper, felt, flannel, or analogous material, to sustain in place aforesaid the matter already prepared or hereafter to be made active.

On

Improvements in Secondary Batteries or Magazines of Electricity.

On the accompanying drawings some different forms of plates are shown, some of which, in addition to being available in series for acting as accumulators or regulators in electric lighting, or as batteries for the production of motive power, may form convenient single reservoir batteries for surgical or experimental purposes, or for working small lights or meters, or for other like purposes. One of the forms of perforated plates—one which I find very suitable—is with corrugations of a dovetail section, as shown at figures 1, 2, and 3 of the drawings. Another form, shown at figure 4, consists of a perforated plate of uniform, angular, serrated, or other suitable section, which may be formed into cells of convenient configuration, as will be understood by reference to the sectional figures shown at 5 and 6 of the drawings, or which may be used as single plates or pairs of plates in series, alternately acting as positive and negative.

In figure 5 a round outer circular plate B is provided, closed in at bottom if desired, forming a negative cell with numerous perforated divisions or lamina of the form last referred to, having indented or plain surfaces, or otherwise conveniently shaped, for holding, when packed, spongy lead, or lead in a fine state of division, or salts or oxides of lead or suitable compounds. C is an inner circular positive element or plate of similar construction, formed of a central rod or of a hollow tube, D, having divisions or lamina *b* thereon, as in the negative one, and packed in a similar manner. The central space on the said tube may also be packed or be partially packed with active material, so as to increase the storage capabilities of the battery.

It is obvious that the formation of such perforated or other plates, which may be of any convenient form or kind, may be varied considerably. Thus, for instance, the lamina divisions may be placed round or against the support as a series of shelves, of any suitable inclination, shape, or form, or may be formed of zigzag, V, dovetail, or other convenient section, out of perforated sheets of roughened, indented, or plain metal, or any combination of these forms. These lamina divisions or projections may be attached or affixed to, or sustained in place by the main supporting plates, the positive plate so prepared standing when necessary in or on a small base of suitable shape and material, so as to insulate it if necessary from the leaden bottom of the negative plate. This would, however, be unnecessary if the negative element be not constructed with a metallic or conductive bottom.

Plates constructed, formed, and prepared as above described may obviously be arranged into cells of various configurations, as, for example, oval, square, or rectangular, the last form being represented at figure 6 of the drawings, the object being to attain a large amount of surface of the material (either already prepared or hereafter to be rendered active) in such a position and under such conditions as to be readily subjected to the influences of charging or discharging as required. Plates so constructed or arranged may under some circumstances form convenient cells without any outer casing, jars, cases, or boxes of earthenware, glass, wood, gutta-percha, ebonite, papier-mâché, or other convenient insulating material being used to contain one, two, or any convenient number of them. A compound form of plate is represented at figure 7 of the drawings, composed of perforated sheets of lead or other suitable substances, as before specified, so riveted, soldered, or connected together, or may be also closed at the ends, sides, or tops and bottoms as to leave suitable intervening spaces, openings, or receptacles into which the aforesaid spongy or finely divided lead, lead salts, or equivalent compounds, is or are packed. These compound plates may be obviously formed of sheets of fluted, corrugated, or similar irregular section, as shown for example at figure 8 of the accompanying drawings. In carrying out what is called the formation, or rendering available of some of these packed plates with the electrical current for the purposes required, I have found it in some cases convenient for the first few hours, until the active material has somewhat hardened, to use pieces of parchment paper, felt, flannel, woven fabric, woodwork, or any suitable substance or material to sustain the material in or on the plates, and then to remove it to lessen the resistance. Several of the above-referred to forms of plates can then be maintained without any wrapping or separating medium, and I thus obtain more favourable results.

According to another arrangement, shown at figure 11 of the drawings, I form the elements or plates of perforated lead in the condition of strips A, having smooth, roughened, corrugated, or indented surfaces, or any suitable woven fabric or form, suitably prepared, may be employed so as to retain the material to be packed therein or thereon, or attached at the side, ends, top, and bottom, and, if desired, intermediately, or in any convenient position, to pieces, rods, or tubes B, of lead or other suitable metal, and then packed with finely divided material, *c*, already prepared or hereafter to be rendered active.

According to the modified arrangement shown at figure 12, I employ lead in the same condition as above; but strung on or affixed to rods of carbon, D, with side or top and bottom pieces of lead cast on or affixed thereto, forming a strong framework, *d*, upon, against, or into which the spongy or other material *c* is packed.

Figure 13 shows another arrangement, in which an element or plate is formed of perforated lead tubes E, of round or other suitable section, packed with the material *c* already prepared or to be rendered active, with side pieces of lead F affixed to or cast thereupon, and with or without a centre wire core support of metal or carbon. In all these forms described the lead may be either unalloyed or alloyed as hereinbefore described.

It will be understood that a great variety of other forms and combinations of plates or elements could be adopted without departing from the principle of my invention; and it should be observed that all the various forms of plates or elements set forth may be composed of lead, platinum, carbon, or sheets of different suitable metals, united by pressure, or of suitable alloy or alloys of lead and antimony, or any combination of the same, as hereinbefore described.

In constructing batteries when great lightness and portability is required, as well as increased durability, I employ plates, especially positive plates, formed of the thinnest possible platinum foil, stretched in frames of wood or other suitable substance, and perforated, indented, corrugated, fluted, or any combination of such forms or others of a suitable kind against, in, or on which the active material can be placed.

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 I wish it to be understood that I do not claim the use of either spongy or finely divided lead, nor of any oxide salt or preparation of lead *per se*, nor the use of corrugated or grooved sheets or plates of lead unperforated, for the retention of such substances, but I claim—

Improvements in Secondary Batteries or Magazines of Electricity.

- 1st—The use in the construction of secondary batteries of perforated plates or sheets, roughened, serrated, or indented, composed of lead, platinum, or carbon, or alloys of lead and antimony, substantially as and for the purposes hereinbefore described.
- 2nd—The arrangement of such perforated plates or sheets as hereinbefore described, and shown at figure 7 of the drawings.
- 3rd—The employment of plates or elements composed of perforated strips, tubes, pieces or woven fabrics of lead or alloys of lead with antimony, either separately or combined, substantially as and for the purposes hereinbefore described with reference to figures 11 to 13 of the accompanying drawings.

In witness whereof, I the said John Scudamore Sellon have to this my specification set my hand and seal, this ninth day of March, one thousand eight hundred and eighty-two.

JOHN S. SELLON.

Signed and sealed in the presence of,—

J. HENRY JOHNSON,
47, Lincoln's Inn Fields, London,
Solicitor.

JAMES Y. JOHNSON,
47, Lincoln's Inn Fields, London.

This is the amended specification referred to in the annexed Letters of Registration granted to John Scudamore Sellon, this 27th day of October, A.D. 1882.

AUGUSTUS LOFTUS.

REPORTS.

Sir,

Sydney, 17 May, 1882.

In reply to your blank cover communication of the 9th instant, No. 5,756, we do ourselves the honor to report that, on examination of Mr. John Scudamore Sellon's specification, drawings, and claim of an invention entitled "Improvements in Secondary Batteries or Magazines of Electricity," we are of opinion so much of Mr. Sellon's first claim may be granted as relates to the form of the plates; so much of his second claim as relates to the arrangement of the perforated plates; so much of his third claim as relates to the perforated strips, tubes, pieces of woven fabrics of lead or alloys of lead, and to their combination; and that the fourth claim does not admit of registration.

The Under Secretary of Justice.

We have, &c.,

E. C. CRACKNELL.
GOTHER K. MANN.

Sir,

Sydney, 20 September, 1882.

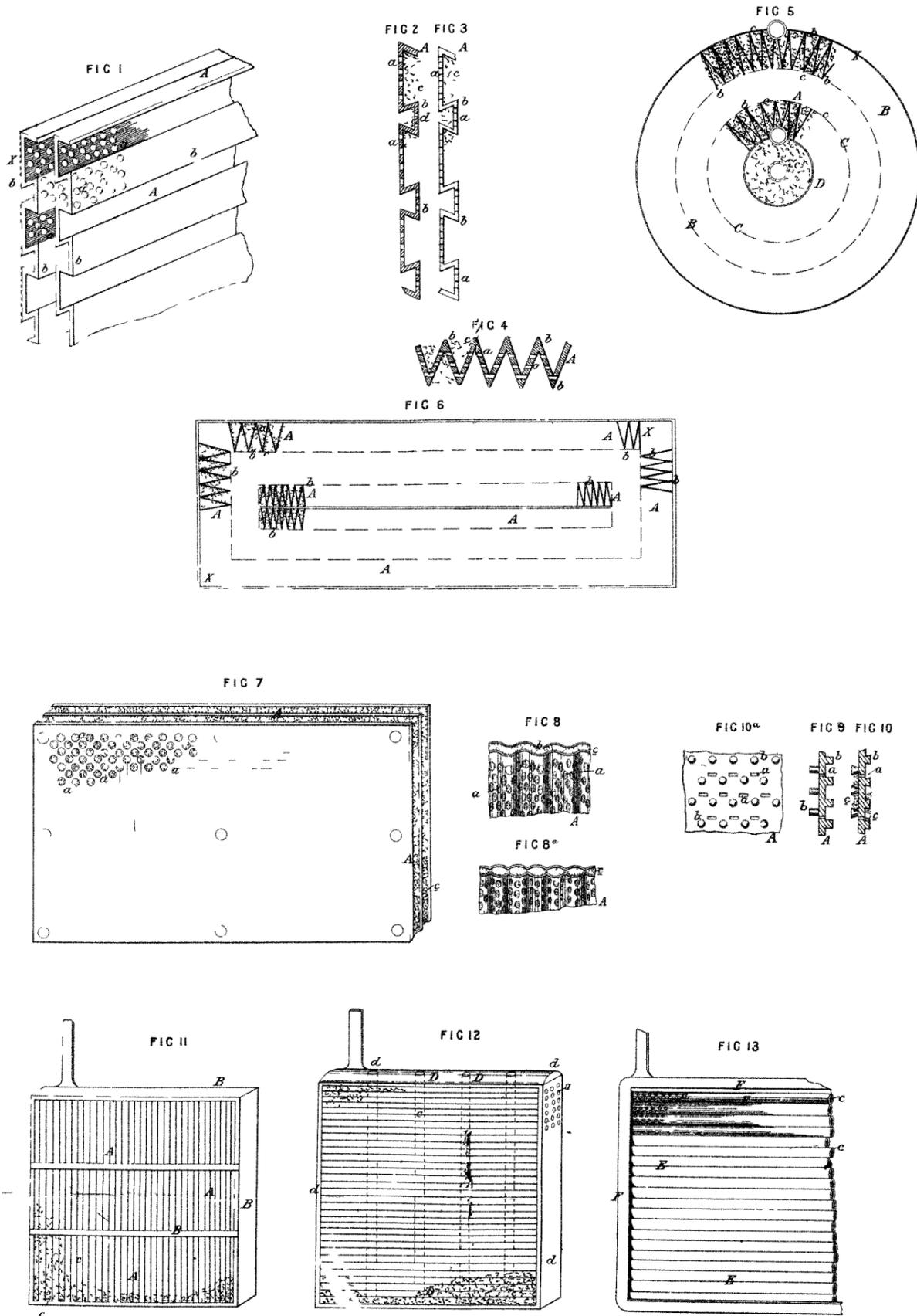
We do ourselves the honor to report, in reply to your further communication of the 8th instant, No. 10,549, that we are of opinion the prayer of Mr. John Scudamore Sellon's Petition for the registration of "Improvements in Secondary Batteries or Magazines of Electricity" may now be granted, in terms of his revised claims.

The Under Secretary of Justice.

We have, &c.,

E. C. CRACKNELL.
GOTHER K. MANN.

[Drawings—one sheet.]



*This is the Sheet of Drawings referred to in the annexed
Letters of Registration granted to John Scudamore Sellon,
this 27th day of October A.D 1882.*

Augustus Lortus.

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



A.D. 1882, 27th October. No. 1151.

IMPROVEMENTS IN THE MEANS OF AND IN THE APPARATUS FOR STORING
ELECTRICAL ENERGY, &c.

LETTERS OF REGISTRATION to John Evelyn Liardet and Thomas Donnithorne,
for Improvements in the means of and in the Apparatus for storing Electrical
Energy, and in the preparation of the materials to be employed.

[Registered on the 27th day of October, 1882, 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 EVELYN LIARDET, of Brockley, in the County of Kent, England, and THOMAS DONNITHORNE, of 30, Gracechurch-street, in the City of London, 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 the means of and in the Apparatus for storing Electrical Energy, and in the preparation of the materials to be employed," 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 Evelyn Liardet and Thomas Donnithorne, 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 Evelyn Liardet and Thomas Donnithorne, 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 Evelyn Liardet and Thomas Donnithorne 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 October, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS,

Improvements in the means of and in the Apparatus for storing Electrical Energy, &c.

SPECIFICATION of JOHN EVELYN LIARDET, of Brockley, in the County of Kent, England, and THOMAS DONNITHORNE, of 30, Gracechurch-street, in the city of London, England, for an invention entitled "Improvements in the means of and in the Apparatus for storing Electrical Energy, and in the preparation of the materials to be employed."

THIS invention has for its object improvements in the means of and in the apparatus for rendering energy potential, or, so to speak, of storing it, and in the preparation of the materials to be employed therein.

1. The secondary batteries of M. Planté and M. Faure, and M. de Meritens, are all worked upon the same principle, which may be briefly stated as follows:—Acidulated water is decomposed by means of an electric current into hydrogen and oxygen gases, with the view of utilizing the oxygen gas on the one hand to assist in the formation of peroxide of lead at the positive pole (originally consisting of lead in whole or in part), and of utilizing the hydrogen gas which condenses upon or is liberated at the negative pole to reduce the peroxide or other salt of lead to a lower state of oxidation, or even to a metallic condition.

2. To further illustrate the principle stated above, when water acidulated with dilute sulphuric acid is electrolysed, using plates of lead as electrodes, the plate at which the current enters becomes coated in course of the decomposition with brown peroxide of lead, and this substance, being powerfully electro-negative towards the metallic lead and the hydrogen which is liberated at the negative plate, the cell is now capable of producing an electric current, if, and after it is detached from the battery by means of which it was originally or primarily charged. By discharging such a "formed" cell the peroxide of lead is reduced, and if now the cell be again charged from a primary battery or other source of electric current in the opposite direction, the other plate of lead becomes peroxidised, and the hydrogen gas is now liberated less freely than upon the first charging, because it re-acts upon the oxide of lead, and reduces it to the metallic state. By thus charging and re-charging a number of times, there are ultimately obtained relatively great amounts of peroxide of lead upon the one hand, and finely divided and crystalline metal upon the other hand.

3. The quantity of potential energy thus admitting of storage, so to express it, depends entirely upon the amount of electro-chemical work done, and this in its turn is proportioned to the extent of surface of the electrodes, other conditions being constant.

4. Knowing the nature of the work which is performed in "forming" such accumulators, that is to say, knowing the substances which result as products of the action, it may be a step towards simplification if, instead of starting with metallic lead alone, there is used in addition thereto a quantity of the peroxide of lead, or any other oxide of lead intermediate between lead and its peroxide, or other suitable salt of lead, such as the sulphate of that metal. Similarly, since the greater the surface of the electrodes the greater is the action, it is of advantage to start with the plates or electrodes so constructed as to present the greatest possible surface.

5. Many attempts have been made towards accomplishing these objects, and our invention relates in part to the same subject.

6. It is not essential, however, to the so-called electric storage of energy, that lead plates should be used for the electrolysis of water—other metals and substances may be employed, and other products consequently result from the action—but in all cases it is sought to obtain as relative products two or more substances which present differences in the amount of their potential energy, so that in their neutralisation or running down by chemical re-action to the same inert level force in the form of an electric current is developed, and our invention relates in part to this subject.

7. In those cases where we employ metallic lead, we employ it in the shape—A, of cells or structures of any shape, packed or filled with lead shots; B, of cells or structures of any shape, packed or filled with hollow spheres of lead prepared as follows:—We mould or otherwise prepare marbles or round balls or squares, or other forms of chalk or other substances which are known to be soluble in or dissolved by water or acids or alkalis, or other solvents, and we then coat them with a film of lead by rolling them about in molten lead or otherwise, after which they are removed from the bath of lead, suitably pierced so as to break the coating of metallic lead in one or more places, and they are then immersed in the solvent or re-agent which exercises the solvent or decomposing influence capable of removing the matter which forms the contents or cores of the leaden spheres or shells—for instance we employ chalk, which is decomposed by hydrochloric acid, or common salt, which is soluble in water; C, of cells of any shape packed with broken charcoal, coke, asbestos, pumice-stone, sand, or other material presenting an extended surface, which has been previously coated with metallic lead, either as described in B, or by electrolysing a solution of the acetate or other soluble salt of lead in which such porous substances are immersed; or, D—We employ lead in that particular porous and finely divided condition in which it is deposited from a solution of acetate or other salt of lead when metallic zinc is placed in such a solution. Such finely divided and porous lead may be packed in cells or leaden or other suitable vessels, or on supports of any shape and size, to serve in the places of plates in the secondary batteries or accumulators, or it may be attached to any leaden or other metallic surface of any suitable nature or description; or, plates covered with such porous metal may be used, being prepared as follows:—Plates of lead are taken, and to each surface is attached, by means of leaden fastenings or otherwise, a sheet or plate of metallic zinc. Such prepared compound plates are then encased in a suitable jacket of porous material, such as felt or sacking, and then suspended in a solution of acetate of lead or other salt of lead until the zinc is dissolved out into the solution and substituted by lead in the finely divided and porous condition already described.

8. All such forms of lead as are described in 7 may be coated, if desired, with any oxide of lead or the sulphate of lead.

9. In the place of a coating or paint of peroxide of lead, or red lead or other suitable lead compound, to be attached to the plates of lead, or other forms of that metal hereinbefore referred to, we employ more or less thick cakes of such substances, prepared in the first place by suitable chemical means, and then compressed in blocks or moulds, and attached to the metallic plates by means of leaden fastenings or hooks, or by bandages or strips of gutta-percha or felt, or other suitable material. Similarly other cakes may be employed, such for instance as we obtain by mixing any proportions of red oxide of lead or peroxide of lead, or sulphate of lead, with plaster of Paris, or other like cement, or with China clay, or other similar earths

Improvements in the means of and in the Apparatus for storing Electrical Energy, &c.

earths and water, with or without the addition of other inert substances presenting an extended surface, such as powdered glass, pumice, charcoal, asbestos, gypsum, &c., &c.; and such cakes may be surrounded by a further casing of pure plaster of Paris, with the view of preventing the formation in the solution of the battery of a deposit of metal liable to impair the usefulness of such battery.

10. In further relation to the use of the finely divided porous lead, more particularly described in 7 D, we can also attain our object by filling a cell, having two compartments, with a porous wall between them, with acetate of lead solution, immersing as electrodes two plates or other forms of zinc, encased in suitable jackets, one in each compartment, and then so soon as the zinc is dissolved and replaced by metallic lead, drawing off the solution, washing out the cell, if necessary, and refilling it with dilute sulphuric acid, and proceeding, after providing the cell with suitable terminals, to charge or "form" the cell as if we had started with plates of lead. Or, instead of starting with both electrode-like plates of zinc alone, we can start, having one composed of zinc and the other of lead, encased in a coating or cakes of any of the compositions above-mentioned in paragraph 9. Or, again, we can start with one free plate of zinc, and the other plate enclosed in such a coating or cakes as above mentioned in paragraph 9. We may provide the battery cells with air-tight covers, and make suitable provision by valves for the escape of gas, should any be liberated. In those cases in which the battery cells are started with surfaces of metallic lead, we can add peroxides of hydrogen to the dilute acid in which they are immersed, in order to assist in the formation of peroxide of lead.

11. And in order that our invention may be fully understood, we shall now proceed to describe more particularly the same, and for that purpose shall refer to the several figures on the annexed sheet of drawings. Figure 1 of the accompanying drawings represents a vertical section of a battery constructed according to this invention, as hereinafter described; figure 2 is vertical section of another form of a battery, constructed according to this invention, as hereinafter described; figure 3 is a vertical section of another form of battery, constructed according to this invention, as hereinafter described; figure 4 is a vertical section of yet another form of battery, constructed according to this invention, as hereinafter described.

Figure 1—According to the arrangement illustrated in figure 1, a pair of terminals A and B, having flat and parallel surfaces, is employed, the said terminals being composed of two thin plates of lead or carbon, and each surrounded by a coating of the finely divided porous lead D, herein described, and this porous metal in its turn, being surrounded by a coating or composition of red lead, peroxide of lead, sulphate of lead, or other suitable lead compound and plaster of Paris, or the other materials above-mentioned, E, in the proportion, for example, of eight parts of the lead compound and one part of plaster of Paris, or the other materials above mentioned, the whole being placed in a rectangular vessel, C, containing water acidulated with sulphuric acid.

Figure 2 illustrates a battery provided with two terminals of carbon or lead, or other conductor, A and B, embedded in, and therefore in contact with a mass of lead shots or porous lead D packed in cells E of the same metal, or composed of some porous material, and the whole contained in a suitable vessel, C, filled with acidulated water; or, the lead shots or porous lead, as the case may be, may be first mixed with red lead, either in one or in both cells.

Figure 3 represents a battery constructed similarly to that illustrated in figure 2, except that the containing cells of lead E are pierced with holes and encased in a coating, F, of red lead or other compound of lead, mixed with plaster of Paris or other composition as above-mentioned.

Figure 4 illustrates a battery having one terminal made of metallic lead sheet A, surrounded by and encased in a mass of finely divided porous lead, D, which in its turn is kept in its place by thin folds of lead-foil (but in place of the lead-foil a coating of plaster of Paris or the other materials above mentioned may be employed); the other terminal B being composed of carbon surrounded by and encased in a coating or casting, E, of the before-mentioned mixture of red lead, or other compound of lead and plaster of Paris or other materials.

In the case of the Faure and Sellon Volckmar batteries, sheets or plates or other forms of lead are employed, the lead, however, always preventing more or less plain or continuous surfaces, and comparatively great massiveness or solidity, while the red lead or other compound used instead thereof is either kept in contact with the said sheets or plates by means of flannel, felting, or parchment, or other destructible material, or else is deposited in holes, crevices, or cavities made by mechanical means in the lead sheets or plates. In such cases it is only after the batteries have been in use for some considerable time that there is obtained (and it is so obtained by the "formation," as it is termed, of the batteries) any appreciable amount of crystalline lead, which in such case results from the process of reduction of a lead compound (say) of the red oxide by hydrogen, and until that point is reached the cells are not thoroughly receptive in character. On the other hand, our batteries, constructed as described, particularly as illustrated by figure 1, are perfectly receptive from the beginning, and before they are actually employed, for we start with lead, the whole of which is already in an exceedingly porous state, thus presenting a most extended surface, very active, and being relatively light as compared to sheets, plates, or even wire or foil. Our lead is therefore in the condition of being most susceptible to the influence of oxygen, which it absorbs with great avidity, thus giving to our batteries exceptional receptivity of character. Not only this, but by mixing plaster of Paris or the other materials above-mentioned with the red lead or other compound of lead to be used in conjunction with the porous metal, we are enabled to place the said lead compound just as and where it is wanted, without the aid of any further support; and the plaster of Paris and materials above-mentioned, being of a porous nature, give to the red lead or other compound a like character, and bestow on the whole cell the valuable property of comparative indestructibility. In this form of battery (figure 1), therefore, which we prefer, the poles or terminals, which may be made of carbon or any other suitable material, are simply intended to serve as conductors for the flow of the electric currents into and out from the cells themselves. In this respect, that is say, the use of porous lead only on the one hand, and the use of a lead compound mixed with a porous cement on the other hand, our process and apparatus are quite novel and most important. We may of course also use the plaster of Paris, or such of the materials above mentioned as are suitable for the purpose, as a cement for binding whole series of cells together, and we can arrange or connect up the members of the said series in the ways that are well-known, in order to obtain quantity and tension effects.

As

Improvements in the means of and in the Apparatus for storing Electrical Energy, &c.

As regards the preparation of the porous lead which we employ, we prepare it by the following processes or modifications direct from the ores of lead, such as galena or native sulphide of lead, as follows:—According to our process the ores are crushed and decomposed by means of any suitable acid, such as hydrochloric acid, in a closed mill or other suitable apparatus; the hydrochloric acid if employed converts the lead into chloride of lead, which after being washed with common water (chalk being used for the neutralization of any excess of acids) may be extracted by means of boiling water from the clear solutions which result from this proceeding; the porous lead is precipitated by means of scrap zinc or other forms of spelter immersed or suspended in the said solutions, and the sulphuretted hydrogen evolved by the action of the acid upon the galena may be employed in the manufacture of sulphuric acid or other useful purpose. The zinc used in this process is readily recoverable by well-known chemical means. According to another process the galena is roasted in a limited supply of air, sulphurous anhydride being liberated; the residue is then treated with hydrochloric acid, which decomposes any residual sulphide of lead, and the mixture of chloride and sulphate of lead thus obtained is then extracted with a solution of brine, which dissolves both the chloride and the sulphate of lead, and from the extract the porous lead is precipitated by means of zinc or spelter, as already described. The sulphurous anhydride liberated in this process may also be employed for the manufacture of sulphuric acid or other useful purposes. If the galena contains besides lead foreign substances, such foreign substances should be removed, the object being to get the lead as pure as possible. The lead as thus obtained suits our purpose admirably, and may be obtained at small cost by either of these or other similar processes direct from the ores of lead, and we claim the application of the porous lead as thus obtained direct from the mineral sources of lead to the construction of secondary batteries or accumulators.

We now proceed to detail, in accordance with the foregoing description, the instructions for constructing a battery (say) of ten compound cells, each cell being composed (say) of eight elements, or four pairs. It will be understood that these instructions may be modified in various ways, and are only given by way of illustrating clearly one method of proceeding to carry out the invention.

A rod or plate of some conductor (say lead or carbon) is taken, and around the greater part of its length is moulded gently with the hands a quantity (say) weighing 16 ozs., of our specially prepared porous lead, which is kept, if necessary, in its place for the moment by cotton or thread. Thus prepared, the pole, so to call it, is suspended or made to stand upright in the centre of a suitable mould (say of a flat character, having parallel sides), into which is then poured a mixture in the proportion of (say) 48 ozs. of red lead (or other lead compound, such as the sulphate) and 8 ozs. of plaster of Paris, or of the other materials above-mentioned, and capable of setting, and sufficient water to make it into a thin paste. When the said mixture has set, the whole apparatus is removed from the mould, and constitutes one element. Then seventy-nine other elements are similarly constructed, after which they are placed in suitable cells, or containing vessels to the number of eight elements in each cell, being placed side by side, either cemented together by pure plaster of Paris, or else isolated by means of a strip of gutta-percha or wood between each element. The containing cell or vessel is charged with sulphuric acid and water (say) in the proportions of one part strong acid to nine parts of water, and the eight several terminals of the elements are then alternately connected or bound up, thus forming a compound pair of each of the ten cells. To obtain tension effects the various cells may be connected, as is well known. If the conducting terminals be made of lead or other metal liable to be acted upon and slowly destroyed by the action of the acid and other agencies, they may be protected from such effects, where necessary, by means of a coating of gutta-percha or other material which is not attacked by dilute sulphuric acid.

It will be seen that the foregoing description of the manner of priming a battery applies specially to the form of battery represented in figure 1; but from the description already given, added to an inspection of figures 2, 3, and 4 of the drawings, any competent workman may readily construct a battery according to the forms shown respectively in figures 2, 3, and 4.

It will be understood of course that the relative amounts of metallic porous lead and the compound of lead (for instance, say, red lead) used in constructing the two elements of any pair may vary. For example, at the positive pole we may have either porous metal solely or red lead, or other compound of lead mixed with plaster of Paris or with the other materials above mentioned solely, and at the negative pole we may have only red lead or other compound of lead mixed with plaster of Paris or with the other materials above mentioned solely; but when both porous metal and the said mixture of lead compound with plaster of Paris; or the other materials above mentioned, are employed at both poles, we may employ a relatively greater proportion of the lead compound mixture with plaster of Paris, or other materials above mentioned, say twice as much, at the positive pole. Or, again, we may employ the porous metal solely at both poles, using the plaster, if desired, to retain the metal in its place against the respective terminals.

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 that what we consider to be novel and original, and therefore claim as the invention, is—

First—The use of finely divided porous lead, prepared as hereinbefore described, to serve in part construction of secondary batteries.

Second—The use of plaster of Paris or other like cements, China clay, or other similar earths, as hereinbefore described, as a support for the active parts of secondary batteries.

Third—The improved secondary batteries, constructed substantially as hereinbefore described, for the storage of energy.

In witness whereof, we, the said John Evelyn Liardet and Thomas Donnithorne, have hereunto set our hands and seals, this 27th day of July, 1882.

J. EVELYN LIARDET.
THOS. DONNITHORNE.

This is the specification referred to in the annexed Letters of Registration granted to John Evelyn Liardet and Thomas Donnithorne, this twenty-seventh day of October, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Improvements in the means of and in the Apparatus for storing Electrical Energy, &c.

REPORT.
—

Sir,

Sydney, 20 September, 1882.

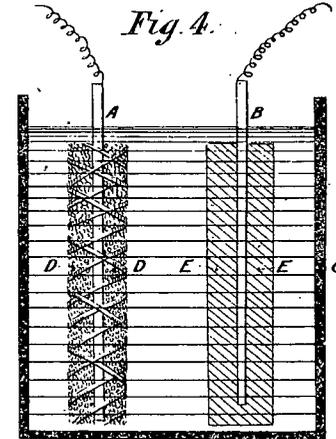
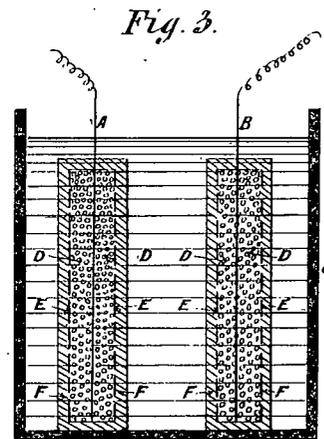
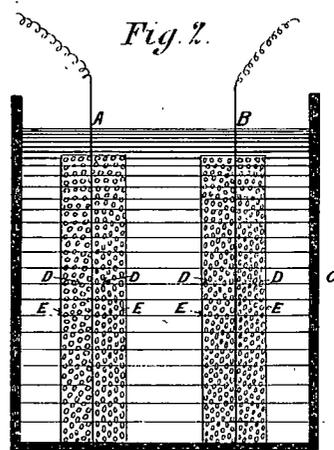
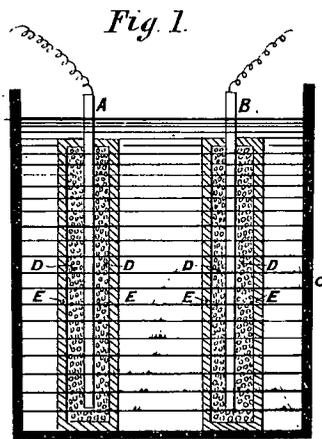
We do ourselves the honor to report, in reply to your blank cover communication of the 12th instant, No. 10,607, that we are of opinion the prayer of Messrs. John Evelyn Liardet and Thomas Donni-thorne's Petition for the registration of an invention entitled "Improvements in the means of and in the apparatus for storing Electrical Energy, and in the preparation of the materials to be employed," may be granted, in terms of their 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 John Evelyn Liardet
and Thomas Donathorne, this twenty seventh day of October
A.D. 1882.*

Augustus Loftus.



A.D. 1882, 27th October. No. 1152.

IMPROVEMENTS IN FASTENERS FOR GLOVES, &c.

LETTERS OF REGISTRATION to Edward Horsepool, for Improvements in Fasteners for Gloves and other articles of wearing apparel, and analogous articles.

[Registered on the 27th day of October, 1882, 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 HORSEPOOL, of Wood-street, Cheapside, London, England, warehouseman, 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 Fasteners for Gloves and other articles of wearing apparel, and analogous articles," 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 Edward Horsepool, 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 Horsepool, 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 Horsepool 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 October, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Fasteners for Gloves, &c.

SPECIFICATION of EDWARD HORSEPOOL, of Wood-street, Cheapside, London, England, warehouseman, for an invention entitled "Improvements in Fasteners for Gloves and other articles of wearing apparel, and analogous articles."

THE object of this invention is—(1) curving the under portion of the ears or lugs of glove and like fasteners for the reception of an eyelet of a "tab" on the wrist portion of a glove, or an eyelet on the wrist portion itself, to keep the eyelet securely in position, and to prevent the lever, which is pivoted or hinged to the ears, from getting opened, by a sliding action of the eyelet; (2) fitting the lever or the base-plate, or both of them, that the lever may be held in a closed condition by the pressure of the eyelet on the tail end of the lever, or by the front or the tail end of either the lever or of the base-plate being formed with a spring lip, or its equivalent, or with one or more catches at the side or sides of the base-plate.

My invention is clearly represented by the several figures on the annexed sheet of drawings.

Figure 1 shows the fastener; *a* is the base; *b*, the ears; *d*, the lever, whose tail end *h* projects in front of the hollow *c* of the ears for the eyelet B to press against when the fastener is closed.

Figure 2 shows the fastener on the wrist portion of a glove, A, the eyelets B being arranged in a tab, C, sewn on it, which tab can be easily gripped by the hand to fasten or to unfasten the wrist.

Figures 1^a and 2^a are views of a base-plate, *a*, with two ears or lugs, *b b*, hollowed at the back portion *c* for the lodgment of an eyelet or other ring-shaped attachment fitted on or to the opposite portion of the wrist of a glove to that on which the base-plate *a* is secured. The eyelet or ring-shaped attachment may, however, be attached to or be part of a lip or tab sewn or otherwise secured thereon. *d* is a tongue or lever pivoted or hinged to the ears of lugs *b b*, so that it can be lifted, as shown at figure 1, or be shut down, so that its extreme end *e* presses back the lip *f*, to become engaged against the under portion *g*, to be held in a secure manner.

Figures 3 and 4 show a similar base-plate, *a*, and ears or lugs *b b*, the tongue or lever *d* having its back end *h* lengthened, to be brought into contact with and under the curl *g*, which is formed from a bent-up back end *j* of the base-plate *a*.

Figures 5 and 6 represent a slight modification of the foregoing. In this the lip *j*, at the back end of the base-plate *a*, is kinked at *g*, for securing the tail end *h* of the tongue or lever *d* when forced down.

Figures 7 and 8 are elevations of a fastener, with a lip, *i*, formed and bent up from one side of the base-plate *a*, and curled or kinked at *g*, for the reception of the tongue or lever *d* when pressed home.

Figures 9 and 10 show a fastener with two bent-up lips, *i i*, one on each side, and curled or kinked for the lever *d* to find a lodgment when pushed down.

Figure 11 represents a fastener with the tail-piece *h* of the tongue curled inwards (as in the detached view, figure 12), to form a springy or yielding end, which permits the tongue or lever *d* to be held in an open or in a closed position.

Figure 13 shows a fastener, with the front end *e* of the tongue or lever *d* bent downwards to engage over a bent-up or curved end *f* of the base-plate *a*, with a nipping action to hold it firmly.

Figure 14 represents a fastener with a bent tail-piece, *j*, to the base-plate at back, and with a side bent-up lip, *i*, at one side at the front, whereby the tongue or lever *d* is held at both ends.

Figure 15 shows a fastener with the front end *f* of the base-plate *a* bent up, and to the front for a hole, *j*¹, formed in the front end of the tongue or lever *d*, to pass over and be held by the springy, nipping action of one to the other.

Figure 16 is a modification of the foregoing, a stud or headed pin, *k*, being fixed to the upper surface of the base-plate *a* for the same purpose.

Figure 17 shows the front end of the tongue or lever *d*, notched or forked to pass down and under or into the nick or recess of the stud or pin *k*.

Figure 18 shows the pin *k* on the under surface of the tongue or lever *d*, to engage in the hole or perforation *j*¹ in the base-plate *a*.

It will be observed that in all the fasteners herein referred to and shown in the annexed drawings, the ears or lugs *b b* of the base-plates are curved inwards below the centres or pivot-holes on which the tongues work, into which hollows, or recessed or inward curved portions, the eyelet or ring-like attachment is compelled to engage; said ears or lugs being so fitted or provided as to bear the strain of the eyelet or ring attachment, the tongue or lever being exclusively as a safeguard, to prevent the eyelet or the ring leaving the fastener while the tongue is in a secured position.

Having now described the nature of my said invention and in what manner the same is to be performed, I declare that I claim—

The deep hollow or recess *c* of the ears *b b* for the eyelet to lodge itself in as a temporary attachment, the positive attachment being effected by the hinged lever *d*, which can be secured in position automatically, as described and as shown in the drawings.

Secondly—I claim to shaping the tail end *h* of the hinged lever *d*, that it projects into the deep hollow or recess *c* of the ears *b*; that the strain of the eyelet on said tail end keeps the fastener closed automatically.

Thirdly—I claim the several details, *f*, *g*, *i*, *j*, *k*, as methods by which the lever *d* can be retained in a closed condition mechanically.

In witness whereof, I the said Edward Horsepool have hereto set my hand and seal, this twenty-fifth day of May, 1882.

EDWARD HORSEPOOL.

This is the amended specification referred to in the annexed Letters of Registration granted to Edward Horsepool, this twenty-seventh day of October, A.D. 1882.

AUGUSTUS LOFTUS.

REPORTS.

Improvements in Fasteners for Gloves, &c.

REPORTS.

Sir,

Sydney, 24 July, 1882.
 We do ourselves the honor to report, in reply to your B.C. dated the 15th instant, No. 82-8,176, that we are of opinion the prayer of Mr. Edward Horsepool's Petition, for the registration of "Improvements in Fasteners for Gloves," may be granted, in terms of his specification and drawings, with the exception of that portion of his claim which includes the detail set forth in drawing (figure 19), which infringes upon the registration already recommended in favour of the same applicant, Edward Horsepool, on behalf of Dent & Co.

We have, &c.,

EDMUND FOSBERY.
GOTHER K. MANN.

The Under Secretary of Justice.

Sir,

Sydney, 1 September, 1882.
 We were not aware, when reporting upon this application, that the former one from Mr. Horsepool, for Letters of Registration for a Glove Fastener, had been refused. However, this being the case, the objection to granting any part of it, as in detail 19 of the subsequent application, would still hold good.

We have, &c.,

EDMUND FOSBERY.
GOTHER K. MANN.

The Under Secretary of Justice.

Sir,

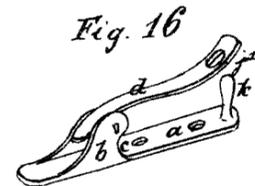
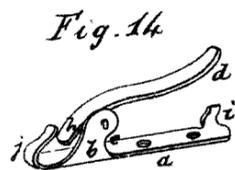
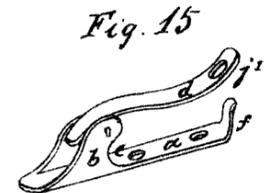
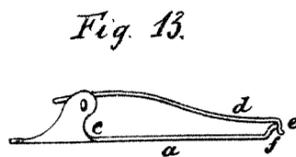
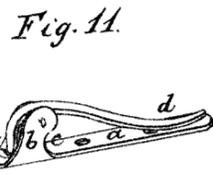
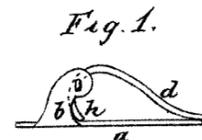
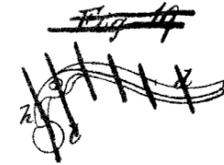
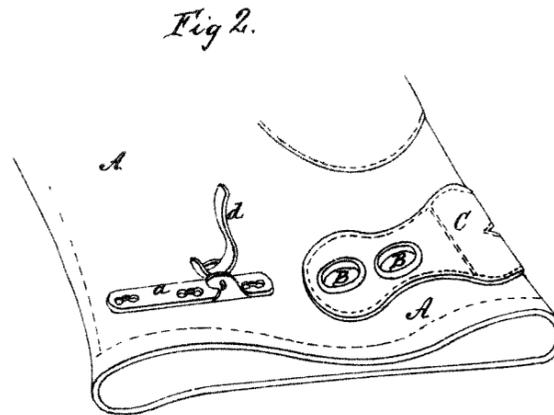
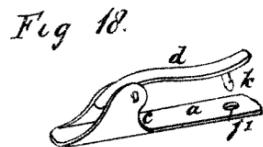
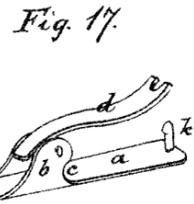
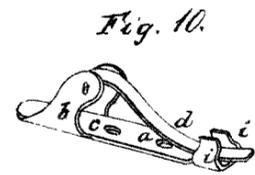
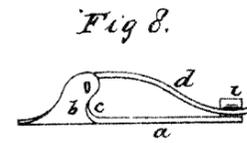
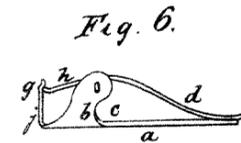
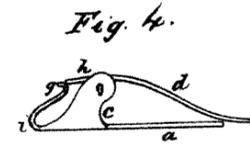
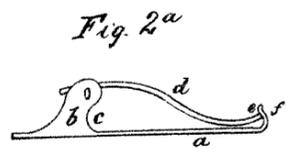
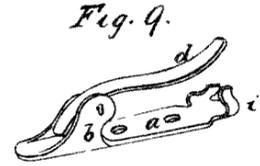
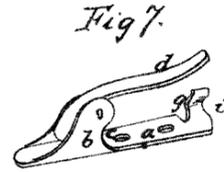
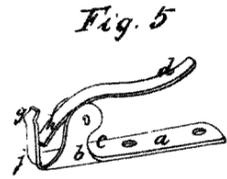
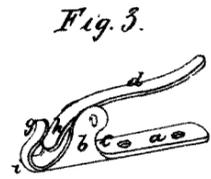
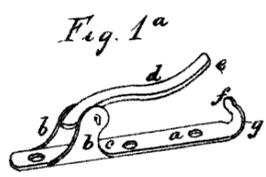
Sydney, 25 September, 1882.
 In reply to your further blank cover communication of the 19th instant, No. 10,952, we do ourselves the honor to report that we are of opinion the prayer of Mr. Edward Horsepool's Petition, for the registration of "Improvements in Fasteners for Gloves, &c.," may now be granted, in terms of his revised specification, drawings, and claims.

We have, &c.,

EDMUND FOSBERY.
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 Edward Horsepool, this twenty seventh day of October, A. D. 1882.

Augustus Loftus.



A.D. 1882, 7th November. No. 1153.

IMPROVEMENTS IN GALVANIC BATTERIES.

LETTERS OF REGISTRATION to The Mallac Patent Electric Lighting Company (Limited), for Improvements in Galvanic Batteries.

[Registered on the 7th day of November, 1882, 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 MALLAC PATENT ELECTRIC LIGHTING COMPANY (Limited), whose registered office is at No. 59, Queen-street, in the city of Melbourne and Colony of Victoria, hath by its Petition humbly represented to me that it is the Assignee of Louis Mallac and Justin Drouhet, who are the authors or designers of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in Galvanic Batteries," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed; and that 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 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 said Mallac Patent Electric Lighting Company (Limited), its successors 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 Mallac Patent Electric Lighting Company (Limited), its successors 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 Mallac Patent Electric Lighting 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 seventh day of November, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Galvanic Batteries.

SPECIFICATION of THE MALLAC PATENT ELECTRIC LIGHTING COMPANY (Limited), whose registered office is at No. 59, Queen-street, in the city of Melbourne and Colony of Victoria, the assignees of Louis Mallac, of Little Raglan-street, Albert Park, near Melbourne aforesaid, electrician, and Justin Drouhet, of Carlisle-street, St. Kilda, near Melbourne aforesaid, engineer, the inventors of an invention entitled "Improvements in Galvanic Batteries."

This invention has been devised principally for the purpose of providing a means whereby electricity for lighting and other purposes may be produced in such a simple, cheap, and inoffensive manner as to be especially suitable for domestic use. According to this invention, electricity is produced by a galvanic battery, in which a novel, cheap, and efficient amalgam is used for the cells, and the several parts of which are so constructed and arranged as that by the simple turning of a handle the process of producing electricity may be instantaneously commenced, terminated, or resumed.

The amalgam consists of three parts of water acidulated with sulphuric acid mixed with two parts of water saturated with pure nitrate of potash.

The acidulated water must be charged with sulphuric acid of 66° Beaume to such an extent as to make the hydrometer, which is zero in pure water, register 45° when the acidulated water is cold. It will not get cold naturally in less than a day or two after mixing.

The saturated water will register about 30° or 31° Beaume when fully charged, and to be sure of the correctness of this registration it is well to agitate the liquid before testing it.

The cold acidulated water and the saturated water mixed together constitute the novel amalgam, and may be stored for use until required.

The battery consists of a well containing acidulated water for the outside of the cells, and of cells, and a well of peculiar construction, as hereinafter more fully explained, but the marked peculiarity in both cells and well is that their liquid contents remain inoperative at the bottom of their respective vessels until they are required to produce electricity. When this is the case a plunger is let down in each vessel so as to displace the contents and force them to rise to such a point as that they become operative, and the generation of electricity commences. When this is no longer required the plungers are lifted, and the contents of the several vessels immediately descend to their original position, and the generation of electricity instantly ceases.

In order that this may be more perfectly understood, drawings are hereto attached, in which figure 1 shows longitudinal section of one half of a battery constructed according to this invention, and figure 2 horizontal section of same on line *a a* in figure 1. Figures 3 and 4 show vertical and horizontal sections on a larger scale of one of the cells, the zinc element being shown by dotted lines, and figures 5 and 6 similar views of the zinc cylinders. Figure 7 is another vertical section of the same. Figure 8 is plan of a cell complete. These cells are composed first of an inner vessel, A, which must be impervious to the amalgam up to its working level, which in this instance is at the point marked A¹. From this up to the point marked A² it must be pervious to the amalgam, so as to admit of its penetrating through it in order to reach the bath and zinc plate B, with which it is surrounded. From A² upwards this inner vessel should be impervious to the amalgam. C is a carbon stick, made by preference to fit the side of the inner vessel A, and projecting through a hole in the lid A³, which hole it should fit tightly. In the drawings this carbon stick is represented as resting on a shelf, C¹, but if they were obtainable sufficiently long; it is preferable to have them reaching to and resting on the bottom of the vessel A. D is a plunger connected by some non-conducting material D¹ with a cord or chain, D², fastened to a barrel E. The zinc plate B is rolled so as to form an imperfect cylinder, its two edges being joined together by some insulating material B¹. The lower part of the inside of this cylinder must be coated with some acid-proof material to a point above that of the bath when said bath is at its lowest level. The whole of the outside of this cylinder must also be coated with some acid-proof material. At its top it is connected by wire with the top of the carbon stick C. At B² and B³ are small holes, the object of which is explained hereafter. F is the well containing the acidulated water, and G the plunger therein, connected by cord or chains G¹ to the barrel H. In the side of this well are holes F². F³ is the floor of the working bath. The inner vessel A is by preference made of earthenware, glazed where it is required to be impervious to the amalgam, and unglazed where it is necessary that the amalgam should penetrate through it. The zinc cylinder is by preference made of an amalgam of from 85 to 90 per cent. of zinc, with from 10 to 15 per cent. of quicksilver. It has been ascertained that acidulated water of 4° Beaume is sufficiently strong for this battery.

The mode of operation is as follows:—The cells are first charged with amalgam up to the point A¹ and the well with acidulated water up to the level of the centre of the holes F². The plungers are then lowered into the amalgam in the cells and into the acidulated water in the well, the result of which is that the amalgam rises to the point A² in the cells, and the acidulated water to a level above the point A². The amalgam penetrates through the cells between A¹ and A², and as soon as it reaches the bath of acidulated water on the outside, the electricity commences to be produced, and is taken from the carbon and the zinc by wires in the ordinary way. This proceeds until no more electricity is required, when the plungers are lifted, and the amalgam and acidulated water return to the bottom of their respective vessels, and the operation ceases.

During this process a certain amount of sulphate of zinc is produced and remains at the bottom of the zinc cylinders. This is removed by means of the acidulated water flowing through the hole B², and establishing a current through the lower hole B³, carrying with it the sulphate into the bath outside, from whence it descends gradually into the well, where it can easily be removed.

The plungers are lifted and lowered by turning the handles E¹ for the cells, and H¹ for the well.

The earthenware cells herein described may also be used in continuously acting batteries for regulating the outflow of its contained amalgam, such outflow being determined by the area of that part of it through which it is permeable.

Having

Improvements in Galvanic Batteries.

Having thus described the nature of this invention, and the manner of performing same, it is to be understood that what is believed to be new, and therefore claimed as the improvements in galvanic batteries now sought to be patented, is—

First—The novel amalgam for the cells, consisting of the combination of water acidulated with sulphuric acid, and of water saturated with pure nitrate of potash.

Second—So constructing galvanic batteries as that by their own mechanism the amalgam in the cells and the acidulated water for the bath can be brought into co-operation with the zinc, for the production of electricity just so long as it is required, and so as that these elements can be removed out of connection with each other when the production of electricity is no longer required.

Third—The special method of effecting this object, as illustrated in the drawings, by means of elongated vessels and wells, in which the contents are raised and lowered by means of plungers and by means of cells, parts of which are impermeable to the amalgam, and part of which will admit of the passage of such amalgam.

Fourth—Perfecting the imperfect zinc cylinder by means of an insulating material, so as to make it act as an external vessel as well as a zinc element, and making the two holes in each in the relative positions shown for the purpose of producing the necessary circulation, and of removing the sulphate of zinc, substantially as herein described and explained.

Fifth—In cells for ordinary galvanic batteries, making part impermeable to their liquid contents, and other part permeable to them, so as to regulate the outflow.

JAMES W. WOOD,
Secretary.

The seal of the Company was affixed }
hereto in our presence—

THOS. MASTERS, }
S. WILTON, } Directors.

This is the specification referred to in the annexed Letters of Registration granted to The Mallac Patent Electric Lighting Company (Limited), this seventh day of November, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

We do ourselves the honor to report, in reply to your blank cover communication of the 26th ultimo, that we are of opinion the prayer of The Mallac Patent Electric Lighting Company (Limited) for the registration of "Improvements in Galvanic Batteries" may be granted, in terms of their specification, drawing, and claim.

Sydney, 3 October, 1882.

We have, &c.,
E. C. CRACKNELL.
GOTHER K. MANN.

The Under Secretary of Justice.

[Drawings— one sheet.]

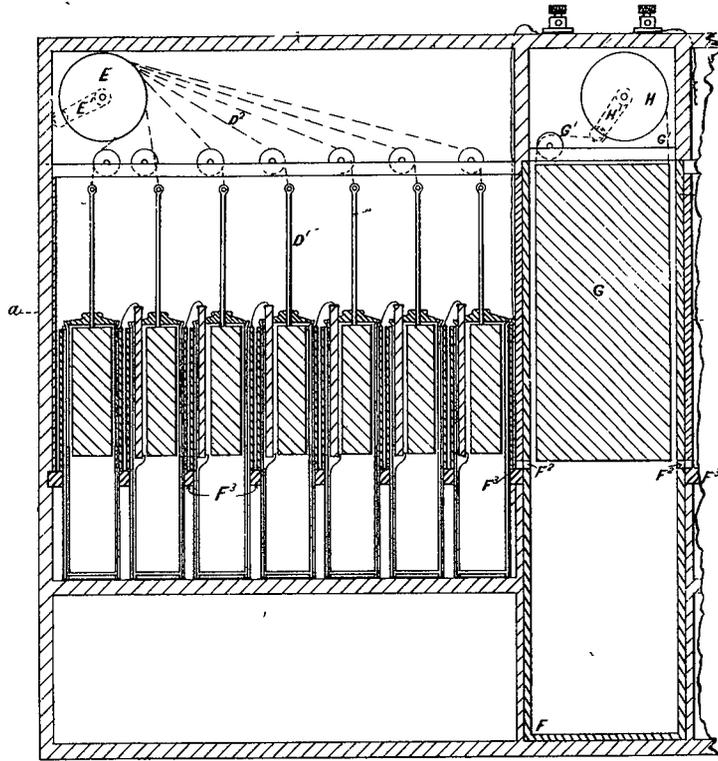


Fig 1

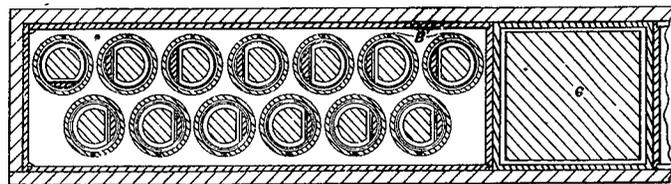


Fig 2

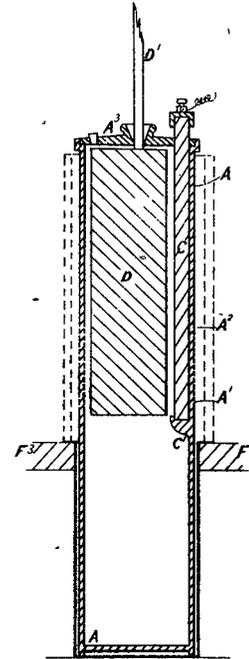


Fig 3

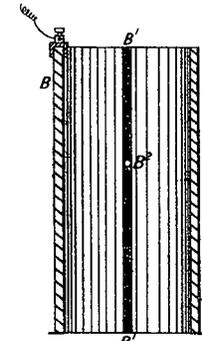


Fig 5

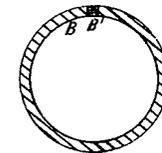


Fig 6

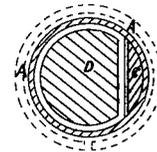


Fig 4

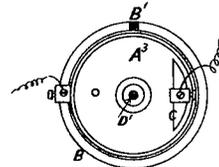


Fig 8

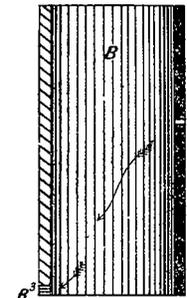


Fig 7

This is the Sheet of Drawings referred to in the annexed Letters of Registration granted to the Mallac Patent Electric Lighting Company (Limited) this seventh day of November A. D. 1882.

Augustus Loftus.

(Sig. 875-)



A.D. 1882, 7th November. No. 1154.

IMPROVEMENTS IN RAILWAY BRAKES.

LETTERS OF REGISTRATION to John Woods, for Improvements in Railway Brakes.

[Registered on the 7th day of November, 1882, 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 WOODS, of Melbourne, in the Colony of Victoria, engineer, and a Member of the Legislative Assembly of the said 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 "Improvements in Railway Brakes," 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 Woods, 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 Woods, 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 Woods 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 November, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Railway Brakes.

SPECIFICATION of JOHN WOODS, of Melbourne, in the Colony of Victoria, engineer, and a Member of the Legislative Assembly of the said Colony, for an invention entitled "Improvements in Railway Brakes."

THIS invention consists of certain improvements in railway brakes, which improvements are applicable to all kinds of railway rolling stock, excepting locomotives, but have been specially designed for railway trucks.

By my present invention I utilize the brakes now commonly in use on railway trucks, in which, as is well known, the brake blocks are forced on the wheels by means of a weighted lever, and released therefrom by such lever being lifted and supported in a suitable catch. Now, I allow the brake blocks and their weighted levers to remain as before, but I dispense with the catches and substitute fluid pressure for the hand power in lifting off the brakes, thus I convey fluid, and preferably hydraulic pressure, to a plunger or piston which is connected to said weighted levers, so that when necessary they may be lifted, and when necessary allowed to fall. This fluid pressure I convey to the brake levers on each truck from a main line of piping coupled together between each truck, and, when such pressure is hydraulic-receiving it through an accumulator on the engine in precisely the same way as is described and represented in the specification and drawings of my invention entitled "Improvements in Railway Brakes," for which I have already obtained New South Wales Letters of Registration, dated the fourteenth day of January, one thousand eight hundred and seventy-eight.

I will now describe my invention, with reference to the accompanying drawings, which illustrate my method of applying hydraulic pressure for working the brakes, because I believe that pressure to be the best, although any other fluid pressure, such as air, may be used if preferred. In these drawings I show the base frame or sole plate of a railway truck with the wheels and brakes attached thereto; figure 1 being a side elevation, figure 2 a plan, and figure 3 an end elevation partly in section thereof.

A A are the brake blocks, and A¹ their weighted lever, as is well understood. B is a pressure cylinder, and C its plunger or piston. D is a main pressure pipe coupled between each truck, and connected with an accumulator, as before set forth, and D¹ is a branch pipe therefrom to the cylinder B. B¹ are hangers supporting the cylinder, and B² and B³ are stays thereto. Plunger C has a groove or slot C¹ in which to hold the weighted lever. The lever A¹ is shown by dotted lines at A² in its lowest possible position, namely, with the brake on the wheels when the blocks are nearly worn out.

In working my invention there is no need to stop the train in order that an attendant may put on or release the brakes, as is now the case, but whilst the train is in motion they may be worked as freely as continuous pressure brakes are now worked on railway carriages.

When the brakes are required to be taken off I force pressure (as described in the specification of my previously patented invention hereinbefore referred to) through pipe D into pipe D¹ and cylinder B. This pressure raises plunger C, whose groove C¹ lifts weighted lever A¹, and thus takes the brake blocks A off the wheels. When the brakes are required to be put on I simply release the pressure in the pipe D, when the weight on lever A¹ forces the blocks A on to the wheels in the ordinary way.

It will be seen that when pipe D is coupled between each vehicle in a train that this becomes an automatic brake. In case of an accident sufficient to sever the train, or release the pressure in the pipe D, the brake will fly on the wheels.

Having now described my invention, I would have it understood that I do not claim to be the inventor of brakes in which the blocks are forced upon the wheels by a weighted lever, neither do I confine myself to any particular arrangement of mechanical parts for carrying my invention into effect, but what I claim as my improvements in railway brakes is—

First—Lifting and supporting the weighted levers of railway brakes by means of fluid pressure, whereby the blocks are taken off and held from the wheels, and preferably by hydraulic pressure, substantially in the manner herein described and explained.

Second—The combination and arrangement of a main pressure pipe D, branch pipe D¹, and cylinder B (suitably supported) with weighted levers which force the brake blocks on the wheels, substantially as herein described and explained.

In witness whereof, I the said John Woods have hereto set my hand and seal, this fourth day of September, one thousand eight hundred and eighty-two.

Witness—

W. S. BAYSTON,
Clerk to Edwd. Waters,
Patent Agent,
Melbourne.

JOHN WOODS.

This is the specification referred to in the annexed Letters of Registration granted to John Woods, this seventh day of November, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 27 September, 1882.

Having examined the specification and plans accompanying the Petition, we have the honor to recommend that Letters of Registration should be issued to Mr. John Woods, for an invention entitled "Improvements in Railway Brakes," 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.

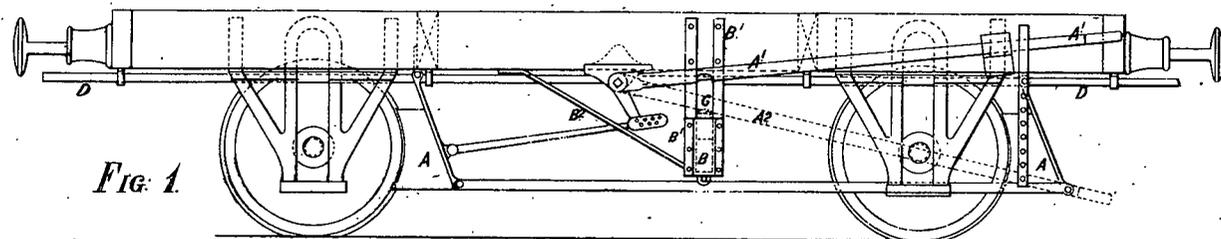


Fig. 1.

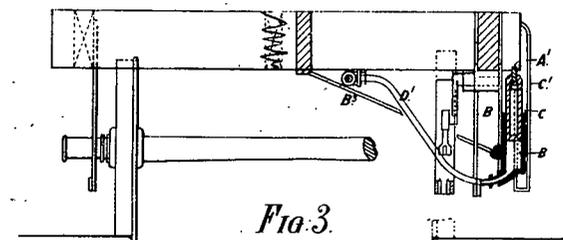


Fig. 3.

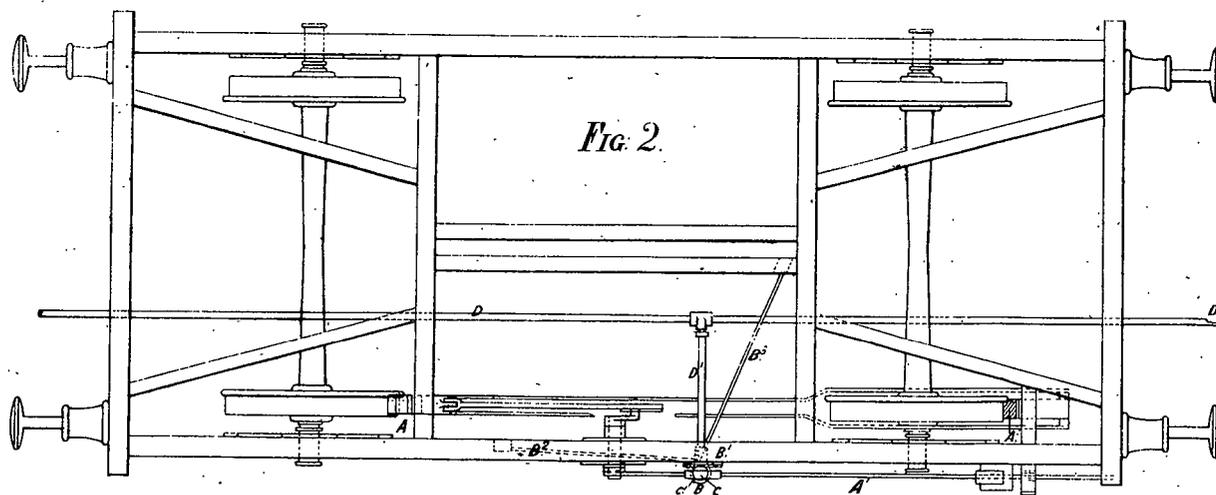


Fig. 2.

— JOHN WOODS PATENT —

*This is the Sheet of Drawings referred to in the annexed Letters
of Registration granted to John Woods, this seventh day of November,
A.D. 1882.*

Augustus Loftus.



A.D. 1882, 7th November. No. 1155.

IMPROVEMENTS IN TRAMWAYS.

LETTERS OF REGISTRATION to Arthur Hill Rowan, for Improvements in Tramways.

[Registered on the 7th day of November, 1882, 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 ARTHUR HILL ROWAN, of No. 6, Westminster Chambers, in the County of Middlesex, in 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 Tramways," 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 Arthur Hill 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 Arthur Hill 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 Arthur Hill 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 seventh day of November, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Tramways.

SPECIFICATION of ARTHUR HILL ROWAN, of No. 6, Westminster Chambers, in the County of Middlesex, in England, for an invention entitled "Improvements in Tramways."

My invention relates to the method of constructing and laying down tramway rails, and their supports and fastenings, so that a comparatively small quantity of the more costly material, steel, is used for those portions of the rails that are most subjected to strain and wear, and so that those portions can be readily removed and renewed without interfering with the paving or surface of the road in which the rails are laid. My invention further relates to methods of forming those portions of the road which are immediately adjacent to the tram-rail, with the object of maintaining the surface of the road at those parts, and the tramrail rigidly in position, relatively to one another.

I attain these objects by the use of the devices and methods of arranging same, as illustrated in the accompanying drawings, in which figure 1 is a sectional and perspective view of a tramway, one-half of which is constructed according to one of my improved methods, and the other half according to another of my improved methods of laying down tramways, but both having the same rail. Figure 2 is a transverse section of one of the tram-rails, represented in the right-hand half of figure 1, showing its fastening, adjacent road pitching, and other details. The tram-rail is composed of two principal parts. One of these parts, which I call the flange rail, is preferably of steel; and is rolled to a section corresponding generally with that shown in the accompanying drawings. It consists of a head, A, on which the wheels run, a vertical rib, B, and a flange, C, projecting wholly or principally on one side of the vertical rib. The other part of the tram-rail, which I call the channel rail, and which for economy may be of iron, consists of two sides or ribs, E and F, turned edge upwards, and an intermediate horizontal portion, G. The side E of the channel iron is latterly in contact with the flange or vertical rib B of the flange rail, and is housed beneath a projecting portion of the rail head A, which latter the rib E may be made to support. The intermediate portion G of the channel rail serves to support the flange rail, the flange C of the latter lying in the channel in contact with the part G. The rib F of the channel rail, when projecting upwards to the height indicated in the drawings, forms a guard rail at such a distance laterally from the inner edge of the head A of the flange rail as to leave sufficient space for the flange of the wheels. This space or groove may be partly filled by a wooden runner or a flat iron bar, or any other suitable material, so as to form a bottom for the groove, leaving sufficient space for the flange of the wheels. This enables the groove to be easily cleaned, and prevents the bolt ends and the wedges from being cemented by the dirt which would otherwise get there and give great trouble to remove. This bar is marked S in figure 2, and its substitute in the shape of an asphalt filling is marked S' in figure 7. H is a sett or block of stone, wood, slag, or other material suitable for use for pitching or paving that portion of the surface of the road which is immediately adjacent to the tram-rails. I form in the upper face of each of the setts H a notch or recess of sufficient width to admit the tram-rail already described, and of sufficient depth to admit same, together with a strip of packing, I (when employed), forming a cushion under the said tram-rail. This packing may be of wood, asphalt, or other material suitable for use as a packing or cushion, or both. Setts formed in this manner, and arranged side by side, with the bottom and sides of their notches or recesses in line, constitute a series of chairs affording the tram-rail support of a practically continuous character. The setts H are themselves underlaid by continuous or approximately continuous base-plate K, connected at frequent intervals with the tram-rails, and breaking joint with them longitudinally. It will be seen that the tram-rail, setts, and base-plates, formed, arranged, and connected together in the manner herein described, not only assist and support one another in maintaining their proper relative positions, but constitute a tram-road possessing considerable weight, strength, and rigidity, whilst affording facilities for construction and maintenance. The gripping of the parting setts between the tram-rail and the base-plate, resulting from the wedge or other adjustable fastening forcing and tightening these two parts towards one another, and the consequent welding of the metal part of the road with a considerable portion of the surrounding paving into a comparatively rigid mass, are effects entirely absent from any existing system of constructing tramways with which I am acquainted. The left-hand half of figure 1 represents the rail resting on a continuous concrete longitudinal, to which it is firmly held down at suitable intervals by the holding-down pins, which are solidly anchored in the concrete substructure, allowing the pavement to come vertically flush against the channel iron and rail.

For securing the tram-rail in position, I pass bolts, such as L, through the base-plate K, the lower end of the said bolt L being provided with a tee head, L', suitable for engaging with the base-plate K, through a slot therein. The bolts L then pass upwards through holes in the horizontal portion of the channel rail, and through holes or notches in the flange of the flange rail, and present their upper ends in the space or groove for the wheel flanges before referred to. Near the upper end of each of the bolts L is cut a lateral notch, into which is driven horizontally a taper key, N, which, bearing on the flange rail, tightens the latter downwards upon the part G of the channel rail, and sideways against the vertical rib E thereof. At the same time the keys N secure both flange rail and channel rail to the base-plate K, and consequently to the series of paving setts or chairs H, portions of which are embraced between the tram-rail and the base-plate.

By arranging the notches or recesses in the upper face of the paving setts or chairs H towards one or other of the ends thereof, as is shown for example in figures 3 and 5, the ordinary paving setts contiguous thereto break joint, and in a manner interlock with the special setts H, with the effect that the tram-rails, the adjacent setts H, and the ordinary paving setts adjoining the latter, all assist one another in maintaining their proper relative positions in the surface of the road. A modification of this plan is shown in figures 4 and 6, where the notches or recesses are in the centre of the wooden or slag setts, but are laid alternately with the pitchers of the roadway, so as to break joint with them.

When, owing to wear or other cause, it becomes necessary to remove the tram-rails, the keys N are driven back and out of their notches, whereupon both the flange rail and the channel rail composing the said tram-rail, as well as the packing or cushion I, can be lifted without disturbing the paving or surface of the road.

In laying a tram-road constructed according to my invention, I arrange the points of separation of the flange rail and channel rails respectively so as to break joint, as shown (as regards the flange rail) in figure 9, which is a horizontal section taken above the key N. The use of separate fish-plates at the joints is thus rendered unnecessary.

To

Improvements in Tramways.

To facilitate the setting out of two lines of tram-rail at their required distance from one another, and to ensure the maintenance of such gauge, distance pieces may be introduced at suitable intervals.

I prefer to use flat bars for such distance pieces, and to notch them at each end in the manner shown in figure 2, where R is a terminal portion of a tie-bar, and T is a notch to receive the tram-rail. The bars standing on edge pass between the paving setts, and interfere but little with the proper pitching of the roadway.

According to another improved method of laying tramways, I substitute for the base-plate K a concrete longitudinal bearing. In constructing this longitudinal bearing, I form in the surface of the ground a trench, and having placed suitable anchor plates P, figures 7 and 8, in position for receiving the bolts L, I fill in the trench with concrete, the upper ends of the bolts L remaining exposed. Whilst the concrete is still soft, the setts or chairs H are placed in position and truly bedded in the as yet unset concrete. The packing or cushion I and channel rail are next dropped over the exposed ends of the bolts L, and finally, after the concrete is thoroughly set, the flange rail is introduced, and secured by the keys N in the manner already described. If preferred, wooden anchor plates may be used instead of iron.

In some instances the height of the concrete longitudinal may be increased, and the tram-rail, with or without its packing or cushion I, bedded direct thereon, the intervention of the chairs or setts H being dispensed with.

Having thus described the nature of my invention and the manner in which the same is or may be carried into effect, I would have it understood that I do not claim as new the method generally of constructing tram-rails in two parts, the one part consisting principally of the rail head, and the other, part performing the subordinate function of supporting the first-named part; neither do I claim as new the use of the chair paving sett described, nor the method of laying the tram-rail in the channel formed by the succession of recesses in the said setts; neither do I claim as new the wooden, asphalt, or other packing as a cushion under the tram-rail; but what I do claim as my invention, and desire to secure by Letters Patent, is—

First—Constructing tram-rails in two parts, one consisting of the head, vertical rib, and flange, and the other consisting of a channel-rail supporting and partly enclosing the first-mentioned part, substantially as herein described, and whether or not one rib of the channel-rail forms a side of the groove for the wheel flanges.

Second—The method of fastening and tightening the various parts of such tram-rails in their proper positions relatively to one another, by means of bolts projecting upwards into the groove of the tram-rail, the same bolts being notched and provided with keys, substantially as and for the purposes herein set forth.

Third—The method of laying tram-rails of the description referred to in claim 1, in conjunction with base-plates, intermediate channelled paving setts, substantially as herein described, and whether fastened in the mode proposed or otherwise.

Fourth—The method of laying tram-rails of the same description, in conjunction with concrete longitudinals, and with or without intermediate channelled paving setts, substantially as herein described.

Fifth—The combination in a tram road of a tram-rail, base-plate, and series of intermediate channelled paving setts, arranged substantially as herein set forth, and secured together by adjustable fastenings.

In witness whereof, I, the said Arthur Hill Rowan, have hereto set my hand and seal, this sixth day of September, one thousand eight hundred and eighty-two.

ARTHUR H. ROWAN,
(By his Agent, F. C. ROWAN).

Witness—
EDWD. WATERS,
Melbourne, Patent Agent.

This is the specification referred to in the annexed Letters of Registration granted to Arthur Hill Rowan, this seventh day of November, A.D. 1882.

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 Mr. Arthur Hill Rowan, for an invention entitled "Improvements in Tramways," as shown in the drawings and described in the specification attached to his Petition.

Sydney, 27 September, 1882.

We have, &c.,
JOHN WHITTON.
E. O. MORIARTY.

The Under Secretary of Justice.

[Drawings—one sheet.]

— ROWANS PATENT —

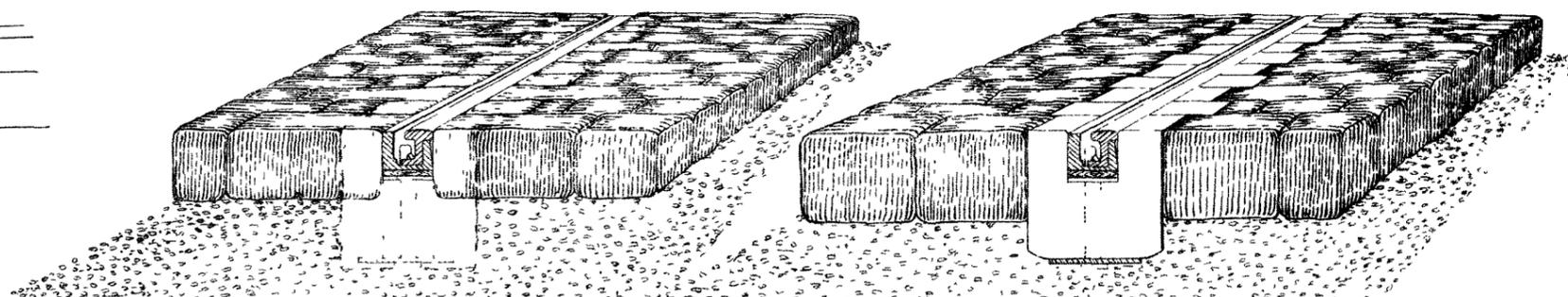
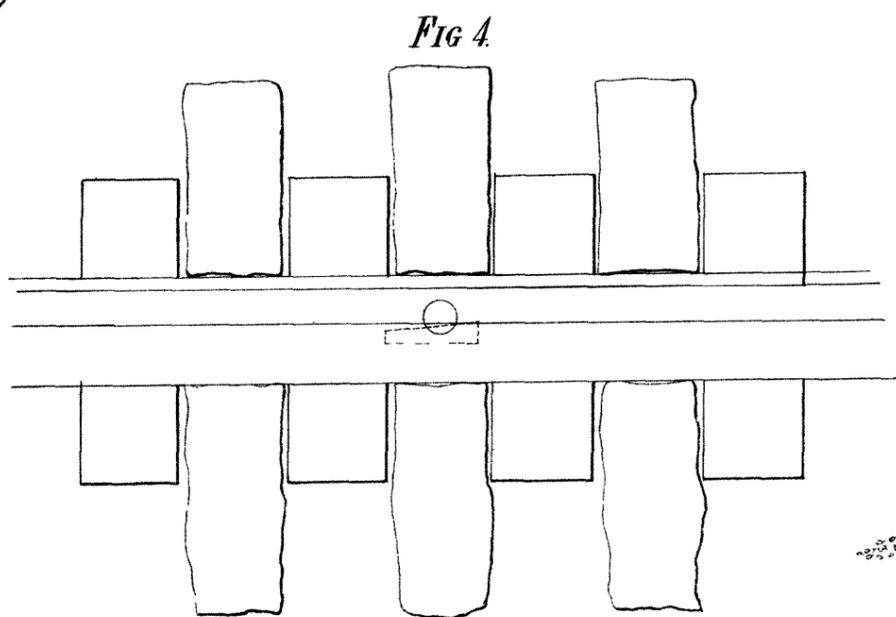


Fig 1.

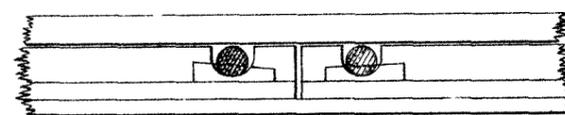
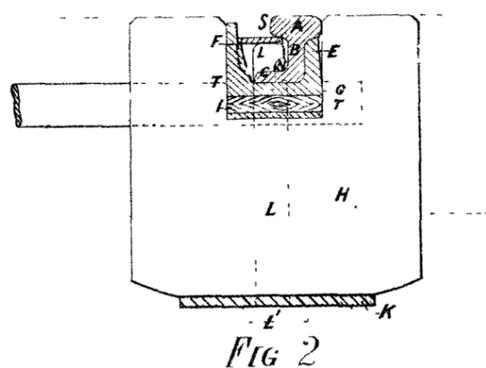
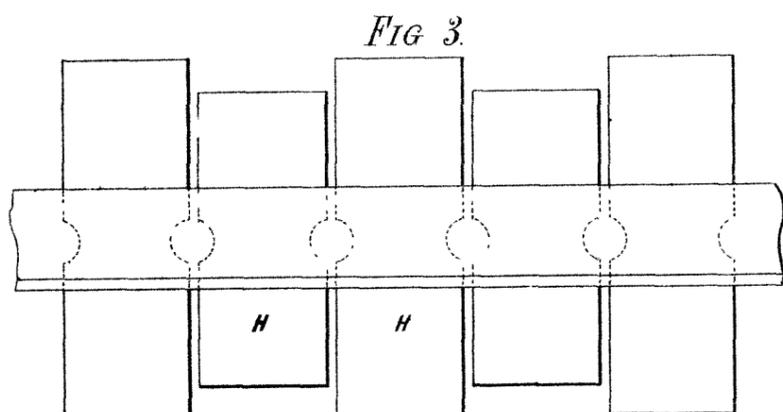


Fig 9

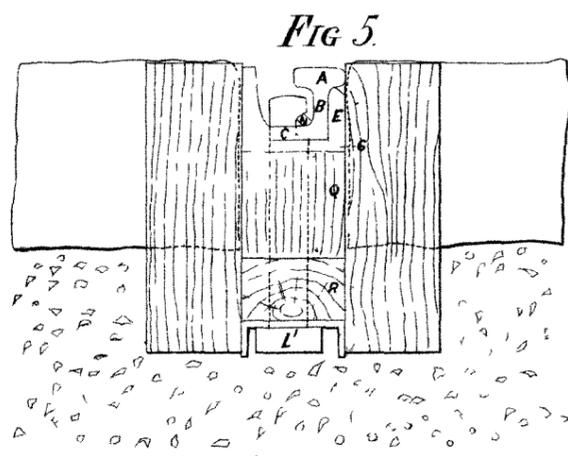


Fig 5.

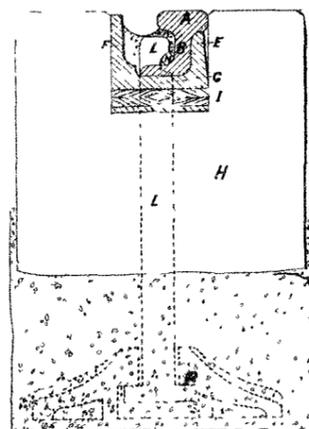


Fig 7

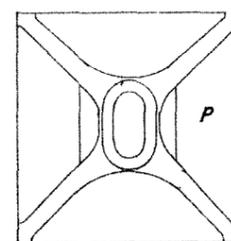


Fig 8.

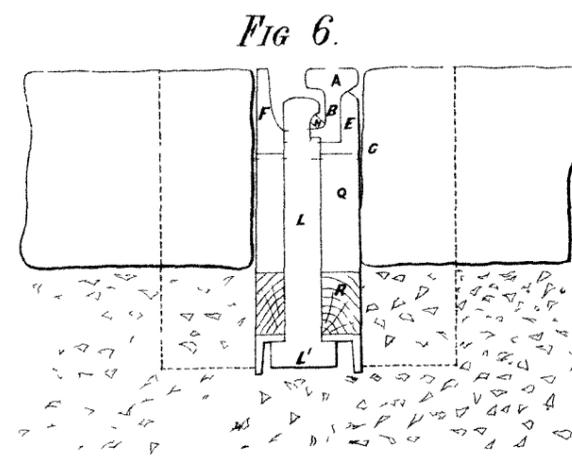


Fig 6.

This is the Sheet of Drawings referred to in the annexed Letters of Registration granted to Arthur Hill Rowan, this seventh day of November, A.D. 1882.

Augustus Loftus.



A.D. 1882, 15th November. No. 1157.

IMPROVEMENTS IN ELECTRIC LAMPS.

LETTERS OF REGISTRATION to Robert Jacob Gülcher, for Improvements in Electric Lamps.

[Registered on the 15th day of November, 1882, 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 JACOB GÜLCHER, of Bielitz Biala, in the Empire of Austria, 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," 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 Jacob Gülcher, 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 Jacob Gülcher, 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 Jacob Gülcher 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 November, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Electric Lamps.

SPECIFICATION of ROBERT JACOB GÜLCHER, of Bielitz Biala, in the Empire of Austria, for an invention entitled "Improvements in Electric Lamps."

THIS invention consists, first, of the improved arrangement of apparatus hereinafter described, and illustrated in figure 1 of the accompanying drawings, for adjusting and regulating the relative positions of the carbons in electric arc lamps.

In the following description the different parts of the said drawings are referred to by the letters and figures marked thereon.

A is the upper carbon and B is the lower carbon, which are respectively secured in holders, $a^1 b^1$, carried by rods, $a^2 b^2$, mounted so as to be capable of a vertical sliding motion in the case C, containing the adjusting and regulating apparatus hereinafter described. The said rods $a^2 b^2$ are connected by cords $a^3 b^3$ to a pulley, D, mounted in the case C so that the downward motion of the upper carbon A shall cause the upward motion of the lower carbon B. E is a bar electro-magnet, secured in a ring, F, pivoted at f^1 to a standard, G, secured to and insulated from the case C, the poles of which magnet are curved with radial curves struck from the pivots f^1 as centres.

The pole e^1 of the said magnet is in contact with the rod a^2 , which is of iron faced with brass or other non-magnetic metal, and which is attracted to and held against the said pole when the circuit of the lamp is completed. The opposite pole e^2 of the said magnet is in contact with a block of iron, H, which is faced with brass or other non-magnetic metal, and is affixed to the free end of a strip of metal, I, secured at i^1 to the case C. On the said pole e^2 an extension e^3 is formed, below which is fixed a block of iron, J, faced with brass or other non-magnetic metal, j^1 ; the magnetic attraction between which block and the said extension e^3 of the pole e^2 when the circuit of the lamp is completed, causes the said magnet to turn on the pivots f^1 , and its pole e^2 to approach the said block. K is a spring secured to a lever, k^1 , pivoted at k^2 , the free end of which spring K bears against a pin or screw, f^2 , projecting from the upper part of the ring F, and thus tends to resist the motion of the said pole towards the said block. L M are screws which pass through and are capable of adjustment in the case C. By advancing the screw L the range of motion of the magnet E is reduced, and by advancing the screw M the resistance of the spring K to the motion of the magnet towards the block J is increased. N is a binding screw secured to and insulated from the case C, to which binding screw the positive conductor is connected, and from which the current passes by the wire n^1 to the standard G, thence through the pivots f^1 to the ring F, thence to the coils of the magnet, thence to the core of the said magnet, thence partly through the strip of metal I, direct to the casing of the lamp, and partly through the rod a^2 and the upper carbon A, to and through the lower carbon B and its rod b^2 to the lamp-case C, and thence by the binding screw O away from the lamp.

The action of this arrangement is as follows:—On the circuit being completed, the rod a^2 of the upper carbon-holder is attracted towards and held by the pole e^1 of the magnet E, and the pole e^2 of the said magnet is attracted towards the fixed block of iron J. The magnet E is thus caused to turn or oscillate on the pivots f^1 , and its pole e^1 consequently rises, carrying with it the upper carbon-holder a^1 . The carbons are thus separated and the voltaic arc formed.

As the carbon-points burn away, and the distance between them and the consequent resistance to the current increases, the power of the magnet E decreases, and its pole e^2 gradually rises from the fixed block of iron J until the motion of the magnet is stopped by the screw L. The magnet then remains in this position, and the rod a^2 of the upper carbon-holder remains stationary until, by the consumption of the points of the carbon-rods, the distance between them has increased to that at which the maximum intensity of light is produced. When by the further consumption of the carbons the resistance to the passage of the current increases, the holding power of the magnet E decreases proportionally, and the rod a^2 carrying the upper carbon slides downwards until the resistance of the current is again reduced, when the further motion of the said rod is arrested by the increased attraction of the said magnet. This motion of the carbon-rods is so gradual, and so exactly in accordance with the consumption of the carbon-points, that no visible fluctuations occur in the light.

The strip of metal I carrying the brass-faced block of iron H, which bears against the pole e^2 of the magnet E, is attracted to and caused to press against the said pole with greater or less force, according to the strength of the current passing through the lamp, thus constituting a magnetic brake which prevents any sudden or violent motion of the said magnet, and consequently the carbons.

Instead of mounting the block of iron H on a flexible strip of metal, as hereinbefore described, it may be mounted in any other manner which will admit of its free motion in the direction in which the attraction of the magnet acts.

This invention consists further of a modification of the arrangement hereinbefore described.

Figures 2 and 3 of the accompanying drawings are elevations taken at right angles to each other, and partly in section, of an electric arc lamp to which the said modification is applied. Figures 4 and 5 are details hereinafter referred to. In this arrangement a horse-shoe electro-magnet is used for actuating and controlling the motions of the carbons, the two limbs of which magnet are of unequal length, the pole of the shorter limb bearing against the iron rod carrying the upper carbon, and that of the longer limb being in contact with a magnetic brake, and in proximity to a fixed block of iron, the arrangement of which brake and block is different from that of the brake and block hereinbefore described with reference to figure 1 of the accompanying drawings.

The same letters and figures of reference indicate the same parts in the said figures 2, 3, 4, and 5.

A is the case containing the regulating apparatus; B is the upper carbon, which is secured to an iron rod b^1 by means of a clamp, b^2 ; and C is the lower carbon, secured in the lower part of a frame or holder c^1 . The said rod b^1 is suspended by a cord, b^3 , which is attached thereto at one end, and passes over a pulley, a^1 , mounted in a bracket, a^2 , affixed to the upper part of the case A and under a pulley, c^2 , on the upper part of the frame c^1 , and is attached at the other end to the said bracket a^2 . This connection of the two carbons ensures their simultaneous movement in the required ratio. D is the horse-shoe electro-magnet, which is supported on pivots $d^1 d^1$ working in standards $d^2 d^2$ affixed to the base of the case A. The said magnet is shown separately, drawn of the full size, in plan in figure 4, and in elevation, partly in section, in figure 5. Portions of the end of the core forming the pole of the shorter limb d^3 of this magnet

(towards

Improvements in Electric Lamps.

(towards which pole the rod b^1 is attracted when the lamp is in circuit) are cut away, both above and below its horizontal diameter, so as to produce a pole having somewhat the form of a knife-edge, as shown in figure 5 (in which figure the said limb is shown in section), and the parts cut away are replaced with brass or other non-magnetic metal, $d^4 d^4$, leaving only the apex of the knife-edge exposed, and the rod b^2 is held against the said pole or the brass covering d^4 thereof by magnetic attraction while the lamp is in circuit.

By thus forming and covering the said pole the rod b^1 is held with greatest force when the magnet is in a horizontal position, and with gradually decreasing force as the said magnet is turned on its pivots, whether its free end be raised or lowered. The pole d^5 of the longer limb of the magnet D is extended at d^6 , and both the pole d^5 and the outer face of the brass covering d^4 of the pole of the shorter limb d^3 of the said magnet are curved with radial curves, the centre of which is the axis of the pivots $d^1 d^1$. E is the block of iron towards which the magnet is attracted when the lamp is in circuit. The said block is set slightly out of the path of motion of the pole d^5 , and is secured to a standard e^1 by means of a screw e^2 which passes through a slot, e^3 , in the said standard, which arrangement admits of the vertical adjustment of the said block.

F is the magnetic brake, which consists of a strip of non-magnetic metal secured at its lower end to the case A, and touching near its free end the pole d^5 , and having a screw-pin, f^1 , affixed to it at its said free end, and projecting from it at the side opposite to that which touches the pole, on which screw-pin a block of iron, f^2 , is screwed, and is secured by a lock-nut, f^3 , by screwing the said block of iron nearer to or further from the strip of metal F. The force with which the said block is attracted towards the pole d^5 , and the consequent pressure or friction of the said strip on it, may be regulated according to the intensity of the current passing through the lamp.

Instead of securing the strip of non-magnetic metal to the case of the lamp, as hereinbefore described, in order to form a support for the block f^2 , the said non-magnetic metal may be supported by the said block, which may be mounted in any way which will admit of its free motion only towards or from the magnet, *i.e.*, in the direction or line in which the attraction of the magnet acts.

G is an adjustable spring by which the tendency of the magnet D to rise when the current is passing may be regulated; and H is a screw-stop for limiting the downward motion of the said magnet.

The current passes through the lamp as follows:—From the insulated clamp I, to which the positive pole of the generator is connected, the current passes by a suitable conductor to one coil of the magnet D, near its pivoted end, and from the said magnet by the other coil to a conductor also attached near the pivoted end of the magnet, thence to the iron rod b^1 carrying the upper carbon B, through which the current passes to the lower carbon C and its holder c^1 , and thence by a suitable conductor to the clamp J, which is connected with the negative pole of the generator.

The action of the arrangement hereinbefore described is as follows:—

When no current is passing, the carbons are in contact. When the current passes through the lamp, the magnet D turns on its pivots, its free end rising owing to the attraction between the pole d^5 of its longer limb and the fixed block E. The attraction between the pole of the shorter limb d^3 and the iron rod b^1 carrying the upper carbon B, causes the said rod to rise with the magnet D, and the electric arc is formed.

When from consumption of the carbons the space between them is increased, the current is weakened; the electro-magnet D then descends by its own weight until it is in such a position that the attraction between the pole of its shorter limb d^3 and the iron rod b^1 is so much reduced that the said rod descends, and the strength of the current is thereby again increased. The increase of strength of the current increases the attraction between the magnet D and the fixed iron block E, and the magnet rises until it is in position again to hold the said rod b^1 .

This invention consists further of an improved arrangement for connecting the glass globe to an electric lamp. This arrangement is illustrated in combination with the lamp shown in figures 2 and 3 of the accompanying drawing hereinbefore referred to, and is shown separately in section and in plan in figures 9 and 10 respectively of the said drawings, and is hereinafter described. N is a tube or socket secured to the base of the lamp, in which tube or socket other tubes $n^1 n^2 n^3$ slide concentrically, after the manner of the tubes of a telescope. The said tubes $n^1 n^2 n^3$ have rings or flanges, $n^4 n^4$, formed on or secured to their ends, by which they are prevented from separating.

The innermost tube n^3 is closed at the lower part, and to the closed end a plate, O, is secured, which supports the mount of the glass globe P, and has a ring-handle, o^1 , and lugs, $o^2 o^2$, formed on it, which lugs engage with other lugs, $n^5 n^5$, on the tube or socket N. This arrangement admits of access being obtained to the lamp without detaching the globe P therefrom, the said globe being lowered by turning the handle o^1 sufficiently to clear the lugs $o^2 o^2$ from the lugs on the tube or socket N with which they are engaged, and then drawing out the telescopic tubes, as shown in figure 9. The globe P is thus lowered clear of the lamp.

Instead of applying the adjusting apparatus hereinbefore described to the rod carrying the upper carbon, the said apparatus may be applied to the rod carrying the lower carbon. This arrangement, which is very advantageous in lamps where long carbons are required to be used, is illustrated in figure 7 of the accompanying drawings. The parts of the regulating apparatus (which are necessarily inverted in this arrangement, it being required to govern the upward motion of the said lower carbon), are marked with the same letters and figures of reference as in figures 2, 3, 4, and 5, and need no further description.

The carbon-holders are connected by cords K K, which are each secured at one end to the upper carbon-holder, and pass over pulleys $k^1 k^1$ carried by the top plate L of the lamp, and under pulleys $k^2 k^2$ on the lower carbon-holder, and are secured at their other ends to the plate carrying the regulating mechanism.

In this arrangement the glass globe of the lamp is suspended, as shown in figure 8, by cords or chains $m m$, and counterbalanced by weights $m^1 m^1$.

Improvements in Electric Lamps.

I claim as the said invention of "Improvements in Electric Lamps"—

First—The use in electric arc lamps of the arrangement hereinbefore described, and illustrated in figure 1 of the accompanying drawings, and termed a magnetic brake, the said arrangement consisting essentially of a block of iron so mounted in proximity to one of the poles of an electro-magnet as to be capable of being attracted towards the said pole, and to have free motion only in the direction in which the attraction of the magnet acts, the motion of the carbons or of the mechanism by which they are actuated being controlled by friction caused by the said attraction.

Secondly—The combination in electric arc lamps of a magnetic brake of the kind hereinbefore described, and claimed in the preceding claim, with an oscillatory electro-magnet, substantially as hereinbefore described and illustrated in figure 1 of the accompanying drawings.

Thirdly—The combination and arrangement of parts of the apparatus hereinbefore described, with reference to and illustrated in figures 2, 3, and 7 of the accompanying drawings, for adjusting the relative positions of and regulating or controlling the motion of the carbons in electric arc lamps, the said arrangement consisting of an oscillatory horse-shoe electro-magnet, one pole of which is in juxtaposition to an iron rod carrying one of the carbons, and the other pole of which is in contact with a magnetic brake and in proximity to a fixed block of iron, substantially as hereinbefore described, and illustrated in the accompanying drawings.

Fourthly—Forming and covering the pole of an oscillatory electro-magnet used for actuating and controlling the motion of the carbons in electric arc lamps, as hereinbefore described, and illustrated in figure 5 of the accompanying drawings.

Fifthly—The use in electric lamps of a magnetic brake of the kind hereinbefore described, and illustrated in figures 2, 3, 5, and 7 of the accompanying drawings, the said arrangement consisting essentially of a block of iron and a piece of non-magnetic metal adjustably secured together, the said block being so mounted in proximity to one of the poles of an electro-magnet as to be capable of being attracted towards the said pole, and to have free motion only in the direction in which the attraction of the magnet acts, and the said brake being so arranged that the part consisting of non-magnetic metal shall be nearest the said magnet, the motion of the carbons or of the mechanism by which they are actuated being controlled by friction caused by the said attraction.

Sixthly—The arrangement for connecting glass globes to electric lamps, hereinbefore described, with reference to and illustrated in figures 2, 3, 9, and 10 of the accompanying drawings.

In witness whereof, I the said Robert Jacob Gülcher have hereto set my hand and seal, this third day of July, 1882.

R. J. GÜLCHER.

Witnesses—

W. T. WHITEMAN,
7, Staple Inn, London.

H. A. E. DE PINNA,
71, Cornhill, London.

This is the specification referred to in the annexed Letters of Registration granted to Robert Jacob Gülcher, this fifteenth day of November, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

We do ourselves the honor to report, in reply to your blank cover communication of the 26th ultimo, No. 11,217, that we are of opinion the prayer of Robert Jacob Gülcher's Petition for the registration of an invention entitled "Improvements in Electric Lamps" may be granted, in terms of his specification, drawings, and claim.

Sydney, 6 October, 1882.

We have, &c.,

E. C. CRACKNELL.
GOTHER K. MANN.

The Under Secretary of Justice.

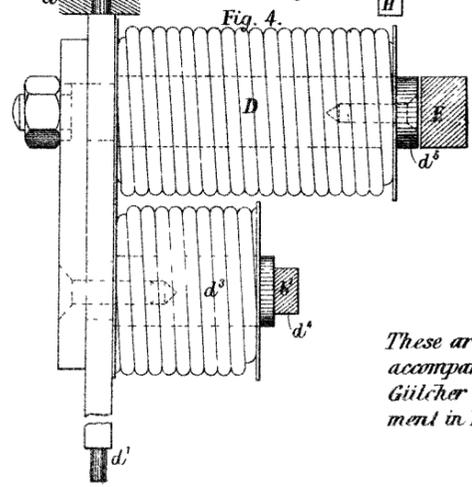
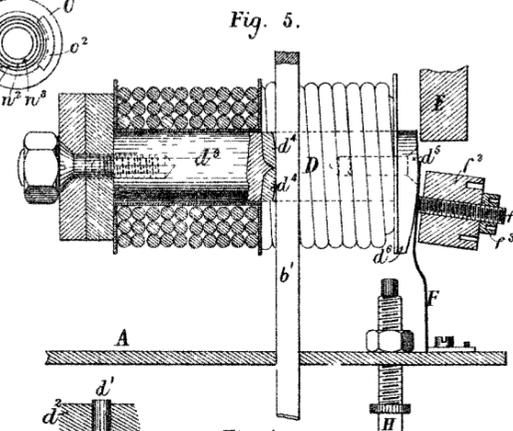
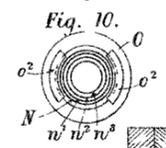
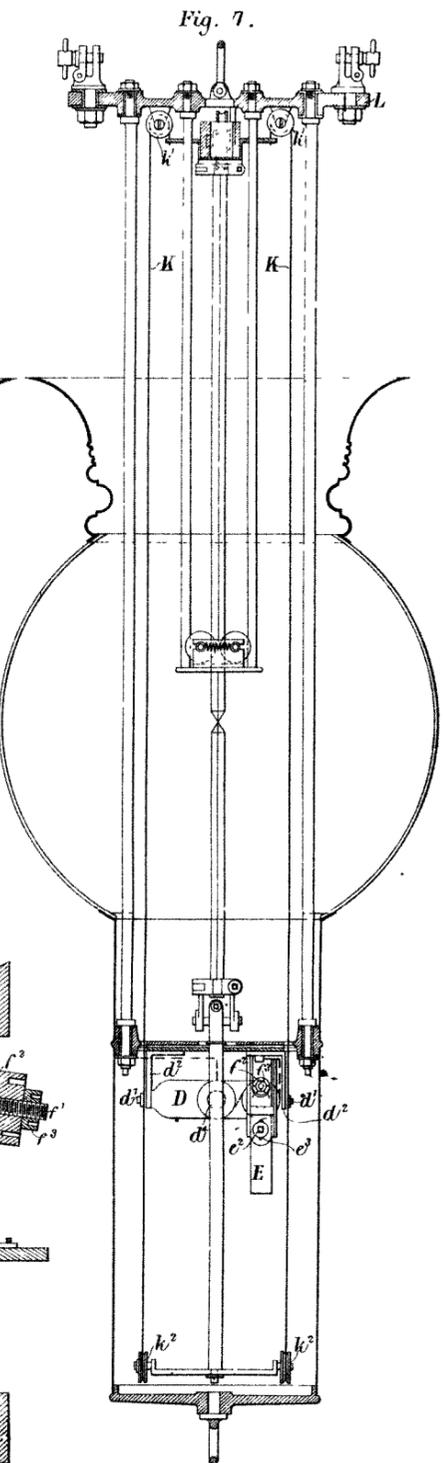
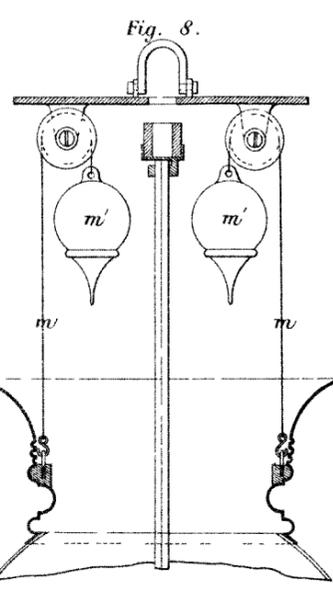
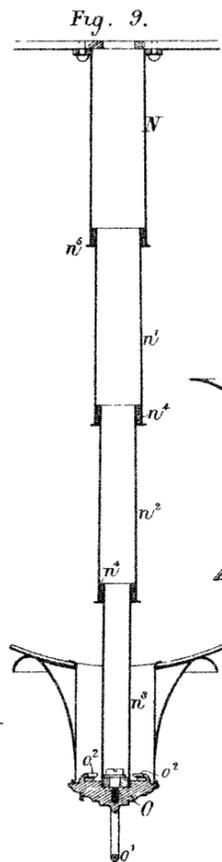
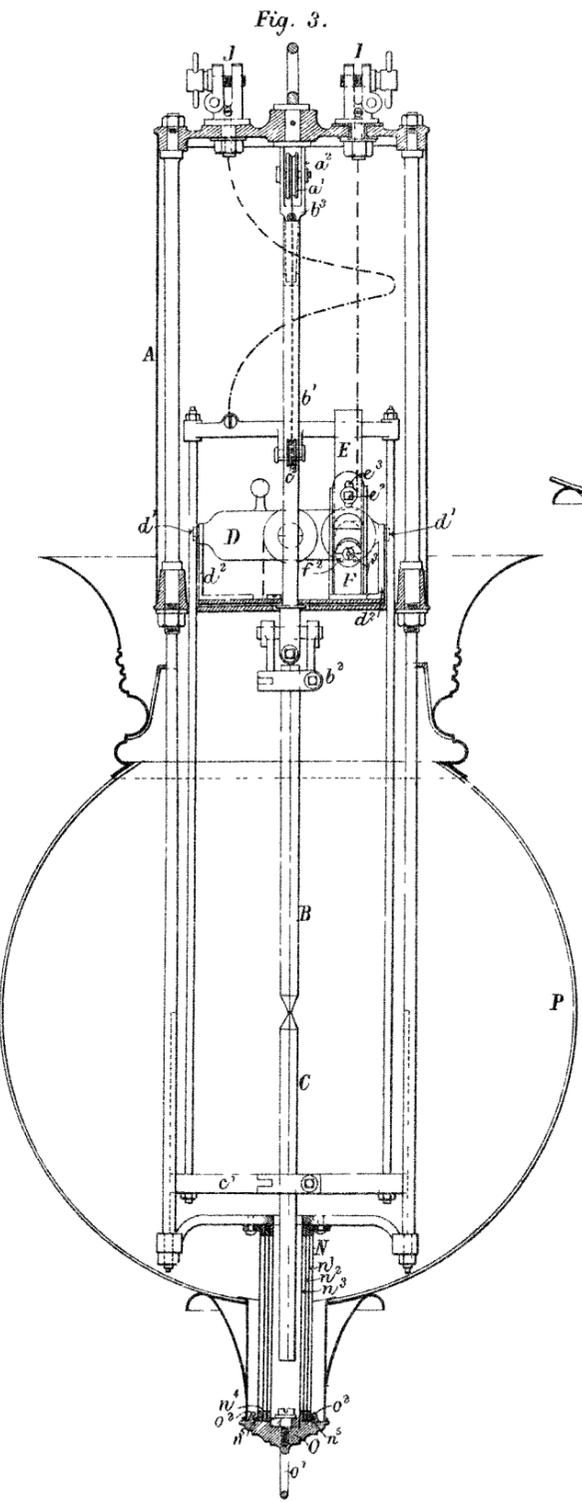
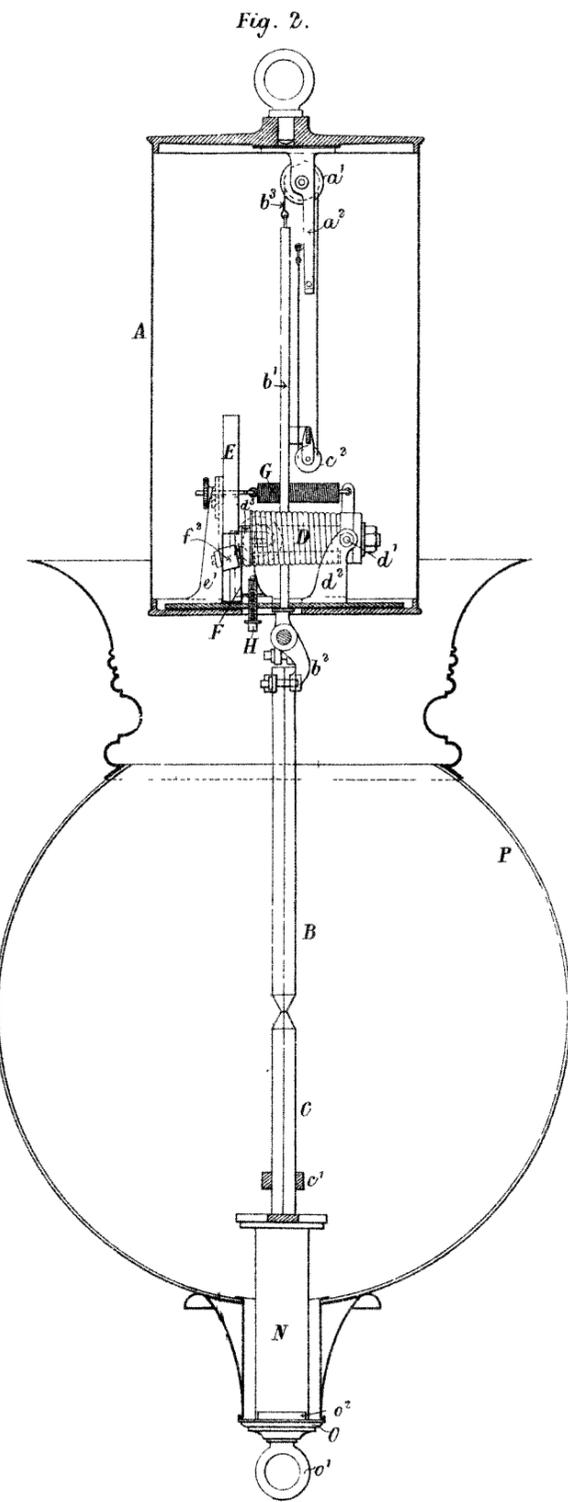
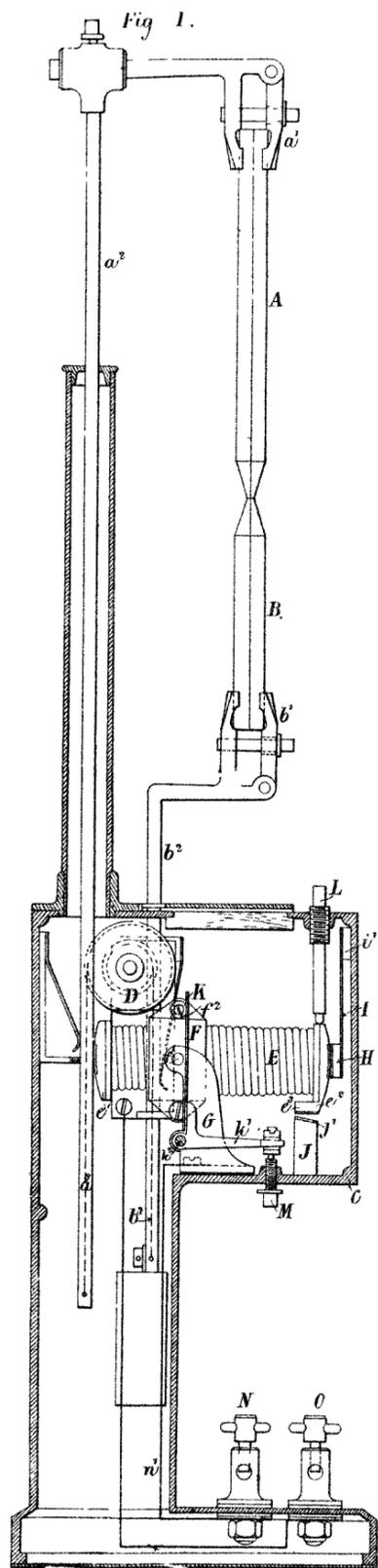
[Drawings—one sheet.]

No. 1158.

[Assignment of Nos. 1139 & 1140. See pages 377 & 381.]

No. 1159.

[Assignment of Nos. 903 & 935. See Letters of Registration for 1881, pages 7 & 125.]



This is the Sheet of Drawings referred to in the annexed Letters of Registration granted to Robert Jacob Gülicher, this fifteenth day of November, A. D. 1882.

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

Augustus Loftus

These are the Drawings alluded to in the accompanying specification of Robert Jacob Gülicher of an invention entitled 'Improvement in Electric Lamps.'

Farnell Lavers & Co. Agents.

Fig. 875.



A.D. 1882, 24th November. No. 1160.

IMPROVEMENTS IN APPARATUS FOR MAKING GAS.

LETTERS OF REGISTRATION to Alfred Wilson, for Improvements in Apparatus for making Gas.

[Registered on the 24th day of November, 1882, 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 WILSON, of Handsworth, in the County of Stafford, 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 Apparatus for making Gas," 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 Alfred 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 Alfred 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 Alfred 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 twenty-fourth day of November, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Apparatus for making Gas.

A.

SPECIFICATION of ALFRED WILSON, of Handsworth, in the County of Stafford, England, engineer, for an invention entitled "Improvements in Apparatus for making Gas."

IN apparatus for making gas, according to this invention, the fuel is fed into a vertical retort, in which it is dried and partially distilled. It gradually descends, falling into a combustion chamber situated vertically below the retort, where it is subjected to the action of a blast from a tuyère or tuyères, one or more of which is or are provided with a dip pipe or dip pipes entering an open box or chamber containing water. The height from the level of the bottom of the dip pipe to the top or overflow of the box or chamber, represents the column of water corresponding to the maximum pressure that can exist in the tuyère, and in the retort, combustion chamber, and flues. By regulating the depth of water in the box or chamber, the limit of pressure can be lowered, but not raised. The gas, whether produced in the retort or in the combustion chamber, escapes by an opening or openings situate at or near the lower end of the retort into a chamber surrounding or partly surrounding the said retort. The ashes fall on to the hearth, from whence they are removed from time to time through a door or doors, the fuel being in the meantime supported by temporary bars introduced through crupper boxes or holes or openings provided for the purpose in the walls of the combustion chamber. The furnace and retort may be both constructed of brickwork, encased with iron or not, as found desirable, or the furnace may be brickwork, and the retort of moulded fire-clay or of iron. In some cases the furnace may be of wrought iron, surrounded by a water-jacket.

Referring to the annexed drawings:—Fig. 1 represents a longitudinal vertical section of apparatus, according to the invention; fig. 2 represents a horizontal section of the said apparatus, according to the invention; fig. 3 represents a longitudinal vertical section of the apparatus, according to this invention, taken at right angles to fig. 1; fig. 4 represents a horizontal section of the same; and fig. 5 represents a plan of the same; fig. 6 is a longitudinal vertical section to a larger scale, showing the tuyère with the dip box and water-box; fig. 7 is a vertical section of the same in line *xx*, fig. 6; fig. 8 is a plan of the same.

In these drawings A is the retort, B the combustion chamber, and C the solid hearth, all three of which are shown lined with fire-brick. D D D are openings between the retort and the combustion chamber, for the escape of gas into the chamber E, from which it is led to any point where it is to be utilized. F is a central tuyère for inlet of air forced into the apparatus by the injectors G G, or by other suitable means. P is a dip pipe entering into the open box Q which contains water. If the pressure in the tuyère exceed that due to a column of water whose height is greater than the vertical distance from the bottom of the pipe P to the bottom of the box Q, the water will be displaced, and the steam and air or gas will escape. This arrangement prevents undue pressure and leakage in and from the retort, combustion chamber, and flues, and automatically regulates the production of gas, whether it is being used in larger or smaller quantities, or is entirely shut off from the furnace to which it is applied. H is a feeding cone closed by the bell L; J J J are openings into the chamber E; K K, sight holes; L L, doors for clearing out the ashes resulting from the combustion of the fuel.

When the clinkers and ash are cleared out from time to time by the two clearing-out doors L L, at the bottom, there is sometimes a tendency for the fuel above to fall down, and interfere with the easy and rapid withdrawal of the clinkers and ash; and in order to avoid this, two slits or crupper box M M are provided, one on each side of the combustion chamber, extending from the outside case through the walls, and parallel with the central tuyère. Whilst the producer is at work these are each closed by means of loose bricks and a light lid, N N, which are fastened with cotters to prevent the escape of gas; but when the producer is being cleaned out at the bottom, the covers and loose bricks are withdrawn, and a series of bars, *o o*, are pushed in through these slits from each side until the ends of the bars rest upon the central tuyère F, and so form a temporary grate, to prevent the fuel from falling. When the cleaning out is completed, the bars are withdrawn, the loose bricks replaced in the crupper boxes M M, and the covers to same again cotted up.

Having described the nature of my invention and the manner of carrying it into practical effect, what I claim is—

- 1—In apparatus for making gas, the novel combination of the retort A, combustion chamber B, solid hearth C, openings D D, crupper boxes M M, and temporary bars O O, substantially as described.
- 2—In apparatus for making gas, the combination of the retort A, combustion chamber B, solid hearth C, openings D D, tuyère F, with dip pipe P, and water-box Q, substantially as described.
- 3—In apparatus for making gas, the combination of the retort A, combustion chamber B, solid hearth C, openings D D, crupper boxes M M, temporary bars O O, tuyère F, with dip pipe P, and water-box Q, substantially as described.
- 4—In apparatus for making gas, the combination of the retort A, combustion chamber B, solid hearth C, openings D D, crupper boxes M M, temporary bars O O, tuyère F, with dip pipe P, and water-box Q, feeding cone H, and doors L L, substantially as described.

In witness whereof, I the said Alfred Wilson have hereto set my hand and seal, this thirty-first day of July, 1882.

ALFRED WILSON.

Witnesses—

MATTHEW P. ELLIOT, Engineer, Birmingham.
EYRE CROWE, Engineer, Birmingham.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to Alfred Wilson, this twenty-fourth day of November, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Improvements in Apparatus for making Gas.

REPORT.

Sir,

In the matter of the application of Mr. Alfred Wilson for Letters of Registration for an invention entitled "Improvements in Apparatus for making Gas," which has 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, 16 October, 1882.

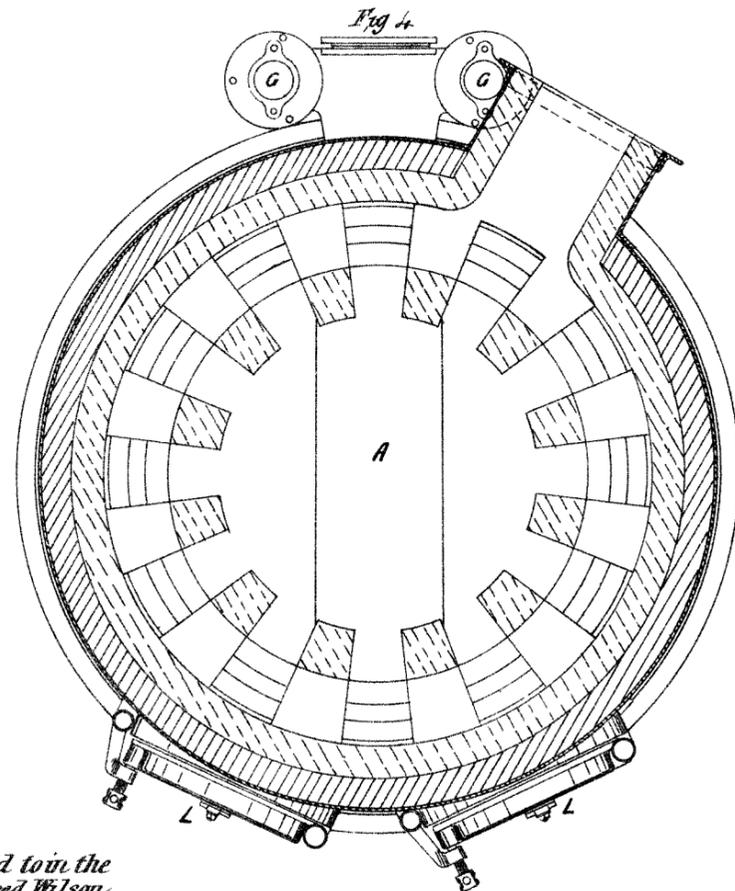
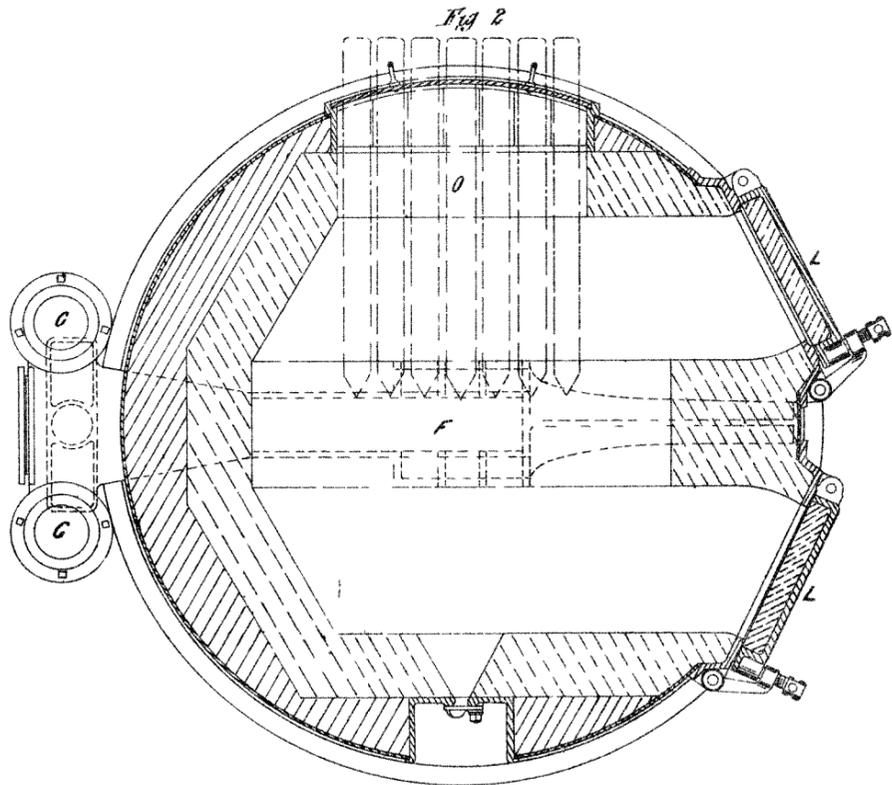
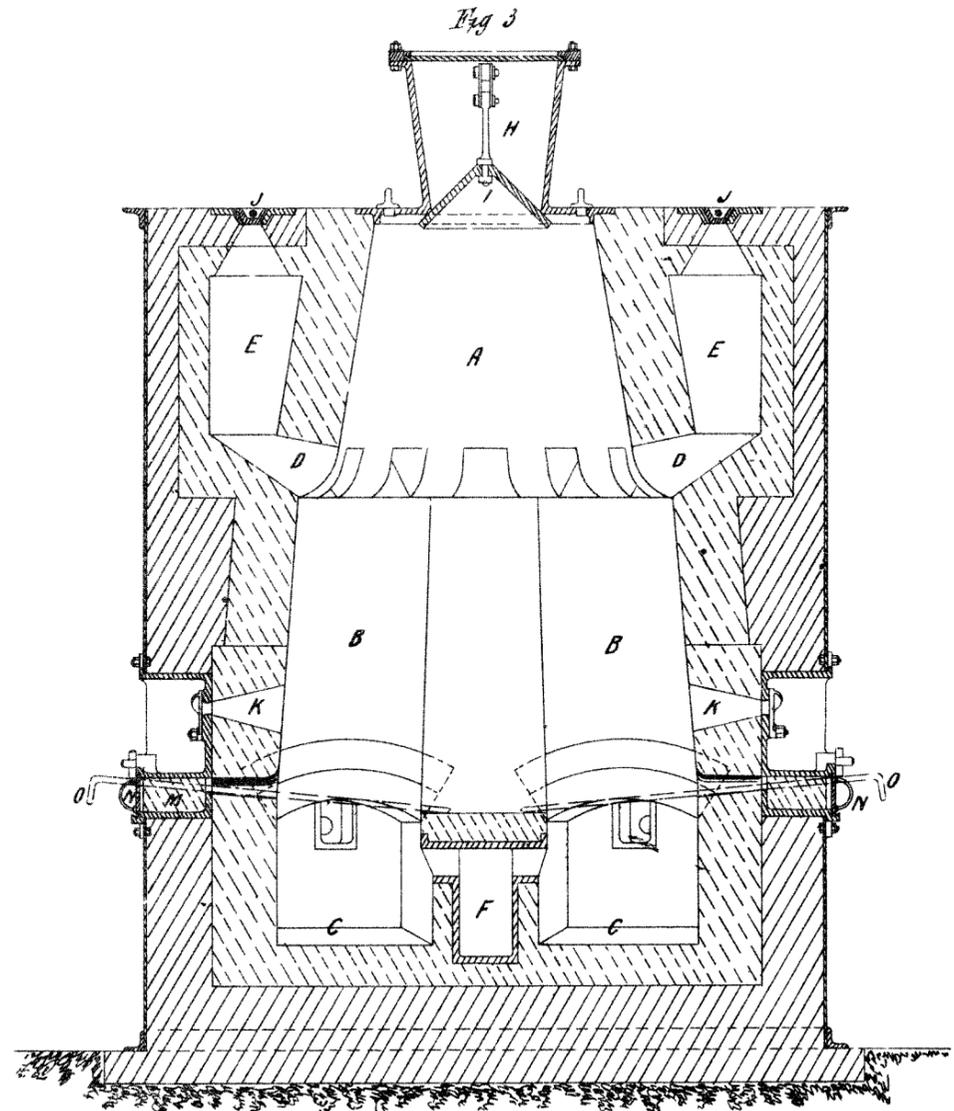
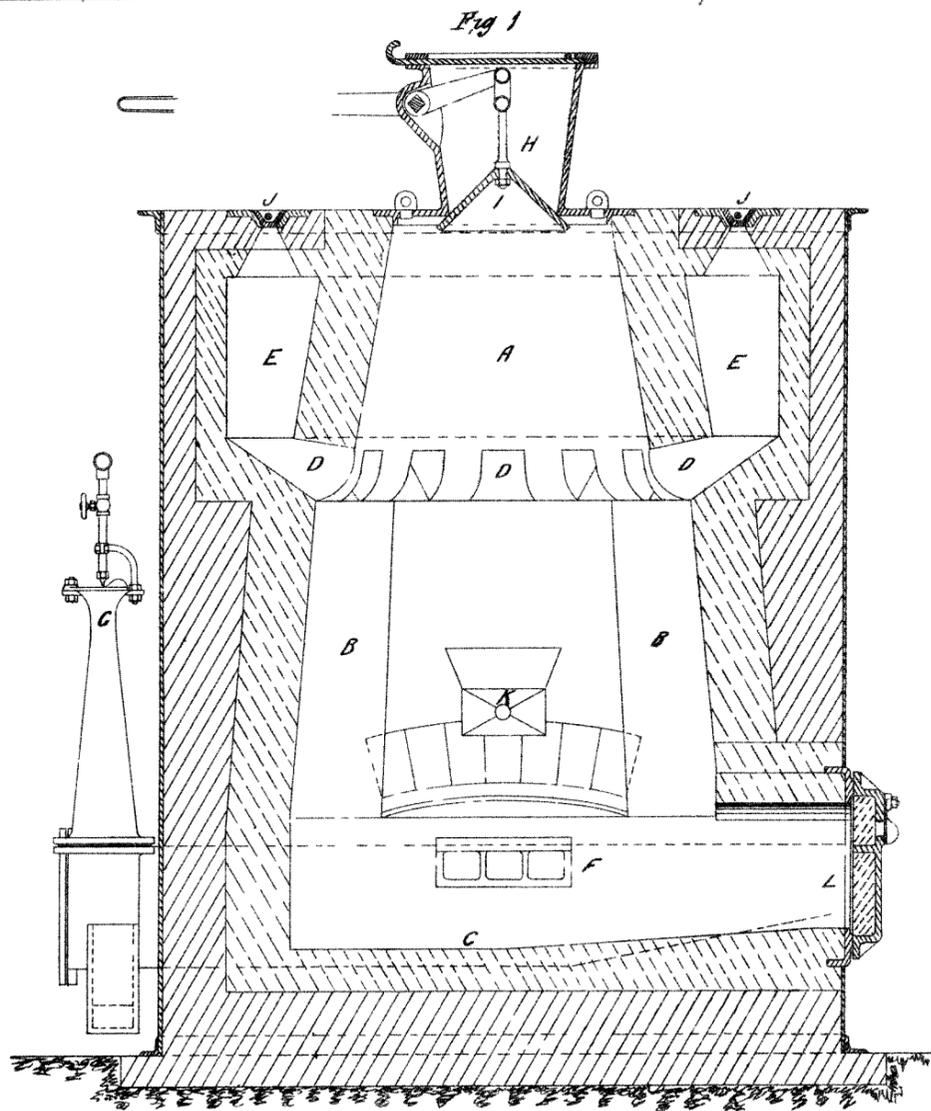
We have, &c.,

A. LEIBIUS.
JAMES BARNET.

The Under Secretary of Justice.

[Drawings—two sheets.]

B



This is the Sheet of Drawings marked B. referred to in the annexed letters of Registration granted to Alfred Wilson, this twenty fourth day of November, A. D. 1882

Augustus Loftus

(875.)

Fig. 5.

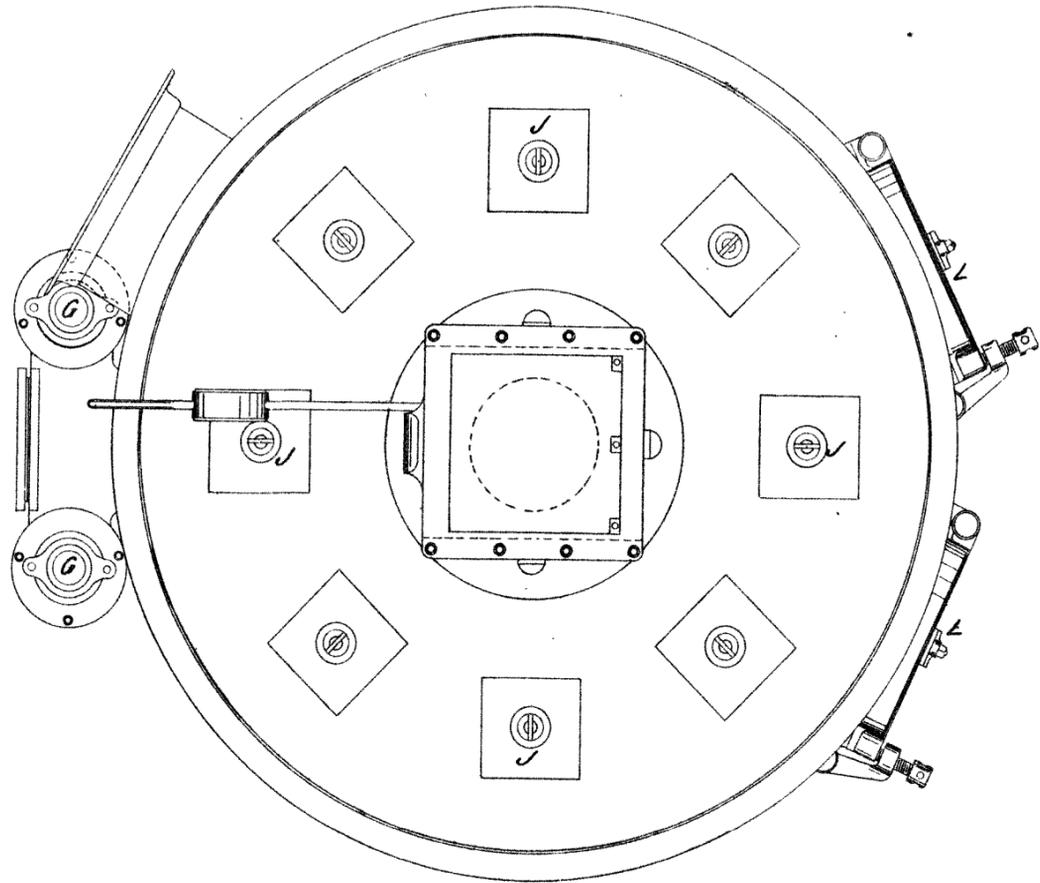


Fig. 7.

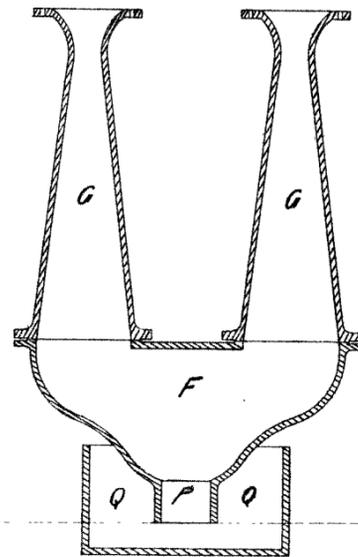


Fig. 6.

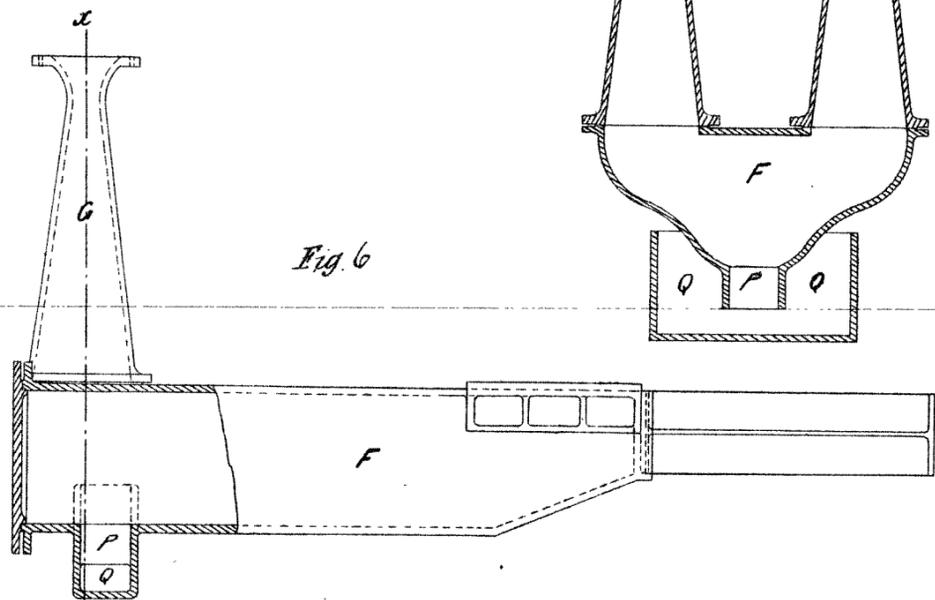
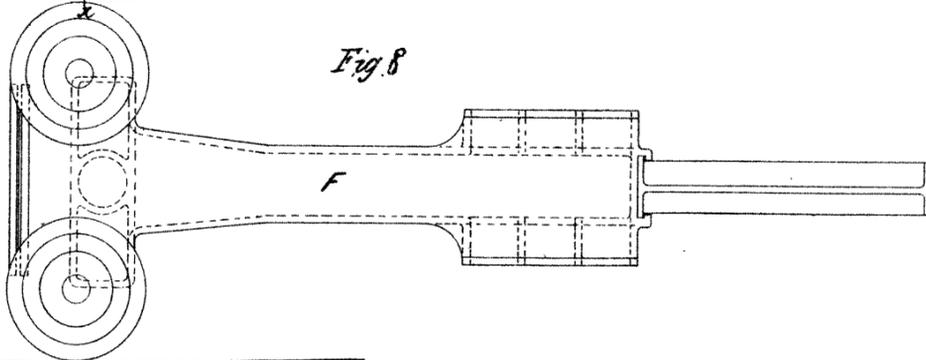


Fig. 8.



This is the Sheet of Drawings marked C. referred to in the annexed Letters of Registration granted to Alfred Wilson, this twenty fourth day of November, A. D. 1882.

Augustus Loftus.

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



A.D. 1882, 24th November. No. 1161.

COOK'S CENTRIFUGAL PULVERIZER AND AMALGAMATING TABLES.

LETTERS OF REGISTRATION to Richard Cook, for an invention entitled "Cook's Centrifugal Pulverizer and Amalgamating Tables."

[Registered on the 24th day of November, 1882, 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 COOK, of No. 11, St. James-street, in the town of Sheffield, 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 "Cook's Centrifugal Pulverizer and Amalgamating Tables," 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 Richard Cook, 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 Cook, 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 Cook 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 November, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Cook's Centrifugal Pulverizer and Amalgamating Tables.

SPECIFICATION.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, RICHARD COOK, of No. 12, St. James-street, in the town of Sheffield, England, engineer, 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 territory of New South Wales and its dependencies, an invention for grinding and amalgamating quartz, bones, cement, fire-clay, zinc, pyrites, shale, copper, tin, and other ores, to be known as "Cook's Centrifugal Pulverizer and Amalgamating Tables"; 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,—the following taken in connection with the drawings is a full, clear, and exact description and specification of same:—

The object of the invention which constitutes the subject of this application is the grinding of gold-bearing quartz or other rock, and amalgamating the gold resulting therefrom, particularly for taking the place of and doing away with the present expensive stampers used in crushing quartz.

The invention consists of certain constructions and combinations of mechanical devices, of which the following are the most important, viz. :—

Two or more revolving balls or rollers (marked A A on drawing) counter-balancing each other, and revolving in the inner periphery of an iron circle made in segments B B B B. A centre, C, having slotted arms, is keyed on to main spindle D, the slots receiving the spindle of balls A A or rollers, carrying the same round at any desired speed. The slots merely act as guides, giving the balls full liberty to give out the full disintegrating power due to the centrifugal force created by the speed of 300 revolutions per minute. An amalgamating table, E, for receiving the liberated gold as it leaves the pulverizer. The pieces of wood F F F projecting from the surface of the table E are set in rows; each row is bolted to a piece of board, G, which rests on to the sides of the table E, allowing the pieces of wood to touch the copperplates H, with which the surface of the table is covered. These wood blocks F are fitted with a square covering of electro-plates, so that particles of float gold which have escaped the ordinary plates and silver wells, by reason of their being suspended in the water, must come in contact with the plated blocks, by which they are secured. A circle of iron or steel, B, in segments, having a strong wrought-iron band, I, round its periphery, the said band being fitted with four (4) strong steel set screws, J, for setting either of the segments in when found necessary, the effect of setting being to make either fine or coarse grinding.

Figure 1 of said drawing represents a full inside view; figure 2 represents the pulverizer complete ready for action; figure 3 represents the plan of amalgamating tables, showing wood projections in position.

The small amount of power taken to drive in proportion to the amount of work done is incredible. 40 cwt. of granite and quartz per hour was at a trial pulverized to an impalpable powder, and the mill was driven by a small portable engine of 4-horse power only, the boiler pressure being 40 lbs. to the inch.

The sieves are placed on to the sides of the mill, hence the screening and grinding are going on at the same time. The advantages of this system of grinding consist not only in the original cost of machinery necessary for reducing two tons of quartz per hour, but also space required, carriage, and facility for removal.

For liberating gold this invention has no equal; the action of the revolving balls A quickly reduces stone to a fine powder, setting free every particle of gold, no matter how fine it may be. Besides setting it free it brightens and burnishes every particle of metal, removing all foreign matter and coating of oxides, thus preparing it for certain amalgamation on coming in contact with the electro-plates.

The novelties claimed by this invention are—

1. The combination, substantially as before set forth, of the revolving balls and rollers and the slotted guides.
2. As before described, the adjustable circle of segments, by which the material operated on may be ground coarse or fine.
3. The combination, substantially as shown in drawings, of the casings for enclosing the rollers, and for receiving and conducting the crushed material as it is delivered through the screen by the said rollers; also the combination of pulverizer with the amalgamating tables, these latter having projecting blocks fitted with electro-plates.
4. The centrifugal action by rollers or balls revolving in the periphery, as shown in drawings.

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 with any such knowledge or belief as last aforesaid.

In witness whereof, I have hereunto set my hand and seal, this _____ day of _____

A.D. 1882.

Signed, sealed, and delivered by the said Richard }
Cook, by his attorneys, in the presence of }

RICHARD COOK,

By his Attorneys,
PALMER, THOMPSON & DENNY.

This is the specification referred to in the annexed Letters of Registration granted to Richard Cook, this twenty-fourth day of November, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT,

Cook's Centrifugal Pulverizer and Amalgamating Tables.

REPORT.

Sir,

Sydney, 17 October, 1882.

The Petition of Mr. Richard Cook, for Letters of Registration, for an invention to be known as "Cook's Centrifugal Pulverizer and Amalgamating Tables," having been referred to us, together with specification and drawings accompanying the same, we have the honor to report that we see no objection to the issue of Letters of Registration as prayed for.

We have, &c.,

A. LEIBIUS,
CHAS. WATT.

The Under Secretary of Justice.

[Drawings—one sheet.]

No. 1162.

[Assignment of No. 920. See Letters of Registration for 1881, page 65.]

No. 1163.

[Assignment of No. 1098. See page 261.]

No. 1164.

[Assignment of No. 881. See Letters of Registration for 1880, page 269.]

No. 1165.

[Assignment of No. 1030. See page 11.]

RICHARD COOK'S CENTRIFUGAL PULVERIZER AND AMALGAMATING TABLES

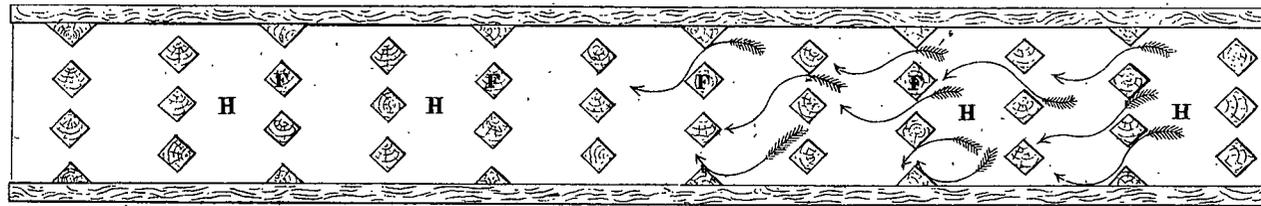


Fig. 4

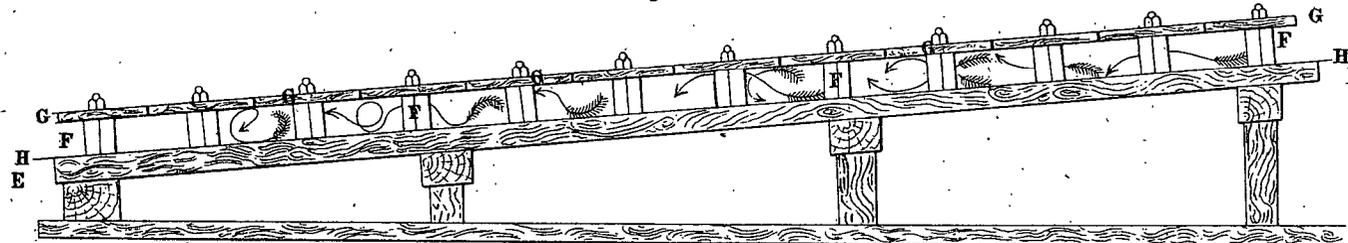


Fig. 3

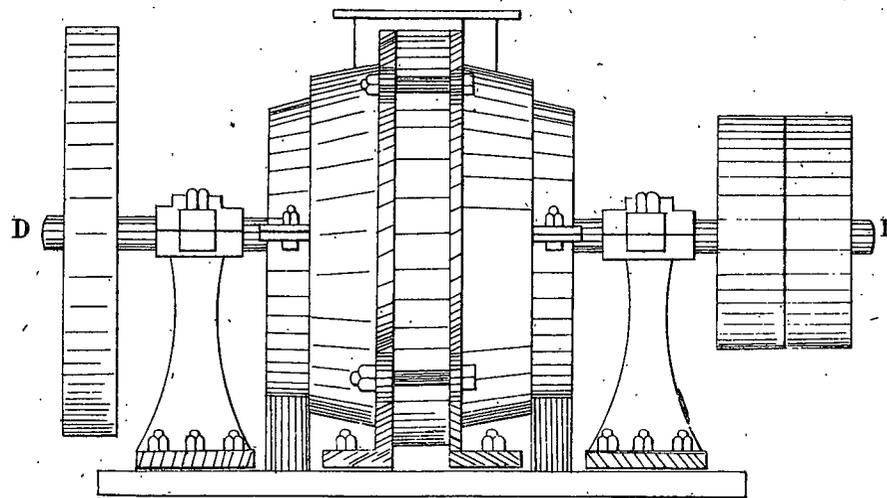


Fig. 2

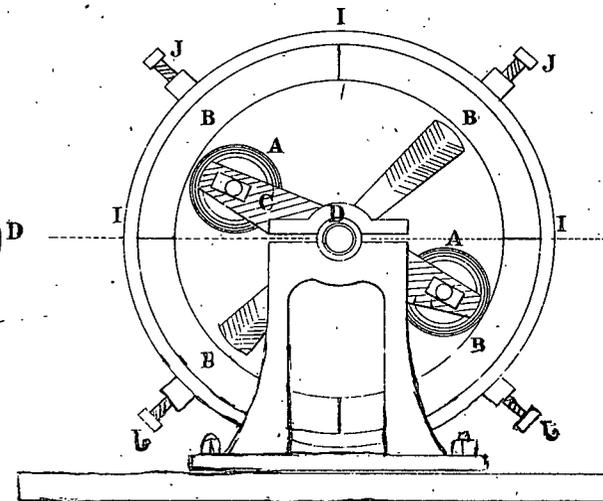


Fig. 1

Scale
 1 1/2 Inch to the Foot

(875-)

This is the Sheet of Drawings referred to in the annexed Letters of Registration granted to Richard Cook, this twenty-fourth day of November, A.D. 1882.

Augustus Loftus.

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

*Richard Cook
 by his attorneys
 Palmer Thompson & Denny*



A. D. 1882, 5th December. No. 1166.

HOWLING'S PATENT SPARK-ARRESTER.

LETTERS OF REGISTRATION to Richard Howling, Charles Walker, Granger Barton, and Wicksteed Charles Barton, for an invention entitled "Howling's Patent Spark-arrester."

[Registered on the 5th day of December, 1882, 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 HOWLING, of Ballarat, in the Colony of Victoria, farmer, 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 "Howling's Patent Spark-arrester," which is more particularly described in the specification and the sheet of drawings which are hereunto annexed; and that he is desirous of obtaining Letters of Registration for the said invention jointly to himself and to certain assignees, that is to say, to himself, the said Richard Howling, and to Charles Walker, Granger Barton, and Wicksteed Charles Barton; 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, the said Richard Howling, and the said Charles Walker, Granger Barton, and Wicksteed Charles Barton, 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 Howling, Charles Walker, Granger Barton, and Wicksteed Charles Barton, 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 Richard Howling, Charles Walker, Granger Barton, and Wicksteed Charles Barton, 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 Richard Howling, Charles Walker, Granger Barton, and Wicksteed Charles Barton, 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 December, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Howling's Patent Spark-arrester.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, RICHARD HOWLING, of Ballarat, in the Colony of Victoria, send greeting :

WHEREAS I am desirous of obtaining Letters of Registration for securing Her Majesty's special license to myself, as inventor, and to Charles Walker, carpenter, of Auckland, in the Colony of New Zealand, to Granger Barton, of Cobar, in the Colony of New South Wales, Esquire, and to Wicksteed Charles Barton, of Adelaide, in the Province of South Australia, Esquire, as assignees of certain shares or proportions, and to our and their executors, administrators, and assigns, and such others as we or they shall from time to time agree with, and no other, that we shall and lawfully may, from time to time, and at all times during the period of fourteen years, to be computed from the day on which this instrument shall be left at the office of the Minister for Justice, Sydney, make, use, exercise, and vend within the Colony of New South Wales, an invention of an improvement in spark arresters, to be styled "Howling's Patent Spark-arrester," as more particularly described in the following specification and drawings forwarded herewith.

SPECIFICATION.

My invention, which relates to improvements in means of preventing destruction of life or property by the escape of sparks from funnels of locomotives, and other flues and chimneys, is novel, and my own.

The object is effected by an apparatus which, while it casts down within itself the live sparks to expire there, gives increased draught area, hastens the escape of smoke, and keeps the flue or chimney hungry and clear of obstruction.

The defection of the live sparks into the inner part of the apparatus is secured by its form, being that of an inverted deflector ; the greater draught area is secured by an internal arrangement of safeties within each other, and within the outside form or covering. The manner in which they are screwed to the flanges, with certain intervening spaces, enlarges the draught area and quickens the escape of the smoke.

The apparatus is shown in three-figures, marked A, B, and C. A is a section of the whole apparatus ; B is a side view or elevation of the same ; C is the particular part of the apparatus which is novel and to be protected.

The various parts shown are as follows :—*a*, parts of the safety cap, perforated with holes in the top ; *b*, ditto ditto, as shown on the plan ; *c*, ditto, to be made of wrought or cast iron ; *d*, plate or bottom ; *e, f*, flanges ; *g*, a band ; *h*, angle-iron ; *k*, gauze covering.

As before stated, the invention consists of a safety cap, and being an inverted deflector the principle is quite novel, and I claim in consideration of such novelty. I claim further that with this safety, either with or without the gauze covering marked *k* on plan, perfect safety from sparks will result, while the free egress of the smoke is not interfered with, but on the contrary is considerably accelerated.

The spark safety is fixed on the flue or chimney by a screw or angle-iron, marked *m* on plan, into a flange of cast or wrought iron, marked *d*, which is fastened to the flue by bolts or screws cut on angle-iron ; on plate *d* an angle-iron is riveted, marked *h* ; the angle-iron is furnished with a screw or bolts to fasten upright flange, marked *e* and *f*, so as to unfasten for cleaning purposes ; on plate *d* an outer upright flange also rests, marked *f*. A wire gauze is riveted on to flange *f* and to band *g*. This band is furnished with flange, on which rests the gauze covering marked *k*, fastened with hinges. The covering *k* is formed of coarse wire gauze, of similar shape, shown on plan, and fastened into a double band of wrought iron, marked *o*, and fitted into before-mentioned band *g*.

The part of the safety cap marked *a* is perforated with very fine holes on the top, and is made of wrought or cast iron. The part marked *b* is made of wrought or cast iron, and perforated as marked on plan. The part *c* is also made of wrought or cast iron, and is also perforated as shown on plan.

The parts *a*, *b*, and *c* are fixed and attached to each other and to the bottom flange marked *d*, by bolts, as shown on the plan, in the following manner :—A nut on top and under *a*, a nut and washer above, with washer below *b*, a washer and nut under *c*, which secures the three parts of the safety cap together. A swell on the bolt above, with washer and nut under flange *d*, fastens the whole safely in its position.

CLAIMS.

Having described the purpose and construction of this invention and described its several parts and operation, I claim especially —

The area of draught space between the safeties, and also between the outer rim of the cap, marked *a*, and the outer covering, marked *e*, such area amounting to fully thirty per cent. more than the area of the funnel or flue to which the arrester is attached, and the casting down within the arrester the live sparks, so that they cannot escape ; and generally, I claim all the advantages arising therefrom.

Although specified to be made of wrought or cast iron, I do not think it necessary to limit myself to any particular metal or metals, nor to any particular height where modification may be necessary.

RICHARD HOWLING,

2, Wentworth Court, 22 September, 1882.

(Per HENRY HALLORAN, Patent Agent).

This is the specification referred to in the annexed Letters of Registration granted to Richard Howling, Charles Walker, Granger Barton, and Wicksteed Charles Barton, this fifth day of December, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Howling's Patent Spark-arrester.

REPORT.

Sir, Having examined the specification and plan accompanying the Petition, we have the honor to recommend that Letters of Registration should be issued to Mr. Richard Howling, and other persons whose names are set forth in the Petition, for an invention entitled "Howling's Patent Spark-arrester," as shown in the drawings and described in the specification attached to the Petition.

Sydney, 11 October, 1882.

The Under Secretary of Justice.

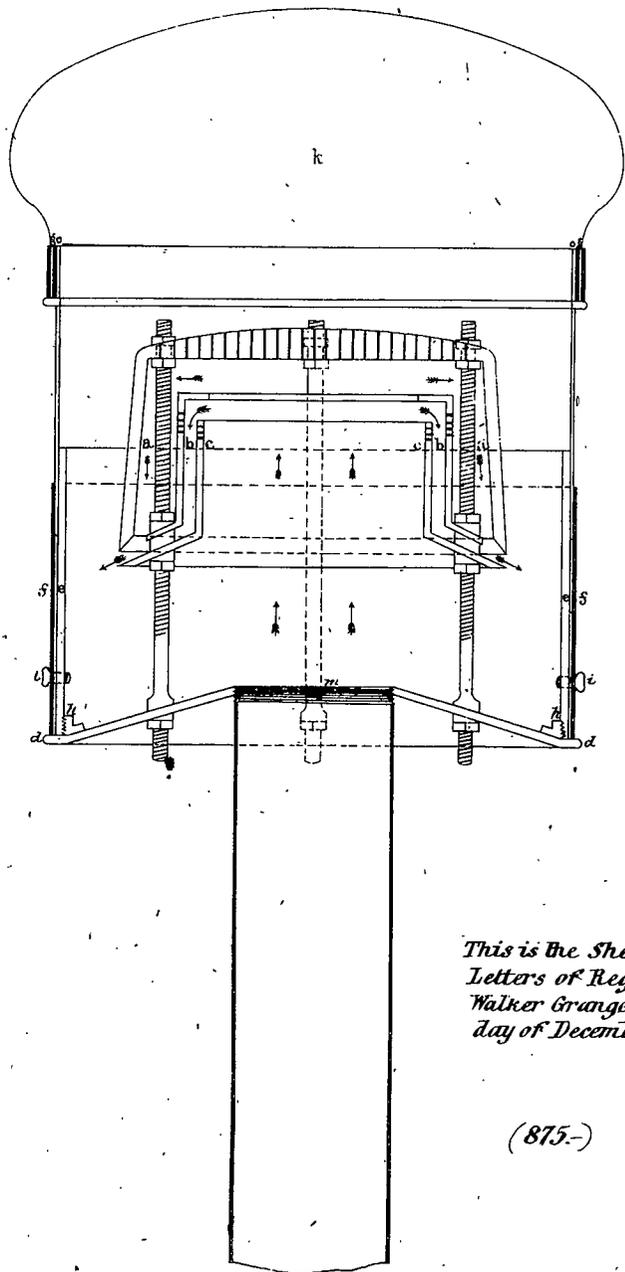
We have, &c.,
JOHN WHITTON.
E. O. MORIARTY.

[Drawings—one sheet.]

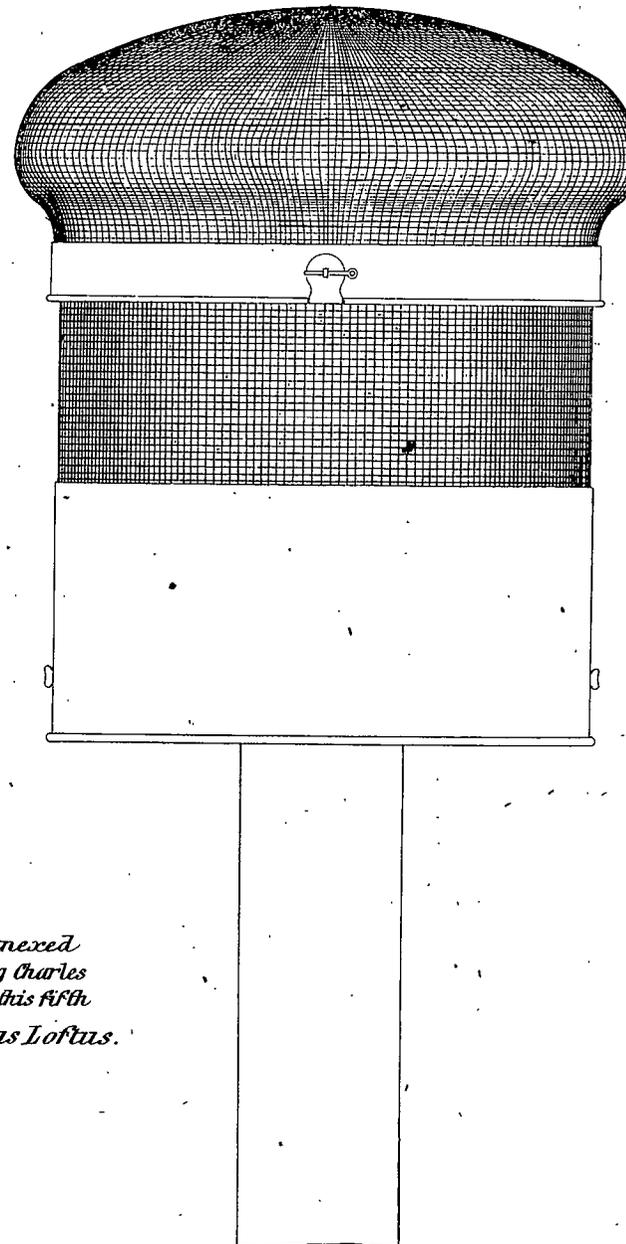
No. 1167.

[Assignment of No. 1029. See page 7.]

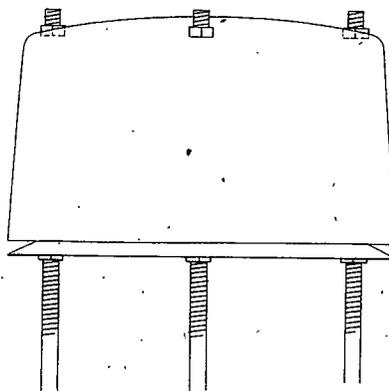
A



B



C



*This is the Sheet of Drawings referred to in the annexed
 Letters of Registration granted to Richard Howling Charles
 Walker Granger Barton and Wickstead Charles Barton, this fifth
 day of December, A.D. 1882.*

Augustus Loftus.

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

(875-)



A.D. 1882, 11th December. No. 1168.

CULLEN'S PATENT FOLDING MEAT-SAFE.

LETTERS OF REGISTRATION to Charles Cullen, for an invention entitled
 "Cullen's Patent folding Meat-safe."

[Registered on the 12th day of December, 1882, 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 CULLEN, of No. 14, Spring-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 entitled "Cullen's Patent folding
 Meat-safe," 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 Charles Cullen, 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 Cullen, 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 Cullen 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 eleventh day of December, in the year of
 our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Cullen's Patent folding Meat-safe.

SPECIFICATION of Cullen's Patent Meat-safe.

THE meat-safe is to be made of black or galvanized sheet iron, each side of which will be made of perforated zinc or wire gauze, for the purpose of ventilation.

As shown in drawing, the safe will be supported from the four bottom corners by means of iron rods passed through the corner joints, bottom of rods to be fastened by means of nuts or cotter pins.

As shown in drawing, the door of safe will be made to slide up and down, with a small catch to hold up the door when required open.

The iron rods which pass through the joints are provided with eyes at top, and by attaching four chains to same the safe is made suitable to hang.

Safe to be painted green or any other suitable colour.

The safe can be made for a very reasonable price.

CHARLES CULLEN.

Advantages of Cullen's Patent Meat-safe :—

- 1st—By undoing four nuts or cotter pins, marked in drawing with the letter B, and then withdrawing the rods, the safe comes to pieces, hence a great saving in packages and carriage.
- 2nd—The safe is supported from the bottom at the four corners, thereby causing great strength, thus obviating one of the great disadvantages of the old shaped meat-safes.
- 3rd—The door of the safe being a sliding door it cannot get out of order, no hinges or latch being required.
- 4th—Lastly, I claim for this meat-safe great strength and lightness, can be packed for transit in small compass, and will remain perfectly fly-proof.

CHARLES CULLEN.

This is the specification referred to in the annexed Letters of Registration granted to Charles Cullen, this eleventh day of December, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

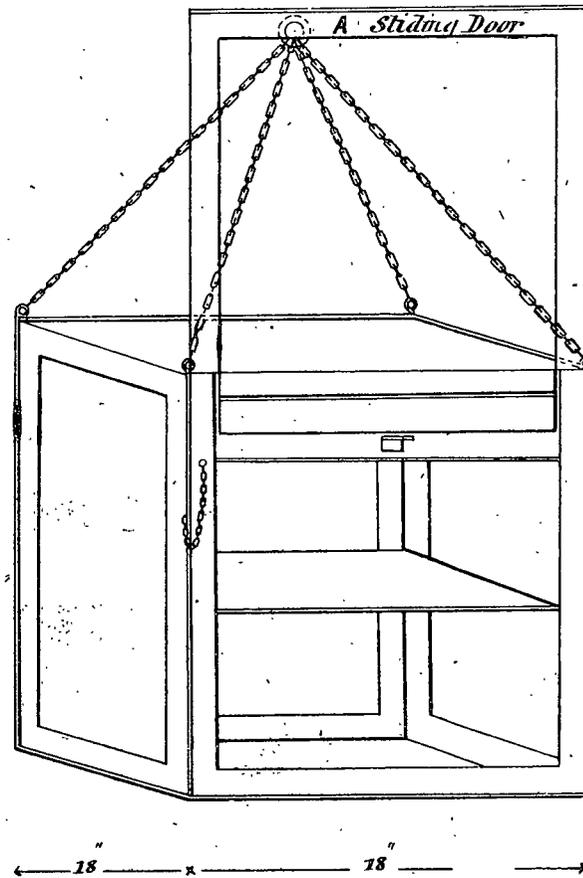
The application of Mr. Charles Cullen for Letters of Registration for an invention for a "Patent folding Meat-safe," having been referred to us, we have examined the plan and specification accompanying the same, and have now the honor to report that we see no objection to the issue of Letters of Registration as prayed for.

Sydney, 30 October, 1882.

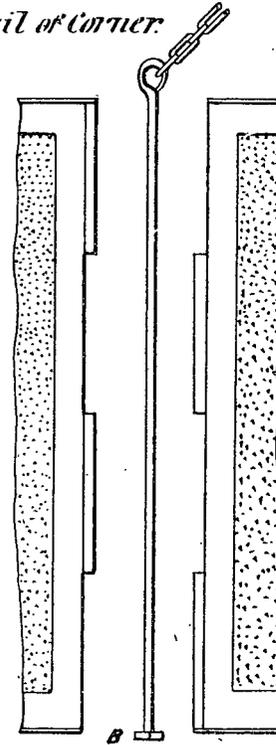
We have, &c.,
JAMES BARNET.
WILLIAM C. BENNETT.

The Under Secretary of Justice.

[Drawings—one sheet.]



Detail of corner.



B Fitted with nut or cotter pin.

*This is the Sheet of Drawings referred to in the annexed
Letters of Registration granted to Charles Cullen, this
eleventh day of December A.D. 1882.*

Augustus Loftus.

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



A.D. 1882, 11th December. No. 1169.

**IMPROVEMENTS IN MACHINERY FOR CRUSHING OR REDUCING GOLD QUARTZ,
CEMENT, &c.**

LETTERS OF REGISTRATION to George Dalton, for Improvements in and connected with machinery or apparatus for crushing or reducing gold quartz, ores, coprolites, cement, clinker, or other like substances.

[Registered on the 12th day of December, 1882, 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 DALTON, of Leeds, 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 and connected with machinery or apparatus for crushing or reducing gold quartz, ores, coprolites, cement, clinker, or other like substances," 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 George Dalton, 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 Dalton, 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 Dalton 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 eleventh day of December, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Machinery for crushing

SPECIFICATION of GEORGE DALTON, of Leeds, in the county of York and Kingdom of England, for "Improvements in and connected with machinery or apparatus for crushing or reducing gold quartz, ores, coprolites, cement, clinker, or other like substances."

My invention relates to machinery or apparatus for crushing gold quartz, ores, coprolites, cement, clinker, or other like substances which require to be reduced to an impalpable powder, and it has for its object rendering the said machine better adapted for being employed in the crushing or reducing of coprolites, cement, clinker, or other like substances.

In carrying out my invention in order to effect this object, the oscillating or movable jaw is pivoted to one arm of a double-armed lever or levers mounted upon a centre or fulcrum in the framing, and the other arm of such lever or of each of such levers is jointed to a connecting rod operated by an eccentric cam or crank upon the actuating shaft. An adjustable toggle or toggles is or are provided for obtaining the lateral thrust of the jaw, which, in conjunction with its downward motion, produces the crushing action. By means of the arrangement and combination of the parts hereinbefore described, the great crushing strain is sustained by the toggle or toggles and by the main frame of the machine, and not by the actuating shaft.

I combine with the crushing apparatus a sieving apparatus and elevator, so that the portions of the material not sufficiently reduced may be separated from the fine portions and carried up, to be again passed through the crushing apparatus.

The details of arrangement of the parts of the apparatus generally may be somewhat modified, without departing from the principle of the invention or altering the character of the machine.

I have shown in the accompanying drawings three types of the crushing apparatus, which only differ from each other in the relative location of certain of the parts, and two modifications of the sieving and elevating apparatus, either of which as desired may be used in combination with any one of the three types of crushing apparatus.

Figure 1 represents a longitudinal vertical section of a crushing or reducing and sieving and elevating machine, constructed and arranged according to my said invention. In this type the crushing or reducing apparatus is adapted for operating upon material of a very hard nature, and the sieving apparatus is arranged immediately beneath the crushing or reducing apparatus, and is combined with a chain or endless-band elevator; figure 2 is a plan of the combined machine corresponding to figure 1; figure 3 represents a longitudinal section of a combined machine of the second type, in which the crushing or reducing apparatus is more particularly adapted for operating upon softer material. In this example a raff-wheel or revolving sieving and elevating apparatus is shown in combination with the crushing or reducing apparatus, but a sieving and elevating apparatus of the description shown in figures 1 and 2 may be employed in substitution for the revolving apparatus in this second type of machine, and the revolving apparatus may be likewise substituted in the first type of machine for the sieving and elevating apparatus shown in figures 1 and 2; figures 4 and 5 are respectively an elevation and section of the raff-wheel or revolving sieving and elevating apparatus; figure 6 represents a longitudinal section of a crushing or reducing apparatus of the third type, which is specially designed for reducing very hard materials to a fine state of division. The sieving and elevating apparatus is not shown in this figure, although intended to be used. Either of the two modifications shown in the other figures may be selected.

Referring to figures 1 and 2, the oscillating or movable jaw A is pivoted at its upper end, *a*, to one arm, *b*, of a double-armed lever, B, mounted upon a centre or fulcrum, *c*, in the framing C, and the other arm, *b*¹, of which lever is jointed at *b*² to a connecting rod, E, operated by an eccentric cam or crank, *d*, upon the actuating shaft D. A downward motion is thus imparted to the oscillating or movable jaw A, and the lateral thrust of the jaw (which, in conjunction with its downward motion, produces the crushing action) is communicated through the intervention of a toggle or toggles, F, the latter being in this type of machine arranged at the bottom of the jaw A, so as to take nearly the whole of the back pressure. The toggle block *e* is adapted to guides, *e*¹ *e*², in the frame, and may be caused to slide outward or inward in order to vary the angle of the toggle or toggles by the act of adjusting the transverse wedge *f*, and the throw of the jaw A can be thus varied, as required, according to the degree of division of which the material under operation is to be reduced.

Below the jaws of the machine is placed the sieving apparatus G, consisting of a revolving screen or sieve capable of receiving a peculiar combined rotary and vibratory motion for receiving and separating the substances introduced in the interior thereof, as crushed and expelled from the apparatus hereinbefore described. This screen or sifting apparatus consists of a compound cylindrical or other conveniently shaped screen and sieve, formed of an inner and outer perforated or reticulated casing, marked respectively *i* and *i*¹. Figure 7 is a transverse section of the said sieve. The inner sieve is of coarser make than the outer, to break the fall of the substance into the fine sieve.

The frame-work or supporting structure of this apparatus may be conveniently composed of light steel hoops, with suitable longitudinal tie-pieces bolted or otherwise conveniently attached thereto. To this framing is fixed an auxiliary wooden frame-work, to which the two perforated casings or screens are attached, another outer casing with coarser meshes or perforations being preferably arranged outside that of finer construction as a support to the latter. This compound sieve or screen is mounted at an angle, being fixed on the central shaft *h*, to which rotary motion is given from any convenient motor. The shaft is mounted in bushes capable of rising and falling in its bearings. To the outer end of the said shaft I fix a ratchet wheel, *p*, or an analogous appliance, presenting different planes of elevation from its centre, which wheel is arranged to bear upon the periphery of a runner or pulley, *q*, conveniently mounted on the framing for the purpose, as shown.

As the shaft with the screening apparatus is caused to rotate, the wheel *p* revolving with it and in contact with the uniform surface of the runner or pulley *a*, rapid intermittent vibratory motion is imparted to the entire apparatus in addition to the rotary motion, so as to effectually prevent the crushed substances contained therein from being clogged.

The material from the jaws passes by the shoot *r* into the revolving screen, and the material which has been reduced to a sufficiently fine state of division passes through both screens and may be delivered at

or reducing gold quartz, cement, &c.

at *k* into any suitable receptacle, while the coarser portion of the material is conducted by the arrangement shown into the elevator I, and by its buckets, *l*, carried up and discharged into the chute K, to be again passed through the machine. The shaft H may drive the elevator I through the intervention of a belt and pulleys, *n*, one of such pulleys being fast on the upper shaft *n'* of the elevator.

I do not limit myself to a cylindrical revolving sieving apparatus, as for instance two flat screens, a coarse one above and a fine one beneath, both having a vibratory motion, may be employed if desired.

Figure 3 illustrates the second type of machine, and figures 4 and 5 show in detail the raff-wheel or revolving sieving and elevating apparatus, which is represented as employed in combination with the crushing or reducing apparatus in this type of machine.

The crushing or reducing apparatus shown in figure 3 only differs from that hereinbefore described with reference to figures 1 and 2 in the following features, *videlicet*:—The lever B is pivoted by its arm *b*, to the lower end, *a*, of the movable jaw A, and the toggle or toggles F are arranged above. In this case, for convenience, the wedge *f*, by means of which the position of the toggle-block *e* is adjusted, is operated in a vertical direction, the block working between lateral guides in the frame.

The sieving or elevating apparatus (shown in detail in figures 4 and 5) consists of the wheel M, which is mounted on a centre or axis, O, carried by the frame of the machine so as to be free to revolve thereon, and has rotary motion imparted to it by any convenient means, such for example as by spur-gearing, the wheel M being shown provided on its outer periphery with teeth, *m'*, for this purpose. The wheel is formed with screens, *i i'*, the inner one, *i*, having a coarse mesh, and the outer one, *i'*, a fine mesh. The material which has been operated upon in the crushing or reducing apparatus is discharged therefrom at *k* into the wheel M, and that portion of the material which has been sufficiently reduced passes direct through both screens of the revolving wheel, and is delivered into any suitable receptacle, while the coarser portion of the material is carried up by the buckets *l* and discharged into the chute K, to be again passed through the machine. As before mentioned, I may substitute for the raff-wheel in this type of machine a sieving and elevating apparatus of the description shown in figures 1 and 2, and the raff-wheel may, if desired, be employed in the first type of machine in substitution for the sieving and elevating apparatus shown in those figures.

The third type of machine is illustrated in figure 6. It differs from the second type only in the use of two toggles or sets of toggles, F, which take the whole of the back pressure. The sieving and elevating apparatus is not shown in this figure, but either of the two kinds hereinbefore described may be employed in combination with the crushing or reducing apparatus.

I claim as my invention—

First—The combination with the fixed and movable jaws and operating shaft of a crusher or reducing apparatus of a rigid lever fulcrumed in the machine-frame, means for connecting it with the movable jaw and shaft, as explained, for imparting an up-and-down movement from the latter to the former toggle-blocks, and one or more toggles arranged between stationary toggle-blocks and said movable jaw, so as to cause the latter to approach the fixed jaw by the downward movement thereof, substantially as described.

Second—The combination with the movable jaw and operating shaft of a crusher or reducing apparatus of a lever fulcrumed between the said jaw and shaft, and pivoted at one end to said jaw, connecting rod crank on said shaft, one or more toggles, and stationary toggle-blocks, substantially as described.

Third—The combination with a crusher or reducing apparatus comprising fixed and movable jaws and mechanism, as explained, for imparting to the movable jaw a movement up and down, and of approach to and recession from the fixed jaw of a sieving apparatus, located with reference to said crusher or reducing apparatus as shown, and an elevator arranged to lift and deliver between the jaws of the crusher the material too large to pass through the sieving apparatus, substantially as described.

In witness whereof, I, the said George Dalton, have hereunto set my hand and seal, this thirty-first day of August, one thousand eight hundred and eighty-two.

GEO. DALTON.

Signed and sealed in the presence of,—

CHAS. MILLS, 47, Lincoln's Inn Fields, London.

CHAS. JAS. JONES, 47, Lincoln's Inn Fields, London.

This is the specification referred to in the annexed Letters of Registration granted to George Dalton, this eleventh day of December, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 31 October, 1882.

We do ourselves the honor to return to you the documents transmitted to us under your B.C. communication of the 23rd inst., No. 82-12,223, which have reference to Mr. George Dalton's invention for "Improvements in and connected with machinery or apparatus for crushing or reducing gold quartz, ores, coprolites, cement, clinker, or other like substances," and we have to report that we see no objection to the issue of the Letters of Registration asked for in terms of Mr. Dalton's Petition, specification, and claim.

We have, &c.,

A. LEIBIUS.

CHAS. WATT.

The Under Secretary of Justice.



A.D. 1882, 11th December. No. 1170.

IMPROVEMENTS IN THE MANUFACTURE OF ARTIFICIAL STONE AND MARBLE.

LETTERS OF REGISTRATION to Raphael Josia, for Improvements in the manufacture of artificial Stone and Marble, and in colouring the same.

[Registered on the 12th day of December, 1882, 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 RAPHAEL JOSIA, of Certaldo, in the Kingdom of Italy, 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 manufacture of artificial Stone and Marble, and in colouring the same," 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 Raphael Josia, 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 Raphael Josia, 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 Raphael Josia 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 eleventh day of December, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in the manufacture of artificial Stone and Marble.

SPECIFICATION of the invention of RAPHAEL JOSIA, of Certaldo, in the Kingdom of Italy, for "Improvements in the manufacture of artificial Stone and Marble, and in colouring the same."

THIS invention relates in general terms to a method or process of working gypsum, and other sulphates of lime capable of like treatment, into manufactured articles for use or ornament, and to the manufacture of such articles from such material, as well as to the products themselves. The articles produced have many of the desirable qualities of marble or of the finer kinds of artificial stone, such as hardness, capability of resisting climatic or atmospheric change, capability of having imparted thereto a high polish and an ornamental appearance. Also, imitations may be made of precious stones, porcelain, china, ivory, celluloid, and other materials for ornamental or useful purposes.

As regards the material from which the articles are to be made under the present invention, I do not limit myself to the chemically pure sulphates of lime, as it is seldom found in that state, but usually contains various impurities, so that I include herein all materials having sulphate of lime as their base, and adapted to be hardened by the treatment hereinafter described; and for the purpose of this description I will use the term gypsum as inclusive of all such materials.

This material, as is well known, comes from the earth in a comparatively soft condition, and therefore may be very readily converted into any desired useful or ornamental form; it is somewhat porous and is comparatively soluble. It contains usually a small, but sometimes a considerable, percentage of impurities, which are found more especially along the veins or interstices of the gypsum, and more commonly it is white or of a light colour. Heretofore gypsum has commonly been utilized in the arts or for manufacturing purposes by a process of calcination and grinding, after which it is mixed with water so as to effect a new modification. It has also been common to carve or cut ornamental articles from firmer and finer qualities of sulphate of lime, as (say) alabaster; but so far as I am aware, no process has been discovered or means invented of date prior to my invention by which the articles so cut or carved can be hardened throughout their substance, or to that extent or degree that they will withstand rough usage or even permanent outdoor exposure.

According to my present invention I employ the gypsum as it comes from the mine, or in its native condition, without pulverization. This material I cut or carve or similarly work by the use of any tools or machines adapted for the working of a soft stone like this, so as to produce the article or shape desired, whether it be for use or ornament. Tools similar to ordinary wood-working tools can be used for this purpose.

My invention in its chief elements of novelty is directed to the attainment (in most cases) of two ends: first, to the hardening or indurating of the material or articles thus cut, fashioned, or brought to form, so as to fit them for exposure to climatic changes, rain, frost, or the like, and to render them capable of withstanding hard wear or rough usage (as for example that to which they are submitted when used as floor tiles); and secondly, to the colouring or tinting of such articles, and fixing the colours or tints so as to secure an ornamental appearance.

By the treatment according to my invention I can secure in the articles substantially the hardness, general appearance, polish, and durability of marble, and also if desired a variety of colours largely in excess of those found in marble and equally pleasant to the eye. The product thus made, considered only as product, I will term "Certaldite."

The first step is that which is employed to render the material anhydrous, or practically so, to the desired depth; and this I do by a baking, or dehydrating, or partial dehydrating operation, which may be applied to the material while in a rough uncut or unfinished condition, but preferably when in the form of plates or slabs, or after the articles to be made are cut, fashioned, or shaped. Any suitable drying or baking apparatus may be employed, but it should be of such construction and operation that the articles or materials shall be exposed to a controllable and gradually rising temperature, and shall not be brought into direct contact with the fire. The duration of this part of the process, which for convenience may be termed the dehydrating operation, and the degree of temperature to be employed, will vary according to the nature of the grain or the porosity or composition of the gypsum and the size or dimensions of the articles under treatment.

The coarser the grain or the greater the porosity, or the smaller or thinner the article under treatment, the more rapidly can it be dehydrated, and *vice versa*. With the gypsum which I have chiefly used, such as is obtained at Certaldo in Italy, when in the form of pieces or of articles of moderate dimensions, cut or worked to shape, an exposure to a temperature of from 120 degrees to 150 degrees Centigrade for a period of about eighteen hours will usually be found sufficient, and the better way of applying this heat is by a gradually increasing and then a gradually decreasing temperature. This decreasing temperature may be readily obtained by allowing them to remain in the drying chamber after the fires are put out, or by transferring them to a chamber heated to about the same temperature and then allowed (after the articles are placed therein) to cool gradually.

When treating blocks, pieces, or articles exceeding about 1 inch in thickness, the operation will require more time, and may be known to be completed by fracturing small test blocks of the same thickness as the blocks or articles being treated, these test blocks being put into the oven at the same time the blocks or articles are introduced. When a fracture of the test block presents a uniform white colour throughout the dehydration is completed, though the dehydrating operation may be arrested sooner if so preferred.

When the process of dehydration or of partial dehydration is complete, by which I mean when all or the greater part of the water has been driven off, the block, piece, or article is left to cool (say) for three, four, or more hours (preferably as hereinbefore described), until it comes down to, or nearly to the temperature of the atmosphere, or until it will be free from danger of fracture or other injury by sudden change of temperature on being immersed in a bath, and it is then ready for the next step in the process, which is one by which it is hardened or indurated, with or without the use of special materials for colouring, or tinting, or changing the colour or tint of the same.

For

Improvements in the manufacture of artificial Stone and Marble.

For the purpose of hardening the gypsum I dip or immerse the block, piece, or article, in a liquid bath, or otherwise treat it with a liquid which in its preparation may be considerably varied, but which in general terms may be described as containing in solution usually a salt and an acid. Thus for most purposes I employ alum, which is a double salt, and oxalic acid, and a suitable mixture may be made by dissolving about four pounds of alum and two pounds of oxalic acid in twenty gallons of water; but these preparations may be varied somewhat, as may all others herein noted, as well as degrees of temperature and duration of time. The block, piece, or article of gypsum is to be dipped in this bath, as presently to be explained. The chief work or effect of the salt is, I believe, to be that it takes the place of the molecules of water driven off or eliminated in the dehydrating operation, so as to substitute a water containing a salt for the molecules of water acted on in the dehydrating part of the process, as a result of which the salt so added tends to render the article or material more compact, harder, or less soluble; and it has also, I believe, a like effect by chemical and physical action on the impurities present, thus producing substantially a new compound or material. As nearly all qualities of gypsum obtained from the earth contain a greater or less percentage of impurities which may be acted upon by oxalic or other acids, and be thereby hardened or set so as to become less soluble than before, I believe the oxalic acid so acts on such impurities and has a like effect as regards lessening solubility on the sulphate itself, for I have found in practice that the conjoint and simultaneous action of a salt and an acid dissolved in a liquid or gypsum in the manner substantially as herein described is such as to impart to it a degree of hardness, density, lack of solubility, and other analogous qualities, such as to render it an excellent substitute for marble or for the finer qualities of artificial stone and the like, and adapted for use for all or nearly all purposes of use or ornamentation to which such marble, stone or the like, has been or can be applied.

The bath prepared as above directed is more particularly designed for use in treating the lighter-coloured or colourless gypsum, with reference to getting a product white or of a light colour, and may therefore be called the "white bath."

The next step in the process constituting my present invention relates to the colouring or tinting of the material so treated, which colouring or tinting is done simultaneously with the hardening, and preferably in the same bath. When the material is of that quality or character that the ingredients of the hardening bath do not materially affect the colour or do not produce the proper or desired colour or tint, I incorporate with the ingredients of the bath suitable mineral, vegetable, or other colouring matter, with the object of obtaining in the product the particular colour, shade, or tint desired. Thus for a pink bath, or a bath to give a pink tint or colour, about an ounce of pink aniline may be added to the bath above described. For a light brown bath, about two pounds of extract of the husk of the walnut may be added.

Instead of using a special colouring matter as thus described, the desired colouring effect may be produced with many qualities of gypsum, by the use in the preparation of the hardening bath of such acids or salts, or both, as will give the hardening effect as desired, and will also at the same time change the colour or tint, or impart a colour or tint as desired. I believe that this effect is due to the fact that some of the known salts or acids suitable for use in hardening also act as a dye, and still further that, as regards certain impurities found in gypsum, the acid or salt which may be employed in the bath acts chemically or physically, not only to harden such impurities as above described, but also to change or modify their colour; and it is owing, I believe, to this latter fact I am able to get variegated colours or tints, irregular in pattern or design, such variegations and irregularities, whether produced in streaks, or in spots or blotches, resulting in part at least from the irregular distribution of such impurities through or in the blocks, pieces, or articles of gypsum under treatment. Thus, for example, to make a sky-blue bath I have used—water 22 gallons, alum 10 lbs., oxalic acid 2 lbs., and yellow prussiate of potash 1 ounce. For some purposes or with some qualities of gypsum, and for the production of some colours, I have found it advantageous to employ in the bath a vegetable colouring ingredient and a salt having colouring properties; as for example, I have used for a black bath—water 22 gallons, extract of log-wood 3 lbs., extract of old fustic $\frac{1}{2}$ lb., powder of gall-nuts 6 lbs., sulphate of iron 3 lbs., and sulphate of copper $\frac{1}{2}$ lb.

Also in some cases, an acid or salt may be added as a mordant, specially for the purpose of fixing the colour.

In working this invention, the operator should make himself acquainted with the kind or quality of gypsum to be treated, or of its action under treatment.

This action may readily be ascertained by the use of test pieces. Instead of alum, or in conjunction with alum, any suitable salt may be employed, as for example, salts of magnesia, carbonate of potash, carbonate of soda, sulphate of iron, sulphate of copper, bichromate of potash, cyanide of potassium, and the known acetates, oxalates, sulphates, nitrates, and carbonates, or their chemical equivalents, these being such as will impart hardness to or indurate gypsum without decomposing it.

And as regards the acid constituent, when used (for it may in some cases be omitted), any suitable acid may be employed, such as nitric, sulphuric, acetic, or their chemical equivalents.

By the treatment thus described the desired degree of hardness and the desired colour (when coloured certaldite is required) is or are imparted to the materials under treatment to convert them into artificial marble, stone, or the like.

But it is not essential that only a single bath be used, as varied effects may be obtained by the use of separate baths, to be prepared on the principles above stated, and the materials being dipped first into one bath and then into the other or others.

Also, where a specific colouring matter is employed, the article or material may be first dipped into the colouring solution bath, and then into a hardening or hardening and colouring bath.

The length of time during which the material should be kept under this hardening treatment will depend somewhat on the strength of the ingredients composing the bath, the character and rapidity of the chemical reactions involved, the porosity and nature or physical and chemical condition of the material, *et cetera*, but usually about twelve hours more or less will suffice, though I prefer repeated dippings, two, three, or more times (say two or three seconds at first), each succeeding dipping increasing in duration gradually until a dipping of three, five, or more minutes' duration, more or less, is attained; drying intervals of like increasing duration being allowed between the dippings. This repeated dipping may extend over half to the three quarters of an hour or so, after which the blocks or articles may remain in the bath for twelve hours or thereabouts, to give the final hardening throughout the substance of the said blocks or articles.

The

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The following procedure I have found to answer well in making white "certaldite":—

The slabs, cut or sawn to a thickness of about 1 inch (or other shaped or unshaped articles), are heated in a stove or oven for a period of from twelve to eighteen hours, at a temperature gradually rising, and attaining from about 130° to 150° Centigrade. In treating thicker blocks, or slabs, or articles, a somewhat higher temperature will be required.

This operation of dehydrating or driving off the water or part thereof throughout the substance of the block, slab, or article is of great importance, and care must be taken not to allow the temperature to rise to an excessive extent, as this would render the materials liable to crack or crumble or be injured in the subsequent treatment in the bath.

The temperature must not reach 260° Centigrade, otherwise the subsequent hardening process will not be effective. The completing of the dehydrating process throughout the whole of the materials under treatment may be ascertained by examining the grain of fracture of a suitable sample or test piece submitted to dehydration in the same chamber.

After the dehydrating operation has been carried to the desired extent, the slabs, blocks, or articles are allowed to cool gradually (preferably as hereinbefore described) for a few hours, preferably until they come to or about the temperature of the atmosphere or of the bath or baths by which the indurating is to be effected, and they are then immersed in a bath composed for example of about four pounds of alum and two pounds of oxalic acid, dissolved in about twenty-two gallons of water. The said slabs, blocks, or articles are allowed to remain in this bath for about two or three seconds, after which they are taken out and allowed to dry for a few seconds, being then again plunged into the bath for about six or eight seconds and again allowed to dry for about a like period. This process of alternate immersing and drying is carried on with a gradual lengthening of the time of the immersions and of the intervening dryings, until at the expiration of about half an hour or three quarters, the blocks, slabs, or articles are left immersed in the liquid for about twelve hours.

They are then removed and dried by being exposed to the sun or to a temperature of from 40° to 50° Centigrade for about six or eight hours, or to the sun for a day or so, or to ordinary atmospheric temperature for two or three days. The blocks, slabs, or articles if cut to shape, or when cut to shape before the dehydrating process, are now ready for scraping, planing, polishing, or otherwise finishing the surface thereof.

When in slab or plate form I may do this by employing cast-iron plates with sand and water in the first place, and afterwards with water alone, though other suitable means (such being well known in this art) may be substituted.

Then the blocks, slabs, or articles are treated by coating or covering them with oil (preferably olive oil) or with melted paraffine, or paraffine wax or stearine, or other preservative applied over the surface one, two, or three times, and then left to dry. If a high polish is desired, the surface to be polished is then rubbed with any suitable polishing material, such as a rubber of lead foil and emery powder and water or bone dust applied by a woollen cloth, preferably commencing with the one and ending with the other.

In this way a fine polish can be given to the articles or materials.

The entire process can then be considered terminated, but if a greater degree of hardness or special combination of colours is desired, the operations of dehydration and subsequent bathing in the manner described may be repeated one or more times.

I will now describe various ingredients for baths for producing certaldite of various colours.

For the making of black certaldite, or one practically so, or of a dark colour, the bath consists of water by weight two hundred parts;

Campeachy-wood (logwood)	3.50
Gall-nuts	6.
Sulphate of iron	3.
Sulphate of copper	0.50.

For the production of certaldite of rose or pink colour or tinge:—In this case the bath is prepared by taking two hundred parts by weight of the bath described for the bath for white certaldite, and there is dissolved therein a small percentage of (say) from the one hundred to the two hundred parts of one per cent. by weight of rose of aniline or rose of naphthaline, varying the amount according to the shade desired.

The following composition is for the preparation of a bath for making ivory-coloured certaldite:—For the purpose of the white bath there is used by weight 200 parts of Brazil-wood, one part sulphuric acid, half part rose of aniline from 1,000th to 5,000th of one part.

For the production of red certaldite:—To this end there is used weight water 200 parts, alum 4 parts, oxalic acid half a part, Brazil-wood 6 parts, chloride of zinc 1 part (as a mordant), cream tartar 2/10.

For making pale yellow-coloured certaldite there are used two baths in which the gypsum is dipped alternately several times. The first consists of the white bath, by weight 200 parts, and of sulphate of copper six parts. After the gypsum has been dehydrated and dipped in this bath as hereinbefore described, it is dipped into a bath composed of the white bath by weight 200 parts with cyanide of potassium six parts, and thereafter again into the first bath, then again into the second bath, and so on, increasing the durations of dipping and drying intervals. For the making of certaldite having yellow spots on the back-ground or body of a general red tint:—To this end there is added to the bath described for red certaldite about half part by weight of sulphuric acid. This colour can only be obtained in the particular quality of gypsum containing impurities of baric nature, which tend to neutralize the sulphuric acid disposed in a certain patchy way.

For the preparation of the bath for the making of yellow certaldite:—In this case there is used two baths; the first is prepared by water by weight 200 parts, and sulphate of iron 6 parts; and the second of the white bath by weight 200 parts, and bichromate of potash 2 parts. The material is treated in each of these baths alternately, substantially in the manner hereinbefore described with reference to the pale yellow bath. After the dippings, the pieces are left to soak in the sulphide of iron bath. The following bath is

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for the making of yellow certaldite. In preparing it there is used of the white bath by weight 200 parts and logwood by weight 4 to 6 parts. For making green certaldite there is used, water 200 parts, alum 3 to 4 parts, logwood 2 to 3 parts, and sulphite of indigo 1 to 2 parts.

A bath for the making of dark green certaldite consists of water 200 parts, alum 2 parts, logwood, 4 parts, and sulphate of iron 2 to 3 parts. The use of sulphate of iron enables the proportion of alum to be reduced from that first described, since the sulphate of iron aids in hardening and also combines with the logwood to make colour.

A bath for making a lilac-coloured certaldite is composed of the white bath hereinbefore described 200 parts, campeachy-wood 8 parts, and to this is added a little carbonate of soda, as much as may be necessary to neutralize the excess of acid in the white bath. Other alkaline matter may be used for this purpose. The hardening is done by the white bath, and the campeachy-wood gives colour. It is important to neutralize the excess of acid in order to prevent the making of a reddish tint.

For the preparation of a bath for the making of a sky-blue certaldite, there is used of the white bath 200 parts, alum 6 parts (in all 10 parts of alum) cyanide of potassium from 1/15,000th to 1/30,000th.

For making dark blue certaldite there is used of the white bath 200 parts by weight aniline, blue 1 part, and sulphuric acid half part. The sulphuric acid acts as a solvent on the aniline. The blue which I prefer to use is in Europe distinguished by the letters BBB.

For making a certaldite of a light green colour there is used, water 200 parts, sulphate of copper 16 parts, ammonia 20 parts. The sulphate of copper takes the place of the alum for hardening, and a portion of it also unites with the ammonia so as to make the desired colouring matter.

For the preparation of a bath for the making of pale yellowish-white certaldite there is used, water 100 parts, sulphate of iron 1 part. This bath is used with the lighter-coloured gypsum, or in those gypsums wherein little or no change of colour is desired. In distinguishing the colours in all the foregoing cases, I mean the colours to be given to the main body, or sulphate of lime part of the gypsum.

The colours or tints of the impurities present in the gypsum will generally be of a dark shade, and will vary considerably with the kind of impurity and the effect thereon of the ingredients composing the bath.

I may add that for such purpose the drying or dehydrating temperature should be such (exactly or approximately as stated) as not merely to drive off water physically combined with the gypsum, but also all or a considerable percentage of the chemically combined water, to the end that the molecules of water so expelled may be replaced by water containing chemical salt, or salt and acid, rendering the product hard coloured and less soluble. Also the time during which the drying or dehydrating action (or partial dehydration) is carried should be such that the entire body, or a considerable portion of it (if it be large), shall be dehydrated (or partially dehydrated) throughout its substance.

It may also be stated that, in order to secure the replacement of the expelled water by a chemical salt or salt and acid to or approximately to the full depth to which the dehydrating operation has been carried as above stated, the solution containing the salt had best be only moderately strong, that is to say, about in the proportions above stated, since the tendency of a fully saturated solution is to deposit rapidly in the outer interstices of the gypsum, and so preventing the proper action to the full or desired depth. And as this work of depositing thus goes on somewhat slowly, the article or articles should be subjected to the action of the solution for about the time stated, and it may be effected at about atmospheric temperature.

When, as is often the case, the impurities present in the gypsum consist partly or wholly of carbonate of lime the use of acid as described is especially desirable, since the carbonate of lime is then decomposed, carbonic acid passing off as gas, and (if oxalic acid be used) the oxalate of lime is formed, which being insoluble further aids in securing a product having the desired qualities. Other acids will in like manner form the corresponding salts. Also, the gypsum sometimes contains a small percentage of hydro-carbons, and these when present are acted upon by the acid and darkened in colour by the colouring matter added.

It will be understood that, in place of immersing the slabs, blocks, or articles for the shorter periods, the solution for hardening may be brushed over them, or otherwise caused to impregnate them.

I claim as my invention,—

First—The method of preparing what I have hereinbefore termed and defined as “gypsum” in the natural or solid state (shaped or not), to convert it into an artificial stone or marble, or the like, consisting in first dehydrating it, or partially dehydrating it, and afterwards submitting it to the action of a bath consisting of a solution of salt or salts, or salt or salts with an acid or acids, substantially as hereinbefore described, whether colouring materials be used in the said bath or not.

Second—The method of preparing what I have hereinbefore termed and defined as “gypsum” in the natural or solid state (shaped or not), for the subsequent indurating process, consisting in dehydrating or partially dehydrating it by submitting it to the action of gradually increasing and then gradually decreasing temperatures, substantially as hereinbefore described.

Third—The method of indurating or hardening the dehydrated or partially dehydrated “gypsum” (being the material as hereinbefore defined), consisting in subjecting it in the natural or solid state (shaped or not) to the impregnating action of a solution or solutions of salt or salts, or salt or salts and acid or acids, by impregnations or immersions with the solution or solutions in a bath or baths of such solution or solutions, alternating with drying intervals, the durations of the impregnations or immersions and drying intervals increasing gradually to the final immersion, substantially as hereinbefore described, whether colouring materials be used in the bath or not.

Fourth—Producing artificial stone or marble from what has hereinbefore been called and defined as “gypsum” in natural or solid state (shaped or not), by first dehydrating or partially dehydrating the said “gypsum,” then submitting it to the indurating process (with or without

Improvements in the manufacture of artificial Stone and Marble.

without colouring it), then finishing the surface thereof, and finally treating the same with oil, wax, paraffine, or paraffine wax, or their equivalents, substantially as hereinbefore described.

Fifth—Separately and each distinctly, I claim the preparation and use of the various indurating baths to be used for producing white or coloured certaldite; the said baths being compounded and employed for obtaining the desired results, substantially as hereinbefore described.

In witness whereof, I the said Raphael Josia have hereunto set my hand and seal, this third day of August, one thousand eight hundred and eighty-two.

RAPHAEL JOSIA.

Signed and sealed in the presence of,—

PROF. ALESSO. BIAGI,
via Tornabuoni F., Firenze.
PROF. C. GARE VALMIRAN,
via Ricasoli F., Firenze.

This is the specification referred to in the annexed Letters of Registration granted to Raphael Josia, this eleventh day of December, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

Sydney, 30 October, 1882.

The application of Mr. Raphael Josia for Letters of Registration, for "Improvements in the manufacture of artificial Stone and Marble, and in colouring the same," 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.

The Under Secretary of Justice.

We have, &c.,
JAMES BARNET.
WILLIAM C. BENNETT.



A.D. 1882, 11th December. No. 1171.

IMPROVEMENTS IN BOTTLES FOR CONTAINING AERATED LIQUIDS, &c.

LETTERS OF REGISTRATION to Hiram Codd and Dan Rylands, for Improvements in Bottles for containing aerated liquids, and in the manufacture of such bottles.

[Registered on the 12th day of December, 1882, 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 HIRAM CODD, of 58, King William-street, in the city of London, England, and DAN RYLANDS, of Barnsley, in the county of York, 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 Bottles for containing aerated liquids, and in the manufacture of such Bottles," 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 Hiram Codd and Dan Rylands, 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 Hiram Codd and Dan Rylands, 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 Hiram Codd and Dan Rylands 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 eleventh day of December, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Bottles for containing aerated liquids, &c.

SPECIFICATION of HIRAM CODD, of 58, King William-street, in the city of London, England, and DAN RYLANDS, of Barnsley, in the county of York, England, for an invention entitled "Improvements in Bottles for containing aerated liquids, and in the manufacture of such bottles."

THIS invention relates to bottles which have internal stoppers, that are to be held up by the pressure of gas to the mouths of the bottles so as to close them, and has for its object to permit of such bottles being opened without the necessity of in any way touching the stoppers or of pressing them inwards into the bottles.

For this purpose we form through the side of the neck of the bottle a small hole, which we subsequently close by a small valve on the inside. The stem of the valve we make to project outwards through the hole, and to its outer end we affix a small head, by pressing upon which the valve may be pressed inwards a short distance.

The hole is formed through the neck just after the bottle has in the ordinary manner been blown in a mould and whilst it still remains hot, after being removed therefrom.

When the bottle has been removed from the mould a small punch is driven from the inside through the neck, just below where the head has subsequently to be formed around it. For bottles already made the hole may be drilled by a sand blast or otherwise.

The valve is preferably formed of a small disc, with on one side of it a stem projecting from its centre.

A small rivet-shaped disc or washer of elastic material, with a hole perforated through its centre, is threaded on to the stem. The stem is then passed through the hole in the neck of the bottle from the inside, and on to its outer end is screwed or otherwise secured the small head.

When the bottle is charged with aerated liquid the pressure within the bottle presses the valve against the inside of the neck, and keeps the hole closed.

When the bottle is to be opened the head of the valve may be pressed on, so as to open the valve and allow of the escape of gas from the interior of the bottle. The diminution of pressure thereby produced within the bottle quickly causes the stopper to drop away from the mouth of the bottle by reason of its own weight, and the contents can then be poured out.

In the drawings hereunto annexed we have shown as an example one form of internally stoppered bottle, fitted with a small valve in the neck for the purpose above described; but the necks of bottles fitted with other forms of internal stoppers may similarly be fitted with a small valve.

Figure 1 shows the neck of the bottle; it has an internal globular stopper of glass, which rests against a ring of vulcanized indiarubber held in a groove formed around the interior of the neck. Figures 2, 3, and 4, show to a scale of about half-size the apparatus we use to form the hole in the neck; figure 2 is a longitudinal section of the apparatus, and figure 3 is an end view.

A is a thick plate of metal which is to be fixed vertically to the back edge of the table or bench on to which the glass-blower's assistant places the bottles as they are removed from the mould; B is a hollow projection standing out from the plate A; C D are two levers carried by pins, which are passed through plates that project from the back of the plate A; E is a third lever, the pin or axis of which is carried by the same plates; upon it is a cam, E¹; one end of the cam (the end furthest from the plate A) acts against the upper lever C; the other end of the cam (the end nearest to the plate A) acts against the rear end of the lever D. The two levers C D are at their rear ends drawn together by a spring, F, and are so held against the cam E¹. The front end of the lever D carries a small punch, which rises up through a small hole in the top of the projection B; the front end of the lever C carries a plate to come down on the exterior of the neck, and it has a small hole formed vertically through it just above the punch carried by the other arm. When the bottle has been removed from the mould in which it was blown and the superfluous glass has been severed off from the end of the neck, the bottle is taken up by the workman with what is called a punty, by which he lays hold of the base of the bottle; holding the bottle in this way, he places the neck over the projection B of the punching apparatus. The lever E is then at once turned into the position shown by figure 4. In this way the punch E¹ is passed through the neck. Afterwards, when the bottle has been headed and annealed, a small valve, G, is fitted to the hole. The valve is composed of a small disc, with a wire stem projecting from it; over the wire is placed a conical piece of indiarubber or other elastic material; the wire stem is passed through the hole from inside the neck, and a disc or head is then riveted on or otherwise secured to the outer end of the stem.

Having thus described the nature of our invention and the manner of performing the same, we would have it understood that we claim—

1. The construction of bottles which are closed at the mouth by internal stoppers, with, in addition, a small valve at the side of the neck, substantially as described.
2. Forming the hole in the neck of the bottle by means of punching apparatus whilst the bottle is in a heated state as it comes from the mould, substantially as described.

In witness whereof, we, the said Hiram Codd and Dan Rylands, have hereunto set our hands and seals, this 28th day of August, 1882.

HIRAM CODD.
DAN RYLANDS.

This is the specification referred to in the annexed Letters of Registration granted to Hiram Codd and Dan Rylands, this eleventh day of December, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Improvements in Bottles for containing aerated liquids, &c.

REPORT.

Sir,

Sydney, 31 October, 1882.

We do ourselves the honor to return you the documents transmitted to us under your blank cover communication No. 82/12,222, which have reference to Messrs. Hiram Codd and Dan Rylands' application for Letters of Registration for "Improvements in Bottles for containing aerated liquids, and in the manufacture of such bottles," and to report that we see no objection to the issue of Letters of Registration as prayed for, in accordance with the specification and drawings accompanying the same.

We have, &c.,

CHARLES WATT.
A. LEIBIUS.

The Under Secretary of Justice.

[Drawings--one sheet.]

Fig: 1.

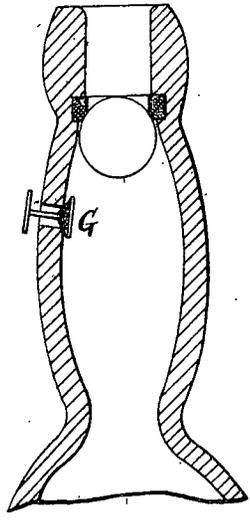


Fig: 2.

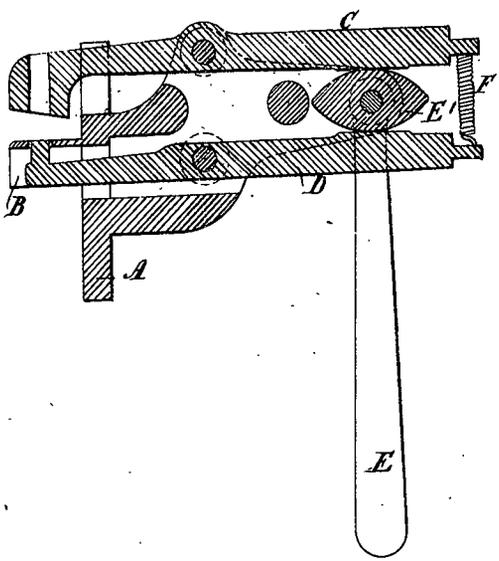


Fig: 3.

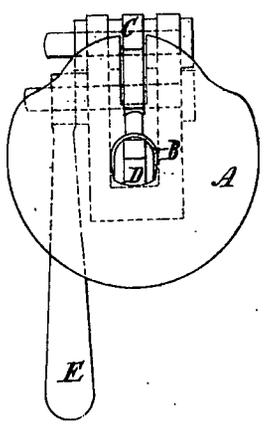
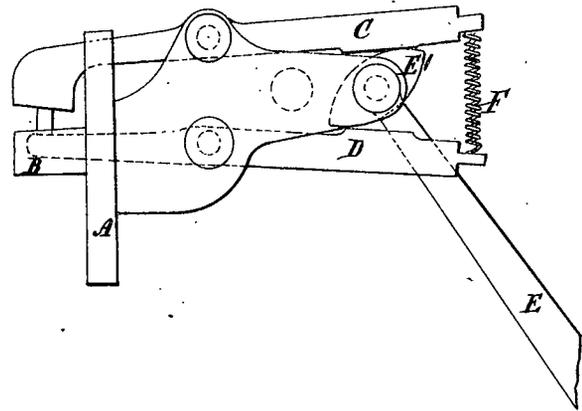


Fig: 4.



This is the Sheet of Drawings referred to in the annexed Letters of Registration granted to Hiram Codd; and Dan Rylands, this eleventh day of December A. D. 1882.

Augustus Loftus.

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



A.D. 1882, 13th December. No. 1172.

**IMPROVEMENTS IN MACHINES FOR CRUSHING, GRINDING, AND PULVERIZING
ORE, GRAIN, &c.**

LETTERS OF REGISTRATION to Robert McCully, for Improvements in
Machines for crushing, grinding, pulverizing, or similarly treating Ore, Grain,
and other materials.

[Registered on the 14th day of December, 1882, 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 McCULLY, of Philadelphia, Pennsylvania, one of 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
Machines for crushing, grinding, pulverizing, or similarly treating Ore, Grain, and other materials,"
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 informa-
tion, 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 McCully, 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 McCully, 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 McCully 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-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Machines for crushing, grinding, and pulverizing Ore, Grain, &c.

SPECIFICATION of ROBERT McCULLY, of Philadelphia, Pennsylvania, one of the United States of America, for an invention entitled "Improvements in Machines for crushing, grinding, pulverizing, or similarly treating Ore, Grain, and other materials."

My invention has relation to mills or mechanism for crushing and granulating ore, and for pulverizing or finishing such material, and grinding grain and other substances, and has for its object to provide an ore-crusher or pulverizer of extreme durability and great effectiveness, and so constructed that it will crush and pulverize an increased quantity of ore in a given time, with less expenditure of power than can be accomplished with such class of machines as heretofore constructed.

The first part of my invention accordingly consists in the novel construction, combination, and arrangement of parts, having reference particularly to the following points:—First—To the provision of a jaw or jaws adapted and designed to reciprocate longitudinally, such movable jaw or jaws moving upon friction rollers, suitably arranged upon the frame of the machine. Second—To the provision of a jaw or jaws having a simultaneous longitudinal and transverse reciprocating movement. Third—To the provision of means for imparting to the jaw or jaws a simultaneous longitudinal and transverse reciprocating motion. Fourth—To certain details of construction, hereinafter more particularly and fully set forth.

Figure 1 is a transverse vertical section of a crushing and pulverizing machine, embodying my improvements. Figure 2 is a plan thereof, partly sectional. Figure 3 is a detail plan of same. Figure 4 is a plan of part of the frame and one of the jaw-holders, with interposed cam-rollers, for imparting a transverse movement to said holder, or the crushing or operating jaw. Figure 5 is a like view of the same, showing said rollers, provided with arms, connected to a bar common to all said arms. Figure 6 is a similar view, showing the bar connected to eccentric mechanism on the driving-shaft. Figure 7 is a vertical section of the rollers and frame shown in figure 6. Figure 8 is a plan of toggle mechanism for effecting the transverse movement of the jaws. Figure 9 is a like view of such toggle mechanism, provided with anti-friction roller bearings. Figure 10 is a side elevation of a slight modification in construction of my improved crusher and pulverizer. Figure 11 is a plan of my improved mill, wherein one of the jaws is stationary. Figure 12 is a transverse vertical section, on the line *x x*, figure 2. Figure 13 is a plan partly in section of a modification in construction of my improvements. Figure 14 is an enlarged detail elevation of the same, partly in section. Figures 15 and 16 are diagrams illustrating the preferable mode of setting the crushing and pulverizing jaws, to obtain the best working results. Figure 17 is a plan of a modification of the crushing mill shown in figure 2, and wherein the rollers *G G*¹ and the jaws *D D*¹ are arranged to have a longitudinal movement only. Figure 18 is a side elevation of one end of a jaw, partly sectional, provided with steel bearing-plates, and divided in such manner that the main body of the jaw may be removed from the machine without disturbing the power or driving-shaft and its bearings. Figure 19 is a plan, partly sectional, showing the sleeves on the cams secured to the driving-shaft. Figure 20 is a broken plan, showing the application of the worm and screw to the jaws, for adjusting the same, to take up the wear thereof, or vary the fineness of the crushing or grinding. Figure 21 is a plan, partly sectional, of the pulverizer or finisher. Figure 22 is a side elevation of same. Figure 23 is a detail longitudinal section of shaft-bearing. Figure 24 is a detail plan of same. Figure 25 is a transverse vertical section, partly in elevation, of the pulverizer or finisher. Figure 26 is a detail plan of friction-rollers and frame therefor. Figure 27 represents an end view of one of the finishing discs, and the automatic feed mechanism therefor, the latter being in section. Figure 28 is a broken elevation of same. Figure 29 is a broken perspective of same. Figure 30 is a plan of modification of rollers and frame therefor. Figure 31 is a detail section of a modification of bearing for friction roller-frame. Figure 32 is an elevation, partly sectional, of a grain or similar mill, embodying my improvements, arranged to have the upper and lower stones revolve. Figure 33 is a like view, with a fixed upper or bed stone and a lower running stone; and figure 34 is a similar view of same, showing the runner, or its shaft, out of line with the centre of the bed-stone.

Referring to figures 1, 2, 3, and 12 of the accompanying drawing, *A A*¹ represent the housings or frames of my improved crusher and pulverizer, having feet, *a a*, through which pass screws or bolts, *a*¹ *a*¹, by means of which said housings or frames are rigidly secured to suitable foundations, or otherwise, as desired. Said frames are connected together by transverse bolts, *a*² *a*², which pass through tubes or nuts, *a*³ *a*³, inside of or between the lugs on the frames, for the purpose of adjustment of the frames; the latter have inclining sides, *a*³ *a*³, as shown. They are also formed with bearings, *a*⁴ *a*⁴, for the cam or eccentric shaft *B*, and with dovetail slots, *a*⁵ *a*⁵, into which pass and have movement therein the frames *C C*¹. The latter form bearings for rods or shafts, *b*, upon which are mounted the friction rollers *b*¹ *b*¹. *D D*¹ represent the crushing or working jaws, secured by screws or keys *d*¹¹ *d*¹¹, in supports or holders *E E*¹. The latter are formed with longitudinal slots *e e*, through which pass the friction rollers *b*¹ *b*¹, so that said supports will rest and partially move on said rollers. *e*¹ *e*¹ are slots elongated vertically, and formed in one of the ends of said supports, and through which pass the cams or eccentrics *B*¹ *B*¹ formed on shaft *B*, whereby, when the latter is rotated, the jaws *D D*¹ are reciprocated longitudinally; the jaws *D D*¹ are formed with corrugated faces *d* *d*, and straight, smooth, and partially corrugated faces, *d*¹ *d*¹, or the latter faces may be smooth and flat throughout their entire surface, the faces *d* *d* being the crushing faces, and *d*¹ *d*¹ the pulverizing faces. The form of the faces *d* *d* provides for a hopper, *F*, as shown, and if desired an extended hopper may be attached thereto.

Between the inclined sides *a*³ *a*³ of the frames and jaw-holders or supporters *E E*¹ are placed anti-friction rollers, *G G*¹. The rollers *G* are sustained in a frame, and roll during the movement of the jaws against the adjacent surfaces of the incline *a*³ and of jaw-holder *E*. The rollers *G*¹ rest against the surface of jaw-holder *E*¹, and upon a series of double inclining plates *H*, secured to the frame *A*¹ as shown. The object whereof is as follows:—As the jaw *D*¹ is reciprocated longitudinally, the rollers *G*¹ move up and down the inclines *H*, and thereby cause said jaws to be reciprocated transversely, or to and from the jaw *D*. This transverse movement of jaw *D*¹ allows said jaws to separate slightly, so that the ore will gradually drop or fall between the working faces, and after being finely pulverized will fall out from between the jaws, thereby expediting the feeding or the movement of the ore through the machine. It is designed that the jaw *D*¹ will be so constructed or provided with mechanism that the tendency of the same will be to

Improvements in Machines for crushing, grinding, and pulverizing Ore, Grain, &c.

to keep said jaw away or out of contact with jaw D, or hold said jaw D¹ in close impingement upon its rollers G¹. For this purpose a spring, *h*, is secured to the housing in any suitable manner. I is a bracket secured to a jaw-holder E¹, and is formed with a bifurcated end, *i*, embracing spring *h*, and is provided with a roller, *i*¹, so arranged as to bear against said spring *h*, as shown in figs. 1 and 2. The result whereof is that the elastic force of spring *h* is exerted against roller *i*¹ to cause jaw D¹ to hug its rollers G¹, and keep it out of contact with jaw D. Such contact of the jaws will be effected only under the influence of the rollers moving up the inclines H. To take up the wear of the jaws, I provide the following means:—The frames, C C¹ are formed with lugs, *c*, having threaded openings, *c*¹, for the reception of adjusting-screws, *c*², suitably secured to transverse bars, *c*³, bolted at *c*⁴ to the housings. If desired, said screws may be provided with handles or winches, *c*⁵. On turning the latter, the screws *c*² operate in lugs *c* to raise or lower the frames C C¹, and with them the jaw-holders E E¹. If lowered, the inclining sides of the housings cause the jaws to come together, and thus the wear of the same is compensated for.

In figures 4, 5, 6, and 7 I have shown modifications of mechanism for effecting the transverse reciprocation of the jaw or jaws, wherein the inclines H are dispensed with, and the peripheries of the friction rollers G¹ are partially formed with sides or arcs of larger circles, as shown at *g g*, which meet and form in apex *g*¹, as shown in figures 4 and 5. In figure 4 such rollers are represented as being supported in a frame, and each roller moving independently. In figure 5 said rollers are each provided with a rigid arm, *g*², which connects with a bar, G², common to all said arms. Such connection of the rollers causes all of them to move simultaneously in whatever direction they are desired to travel. In figure 6 the rollers have part of their peripheries formed with a surface of larger diameter, as shown at *g*³, and the bar G² is connected to an eccentric, *g*⁴, on driving shaft B so that said rollers will be positively actuated during each reciprocation of the jaws. In figures 8 and 9 I have shown toggle levers K K, which may be substituted for the anti-friction rollers just described, to effect said transverse reciprocation of the jaws.

In figure 9 the levers K are shown provided with anti-friction roller bearings *k k*.

The above-described forms of roller mechanism and their modifications all accomplish the same result, viz., the lateral movement of the jaws. Such movement may be increased or diminished so as to obtain a quick or slow feed as desired.

For instance, the length of the inclines H may be such that the rollers will pass up and down the same twice during each full longitudinal reciprocation of the jaws; hence the latter will laterally recede or open from each other, and approach or close together twice during each such longitudinal reciprocation. The result whereof is that the ore pulverized in the mill falls out thereof during such opening of the jaws; and when the jaws open laterally twice during each longitudinal movement of the same, a quick feed is obtained. Such number of openings and closings of the jaws is produced when the modifications shown in figures 7 to 9 are employed, with like results, viz., a quick feed. But if the inclines H be made of such length, that the roller will during each full longitudinal movement of the jaws travel only from the base to the apex, and then back again, then only one opening and closing of the jaws takes place, and in this case a slower feed is provided for.

The reciprocation of the jaws in different directions simultaneously, results in an angular pressure falling upon the ore to be crushed. Consequently, such ore is more readily crushed and pulverized, and with less wear and tear of the working faces of the jaws.

In figure 10 I have shown a slight modification of construction of my invention, wherein the eccentric shaft B is supported in bearings *b*²¹, separate from the housings A A¹, and is connected to the jaw-holders E E¹ by a connecting rod or link B². The friction rollers *b*², instead of passing through slots in the jaw-holders, as shown in figure 1 herein, pass above and below said holders, as illustrated. Such construction permits of a solid jaw-holder throughout its entire length, there being no slots whatever formed therein.

In figure 11 I have shown a still further modification, wherein one of the housings A is so formed that it serves the double purpose of a housing for the mill, and as a jaw-holder, the jaw D being secured directly thereto, as shown, and the rollers G G are dispensed with. Said housing being in other respects constructed substantially as above described, the jaw D¹ only reciprocating. In such construction, only one eccentric on shaft B is used, and only one set of anti-friction rollers G or toggles K employed.

Such construction I deem the most preferable one where cheapness of manufacturing is desirable.

In figures 1 and 2 I have shown the spring *h* and bracket I secured to housing A¹ and jaw-holder E¹ respectively, for effecting a separation of the jaws; but such result may be accomplished by means shown in figures 13 and 14, wherein the jaws E E¹ have their ends *f* formed in vertical lines, as shown. The rollers *b*¹ on shafts *b* extend thereon only a slight distance beyond said vertical sides of the jaw-holders. The middle parts *b*⁵ of said shafts or rods not rotating, and on which are placed in any suitable manner loose collars *b*⁶ between which, and surrounding said rods or shafts is a spiral spring, L. Between the collars *b*⁶ and the jaw-holders, are placed friction rollers *l*, sustained in frames *l*¹; said frames and rollers are held in position by means of lugs *m* cast on said jaw-holders, and upon which said frames *l*¹ rest and move. The rollers *l* are held in close impingement with jaw-holders by the elastic force of springs L, thereby tending to keep said jaws apart. When said jaws are reciprocated, the movement of the roller *l* lessens the friction of such reciprocation. In all other respects the construction is substantially as heretofore described.

In setting the jaws for working, I deem it a preferable plan to so arrange them that, when their straight or vertical surfaces are pulverizing the ore, they will be taking their feed on their upper surfaces, and when crushing between these parts, the ore previously pulverized will then be effecting its exit from between the straight surfaces of the jaws. Such arrangement is shown in figures 15 and 16. In the former, the jaws are represented as having completed one-half of their longitudinal reciprocation, the rollers G¹ being at the apex of the inclines H, consequently said jaws have also been moved transversely to close together. In such position their corrugations register with each other, as shown, and they then take their feed. During such movement there has been only a slight crushing action performed by the upper surfaces of the jaws, but their straight or lower surfaces have more or less completely pulverized any ore that may have been in position between them.

When the jaws have completed their return longitudinal reciprocation, the rollers G¹ are then at the

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the bases of the inclines H, consequently the jaws have also moved transversely to open from each other, and in such position their corrugations do not coincide with each other, as shown in figure 16.

During such movement, their upper surfaces are then crushing the ore placed or fed between them, while ore previously pulverized by their straight, lower surfaces finds its exit therefrom, and the more or less finely divided ore above then finds its way down to the said straight portions of the jaws, to be pulverized during the succeeding movements of the jaws, as above described. Such arrangement and operation of the jaws as I have stated I consider the most available to effect the best working results, but they may be varied as desired. In case it is designed to use the mill for crushing purposes only, the jaws are set the desired distances apart by manipulating the cranks c^5 .

It will be noticed that the slots in the frames E E' fit the rollers b^1 , but the shafts upon which the rollers are placed have their bearings in the frames C C', as shown in figure 12. Hence, when adjustment is made to take up the wear of the jaws, the screws a^1 of frame are loosened, thereby permitting the frames C C' to descend, and push frame A' further from frame A. The more the frame A' so moves, the greater will be the descent of the frames C C'. As the latter so move, the jaws automatically come together by reason of their resting upon the inclined rollers G G'. But I do not limit myself to said described means or manner of effecting such adjustment. The frames A A' may if desired be permanently fixed in position, and the jaw-holders be provided with the worm and gear mechanism N, as shown in figure 20, so that by turning the handle or crank M' the jaws are adjusted to and from each other as desired.

In figure 17 I have shown the rollers G G' interposed between the frames A A' and the jaw-holders. The inclines H H are dispensed with, and the rollers G G' are made cylindrical; in such case the jaws D D' have only a longitudinal movement. In figure 20 I have shown the ends d^3 of the jaw-holders, provided with removable face plates, d^4 . Such plates are attached to wedges or keys, d^5 , and the latter are placed in slots, d^6 , in said jaw-holders, as illustrated, so that as the face of the jaws wear away more rapidly than the face plates d^4 , the latter are removed from the jaw-holders and replaced by new or thinner face plates, to permit of the necessary adjustment or bringing together of the jaws.

In figure 18 the jaw-holders are represented as composed of two parts, or divided on the lines $y y$, such parts being secured together by bolts or screws, d^{15} . Such construction permits of the removal of the jaw-holders from the machine without disturbing the driving or operating shaft and its bearings. The opening e^1 in said holders is represented as being lined with steel bearing plates E', and the cams B' B' have steel sleeves B' thereon, to prevent undue wear or too rapid deterioration of such parts.

The second part of my invention has relation to that class of grinding mills in which the grinding discs are mounted upon separate and unaligning shafts in such manner that a portion of one grinding disc overlaps a part of the other disc, said discs being so arranged that they are closed, or nearly so, from their centres towards the peripheries of their lower parts, and opened from their centres towards their top edges to receive the feed.

Heretofore such mills have been so constructed as to have the grinding discs pressed or caused to come together by means of appliances which exerted a pressure in the line of or on the shafts upon which said discs were mounted.

Such construction not only results in a waste of power, owing to the undue friction produced by the lateral straining of the driving shafts and pedestals, and the positive friction caused by the pressure of the step bearing against the ends of the said shafts, but is also open to the disadvantage that the pressure intended to be exerted upon the grinding discs is not directly applied to that part of the discs which effect the grinding.

My invention has for its object to avoid such disadvantages, by so constructing the mill that the mill or driving shafts are perfectly free of lateral strain and end pressure, and the grinding discs are provided with appliances for exerting or supporting any desired pressure required upon the parts of the discs between which the grinding operation takes place. To this end my invention consists in the novel construction, combination, and arrangement of parts, having especial reference to the provision of two movable frames located back of the grinding discs. Between said discs and frames are placed friction rollers, said frames forming bearings for the driving shafts, and are provided with mechanism for adjusting the frames towards the grinding discs to exert any desired pressure upon them, to take up the wear of their grinding surfaces, and also to vary the grade of grinding of the discs.

Referring to figures 21-31 inclusive of the accompanying drawing, A represents the main frame of the machine, B and B' the grinding discs mounted on separate shafts C and C' respectively, which are out of line with one another, as shown, so that the discs overlap each other about one-half of their grinding surfaces $b b$. The latter are made separate from said discs, but secured thereto by screw bolts b^1 . The rear side b^2 of each disc is formed with a peripheral flange, b^3 , and an annular projecting ring, b^4 , the face of which is inclined as shown.

D and D' are frames, having grooved ends d adapted to rest upon and slide on the tongue bars or blocks E and E', secured to the frame of the mill. Said grooves and tongues may if desired be formed, as shown in figure 5, so as to interlock with each other, to permit the frames D and D' to serve as connecting bars for bracing the frame A at its centre.

The frames D and D' have annular flanges d^1 on their front faces, also annular rings d^2 , the faces of which have an inclination corresponding to that of rings b^4 of the discs. Said frames are provided with bearings d^3 for the forward ends of the shafts C and C'. The rings b^4 d^2 forms seats or ways for the friction rollers $f f$ in annular frames F F', which have central openings f^1 , and are mounted upon the hubs d^4 of the discs and of the frames, as shown in figure 21. G G' represent nuts having threaded openings $g g$. Said nuts are rigidly secured to the frames D D' by screws or bolts g^1 . Into said nuts pass the rods H H' threaded at $h h$.

The end h^1 of rod H' is seated upon a block secured to a brace M', and is provided with a retaining collar, h^2 , and an angular collar, h^3 , to which a wrench is applied for turning rod H' to adjust frame D' to and from disc B'.

The screw rod H also has an angular collar or end, h^3 , for like purposes; said rod is shown as passing through brace M in order that a spring, L, may be placed thereon between brace M and nut h^4 to afford a spring support for said rod H.

If desired, said spring may be dispensed with, or both screw rods H H' may be provided with a spring,

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N N represent collars secured to shafts C and C', immediately to the rear of frames D and D', as shown in figure 21. Said collars hold the discs B and B' back against the friction rollers *ff*, so that the grinding surfaces of the discs will be under full control of screw rods H H', and all irregular movement of the grinding discs to and from each other is avoided.

The rear ends of shafts C C' have their bearings O O secured to frame A, and P P are driving pulleys for said shafts.

It will be noticed that the screw rods H H' are in line with each other, and with the overlapping portions of the grinding discs, and the latter are supported on each side of the shafts by the frames D D', hence, as the screw rods H H' are turned to cause the frames to move towards each other, a pressure is exerted upon the grinding discs which is equally distributed over the entire area of said discs. The extent of such pressure may be varied by increasing or diminishing the adjustment of the screw rods H H'.

The discs B B' being supported on each side of their respective shafts, and rolling on the friction rollers *ff*, all lateral strain on shafts C C' is avoided.

The provision of frames D D' and screw rods H H' dispenses with the necessity of end pressure on said shafts; hence power applied to the latter exerts almost its entire force upon the grinding, and a large portion of such power is not therefore used up or wasted in overcoming the friction of the lateral strain and end pressure of the driving shafts, as has heretofore been the case.

To adjust the discs in relation to each other, so that the bottom of their overlapped parts shall be but slightly separated from each other, while their upper parts are divergent for the introduction of a hopper or the feed, I provide the following instrumentalities, which may or may not be employed, their use depending upon the nature, amount, and size of the material to be ground.

If desired, the mill may be so constructed that the discs have a movement to and from each other only, or they may have a lateral and vertical movement in addition thereto.

In the latter case the shafts C C' and frames D D' are secured in or placed upon the secondary frames A' A', pivoted to a main frame A. The frames A' have slotted ends, *a*², for the passage of set screws, *a*³; when the latter are loosened the frames A' may be raised or lowered to skew the shafts C C' from a horizontal plane, causing the lower parts of the discs to come together, while their upper parts recede from each other.

To provide for a lateral adjustment of the discs and shafts, the tongued blocks E' are slotted at *e* *e* for passage of screws *e*¹, and are centrally pivoted at *e*² to frame A'. The pillow blocks O are constructed, as shown in figures 23 and 24, so that when the set screws *o* are loosened said blocks have liberty of lateral movement on the plate *o*², secured by bolts *o*³ to frames A'.

When the screws *o* are loosened the frames D D' and shafts may be moved laterally; the blocks E and O turn upon their pivotal connections to adjust themselves to the movements of said frames and shafts, whereupon the set screws O are tightened up to hold the pillow blocks in a fixed position to maintain such lateral adjustment.

If desired, the friction roller sustaining frames F may be dispensed with, and the rollers held in place between the discs and frames by means of bearings formed integrally with the discs or with the frames.

So, too, instead of employing a wrench or similar implement to effect adjustment of rods H H', they may be provided with worm and gear mechanism for accomplishing such result.

In figures 27, 28, and 29 I have shown an automatic feed mechanism for the discs B B', wherein the valve Q has a comb-like lower edge *q*, and is secured to shaft *q*¹, so as to be raised or lowered by means of the set screw *q*² working in a slot. The shaft *q*¹ is connected to shaft *p* by means of adjustable slotted arms *p*¹ *p*² and set screw *p*³. The shaft *p* has its bearings in a bracket, P, secured to the frame of the machine, and is provided with a double-pointed tripper, R. Upon the disc B is located a cam, *r*, in line with tripper R, so that as the disc B revolves, the cam *r* strikes and alternately raises each end of said tripper, thereby oscillating shaft *p*, which in turn correspondingly moves shaft *q*¹, and vibrates valve Q. As the latter moves, a certain portion of the feed passes through the openings between the teeth, and is conducted by the hopper tube to the grinding discs. By raising or lowering the valve Q, and adjusting the connection of the shafts *p* *q*¹ any desired variation of the feed may be obtained.

If desired, the rollers *ff* may be arranged as shown in figure 30, that is, be in contact with one another, and be without journals on their ends, as illustrated.

So, too, the frames F F' may have a roller bearing, as shown in figure 31, in which case the weight of said frame and rollers falls wholly upon the sliding frames D D', thereby relieving the shafts C C' of strain resulting therefrom.

In figures 32, 33, and 34 I have shown the application of the second part of my invention to grist, grain, or other mills, wherein the stones or discs S S' may be burr stones, iron plates, or of any other desirable material.

In figure 32 both the upper and lower stones are designed and adapted to rotate, in which case the sliding frames D D' and rollers *ff* are provided for each such stone. The frame D is adjusted by means of the screw *s*, and the spring seat *t* therefore permits the lower stone to yield to and from the upper stone. The latter is raised or lowered by means of the gear and worm mechanism *t*, but any other suitable device therefor may be employed.

In figure 33 the upper or bed stone S is shown as being fixed in position, and its screw feed operated by the shaft.

In figure 34 the burr or other stones are placed slightly out of axial line with each other, the upper stone S being fixed, and is so represented, but I prefer to arrange it so that it will revolve. Hence it may be provided with appurtenances, shown for the upper disc or stone S. In figure 32 said disc has a screw feed U, operated by gear mechanism V, or the belt pulley may be applied directly to screw shaft, as shown in figure 33.

CLAIMS.

First—In an organized machine for crushing and pulverizing ore, a jaw or jaws adapted and designed to be simultaneously reciprocated longitudinally and transversely, substantially as set forth.

Second—In an organized machine for crushing and pulverizing ore, a jaw or jaws, and mechanism for moving said jaw or jaw simultaneously in two different directions, substantially as shown and described.

Third—

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- Third—In an ore crusher and pulverizer, the combination with jaws having vertical upper corrugated working faces of mechanism, substantially as described, for imparting to one or both of said jaws a simultaneous longitudinal and transverse movement, as set forth.
- Fourth—In an ore crusher and pulverizer, the combination of the following elements, viz., a jaw or jaws, mechanism for imparting to one or both of said jaws a simultaneous longitudinal and transverse movement, and means for taking up the wear of said jaws, substantially as shown and described.
- Fifth—In an ore crusher and pulverizer, a fixed jaw and a movable jaw in combination with mechanism for imparting to said movable jaw a simultaneous movement in two different directions, substantially as specified.
- Sixth—In an ore-crusher and pulverizer, a housing or frame adapted for use as a jaw-holder to form a fixed jaw support, and in combination therewith a jaw and mechanism for imparting to said jaw a simultaneous reciprocating movement in two different directions, substantially as shown and described.
- Seventh—In an ore-crusher and pulverizer, the combination with jaws thereof of means for reciprocating the same in one direction, a spring or springs for holding said jaws apart, and means for reciprocating them laterally, substantially as specified.
- Eighth—In an ore-crusher and pulverizer, the combination with the jaws thereof of means for holding the same out of contact with each other, means for reciprocating one or both simultaneously in different directions, and means for taking up the wear of said jaws, substantially as shown and described.
- Ninth—In an ore-crusher and pulverizer, the combination of a fixed jaw and a movable jaw, with means for reciprocating the latter longitudinally and transversely, substantially as set forth.
- Tenth—In an ore-crusher and pulverizer, the combination with a fixed jaw of a jaw designed and adapted to move to and from said fixed jaw, and to reciprocate across the face of the same, substantially as set forth.
- Eleventh—In a machine for crushing or pulverizing ores and other materials, the combination with a jaw or jaws adapted and designed to reciprocate longitudinally only, of friction rollers between said jaw or jaws and the frame of the machine.
- Twelfth—In a crusher or pulverizer, the combination of a longitudinally reciprocating jaw or jaws, friction rollers between said jaw or jaws, and the frame of the machine, and mechanism for adjusting the jaws to and from each other.
- Thirteenth—The combination of grinding discs $B B^1$, mounted on unaligning shafts $C C^1$, the frames $D D^1$, and interposed friction rollers between said discs and frames, substantially as shown (figure 21) and described.
- Fourteenth—In a grinding mill, the combination of two discs or plates mounted on separate and unaligning shafts, a frame or carriage, back of each disc having a bearing for one of said shafts, and friction rollers interposed between said frames and discs, substantially as shown and described.
- Fifteenth—In a grinding mill, the combination of two plates or discs mounted on unaligning shafts, and provided with mechanism, substantially as shown and described, for moving said discs and shafts vertically and laterally, as set forth.
- Sixteenth—The combination of a frame A , provided with blocks $E E^1$, the frames $D D^1$ having bearings $d^3 d^3$, the shafts $C C^1$ out of line with each other, the bearings O , discs $B B^1$, and friction rollers $f f$, substantially as shown (figure 21) and described.
- Seventeenth—The combination of discs $B B^1$, shafts $C C^1$, frames $D D^1$, having bearings, $d^3 d^3$, and mechanism for moving said frames towards said discs, the latter bearing upon friction rollers interposed between the discs and frames, substantially as shown (figure 21) and described.
- Eighteenth—The combination of discs $B B^1$, shafts $C C^1$, friction rollers $f f$, frames $D D^1$, having bearings d^3 , and mechanism, interposed between said frames $D D^1$, and the mill frame for adjusting the frames $D D^1$ to and from the grinding discs, substantially as shown (figure 21) and described.
- Nineteenth—The combination of discs $B B^1$, shafts $C C^1$, friction rollers $f f$, the frames $D D^1$, having bearings $d^3 d^3$, and collars $N N$, substantially as shown (figure 21) and described.
- Twentieth—The combination of frame A , secondary frames $A^1 A^1$, designed and adapted to be moved vertically, the shafts $C C^1$, having bearings $O O$, the frames $D D^1$ having bearings d^3 , and adjusting mechanism $H H^1$, friction rollers $f f$, and discs $B B^1$, substantially as shown (figures 21, 22) and described.
- Twenty-first—In a grinding mill, composed of two grinding discs or plates mounted on unaligning shafts, the combination therewith of friction rollers $f f$, frames $D D^1$ adapted to slide upon blocks $E E^1$, substantially as shown (figure 21) and described.
- Twenty-second—In a grinding mill, the combination with discs $B B^1$ and shafts $C C^1$, the frames $D D^1$ having bearings $d^3 d^3$ and slotted ends d , interlocking with blocks $E E^1$, secured to the frame of the mill, substantially as shown (figure 21) and described.
- Twenty-third—The frame D , having slotted ends $d d$, bearing d^3 , and screw-nut G , substantially as and for the purpose set forth with reference to figure 21.
- Twenty-fourth—The disc B , having flange b^3 , ring b^4 , with inclined face, substantially as shown (figure 21) and described.
- Twenty-fifth—The combination of discs $B B^1$, the shafts $C C^1$, frames $D D^1$, friction rollers $f f$, and screw rods $H H^1$, substantially as shown (figure 21) and described.
- Twenty-sixth—The combination of discs $B B^1$, shafts $C C^1$, friction rollers $f f$, frames $D D^1$, bearings O , movable upon plates a^2 , provided with screws a , the adjustable blocks E^1 , substantially as shown (figures 21, 23) and described.
- Twenty-seventh—In a grinding mill, the combination of grinding discs, friction rollers, supporting frames therefor, and mechanism for adjusting said frames to and from said discs, substantially as shown and described.
- Twenty-eighth—

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Twenty-eighth—In a grinding or pulverizing mill, the combination, with the grinding or pulverizing surfaces, an adjustable frame or frames therefor, with interposed rollers between said frame and surfaces, as set forth,

Twenty-ninth—In combination with grinding discs or plates arranged vertically or horizontally, of adjustable frames therefor, and interposed friction rollers, and an adjustable feed mechanism; substantially as shown and described.

Thirtieth—The combination with grinding discs or plates, arranged vertically or horizontally, the axis of which may or may not align with each other, of adjustable frames and anti-friction rollers between said plates and frames, and a centrally located force or screw feed, substantially as shown and described.

In witness whereof, I the said Robert McCully have hereto set my hand and seal, this fifth day of October, 1882.

ROBERT McCULLY,
(By his Agent, EDWD. WATERS).

Witness—

W. S. BAYSTON,
Law Clerk, Melbourne.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to Robert McCully, this thirteenth day of December, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

The application of Mr. Robert McCully for Letters of Registration for "Improvements in Machines for crushing, grinding, pulverizing, or similarly treating Ore, Grain, and other materials, having been referred to us, we have examined the plans and 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, 30 October, 1882.
We have, &c.,
JAMES BARNET.
WILLIAM C. BENNETT.

The Under Secretary of Justice.

[Drawings—four sheets.]

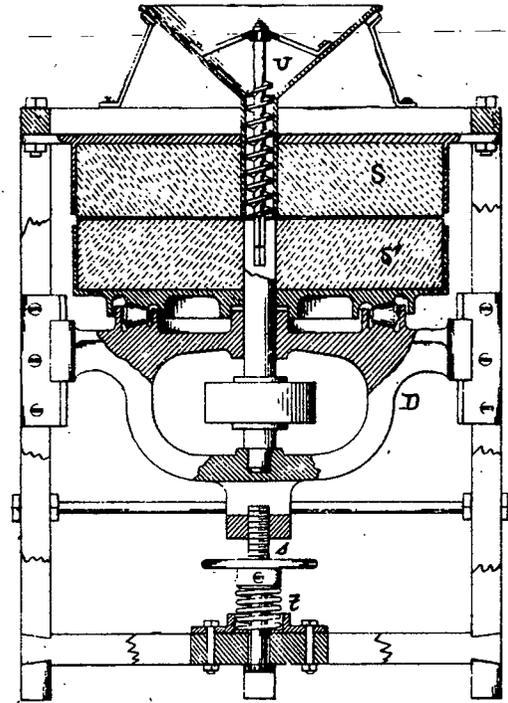


Fig. 33

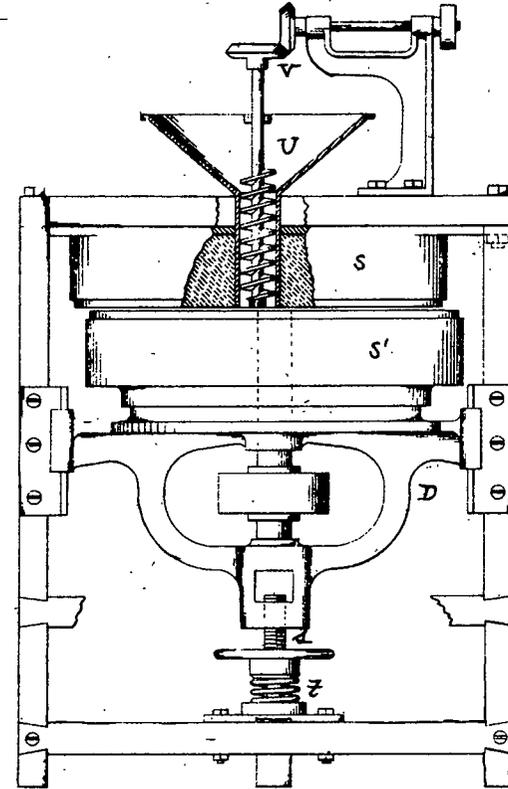
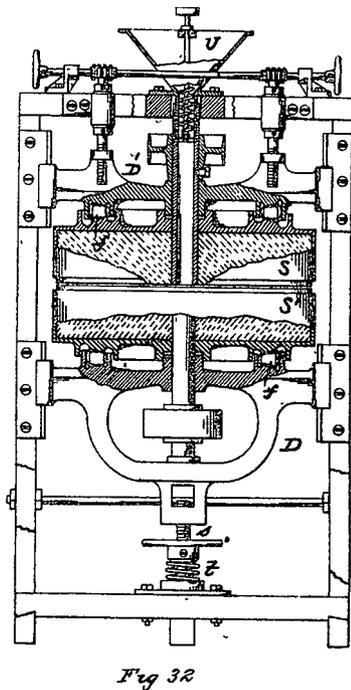
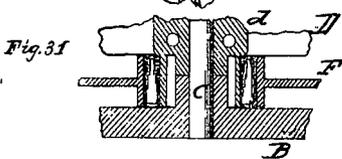
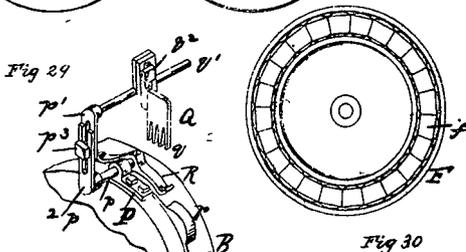
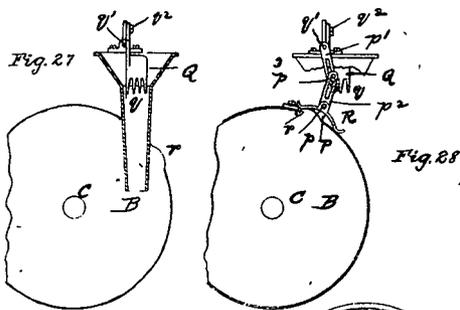
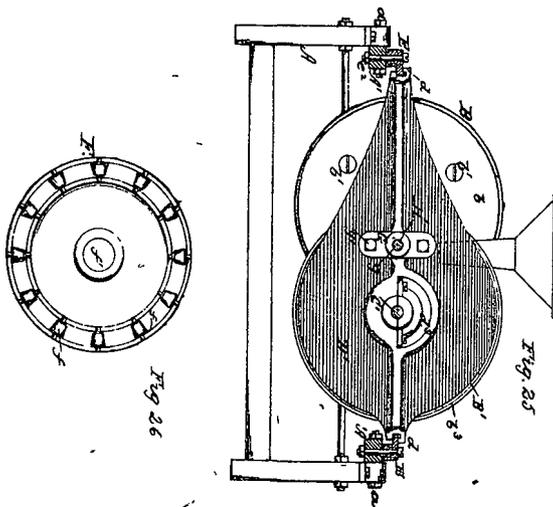


Fig. 34

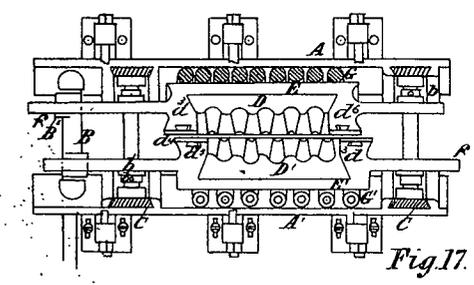
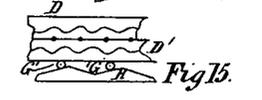
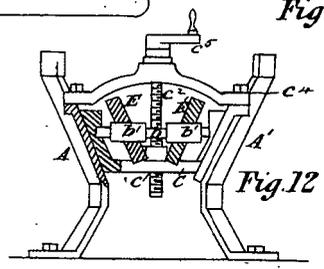
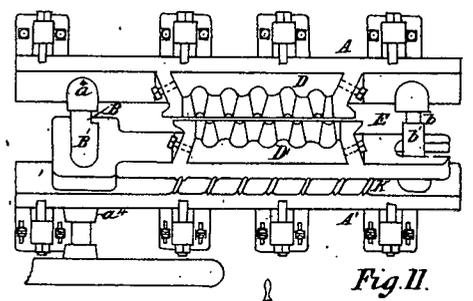
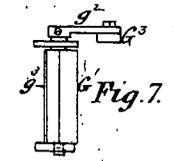
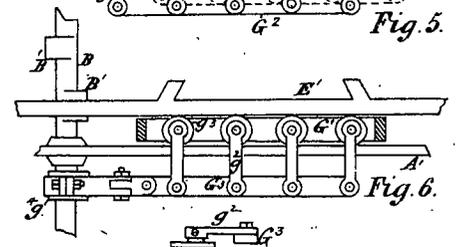
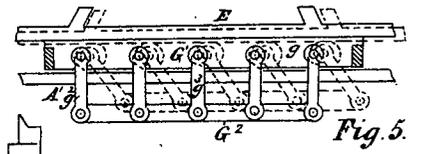
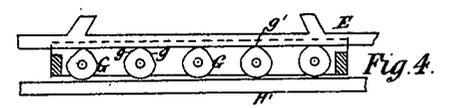
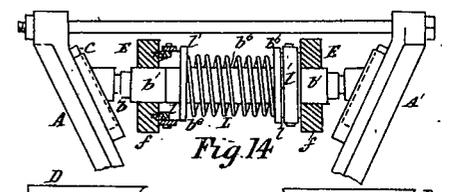
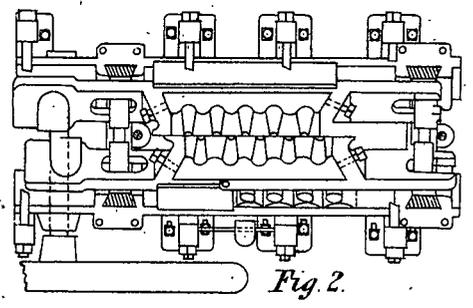
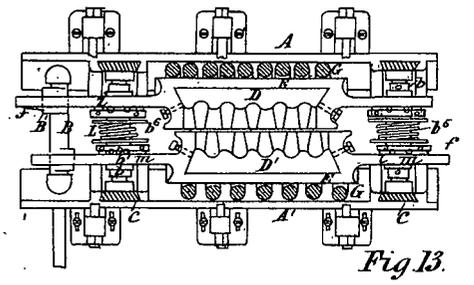
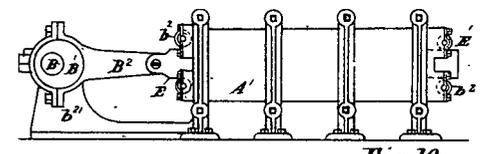
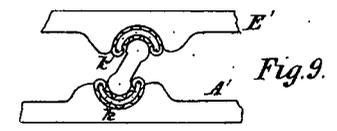
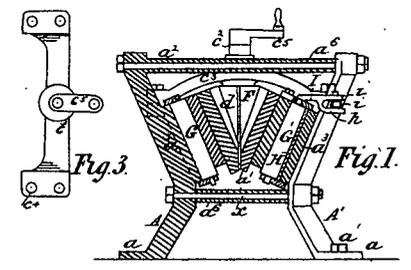
This is the Sheet of Drawings marked B. referred to in the annexed Letters of Registration granted to Robert M^cCall, this 13th day of December, A. D. 1882.

Augustus Loftus.



This is the Sheet of Drawings marked C referred to in the annexed Letters of Registration granted to Robert McCully, this thirteenth day of December, A.D. 1882.

Augustus Loftus.



This is the Sheet of Drawings marked E. referred to in the annexed Letters of Registration granted to Robert M^c Cully, this thirteenth day of December, A. D. 1882.

Augustus Loftus.



A.D. 1882, 13th December: No. 1173.

IMPROVEMENTS IN WATER JACKETS FOR SMELTING FURNACES.

LETTERS OF REGISTRATION to Albert Paulding Brayton, for Improvements in Water Jackets for Smelting Furnaces.

[Registered on the 14th day of December, 1882, 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 ALBERT PAULDING BRAYTON, of the city and county of San Francisco, State of California, one of the United States of America, foundryman, 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 Water Jackets for Smelting Furnaces," 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 Albert Paulding Brayton, 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 Albert Paulding Brayton, 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 Albert Paulding Brayton 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-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Water Jackets for Smelting Furnaces.

A.

SPECIFICATION of ALBERT PAULDING BRAYTON, of the city and county of San Francisco, State of California, one of the United States of America, foundryman, for an invention entitled "Improvements in Water Jackets for Smelting Furnaces."

MY invention relates to certain improvements in smelting furnaces, and it consists in a peculiar construction of a double inclosing wall, forming a space within which water is admitted; and also in the employment within this space of an intermediate cylindrical diaphragm, which is so supported as to leave a space at the top and at the bottom through which water may pass, and by this means a complete circulation is kept up, and the interior surface of the furnace may be kept cool, the water being supplied and discharged by suitable inlet and outlet passages.

Referring to the accompanying drawings for a more complete explanation of my invention:—Figure 1 is a vertical section of my apparatus; figure 2 is a horizontal section; figure 3 is an exterior view.

A is the inner, and B is the outer wall of my furnace, and C are the tuyère openings, through which the blast is admitted to the interior of the furnace. D is the door through which the slag and refuse is drawn out.

Water is admitted into the space between the walls A B of the furnace through the pipes E, which may enter at any point; but I prefer to connect them near the bottom, as shown. The water is discharged through the pipes F, a current being kept up by means of a pump, an elevated pressure tank, or other device.

In order to keep up a more perfect circulation and bring a cold body of water against the inner hot wall of the furnace, I form a cylindrical shell, G, of iron, of such a size that it will form a vertical cylindrical partition between the outer and inner walls.

This shell is made of such a length as to leave a space, H H, above and below it, through which the water may flow freely. Braces I extend inward from the outer shell, and are bolted or riveted to it and the cylinder G, so as to support the latter and hold it in place.

The operation will then be as follows:—Water being forced in through the ingress pipe, will flow to a point where it can pass below the lower edge of the shell G, and thence up between it and the inner shell to the top. In its upward passage it also flows around the tuyère openings, and is also caused to spread around the inner cylinder. At the top it flows outward through the upper passage H, and the cooler water descends between the outer shell and the shell G to the bottom, and thence flows upward again in the narrow space between the shell G and the inner wall, A, of the furnace. A circulation may also take place through the openings in this shell around the tuyères.

By this construction I am enabled to force a strong current of cold water continually against the inner wall of the furnace and thus keep it cool, and the water is used with the greatest economy, being forced in at all sides of the furnace. When it becomes warm the heated portion will escape through the pipes F at the top, the flow being controlled by suitable cocks.

Having thus described my invention, what I claim as new and desire to secure by Letters of Registration, is—

1st—The improvement in smelting furnaces, consisting of the double walls A B, having the interposed shell G, with a space above and below, as shown, and the ingress and egress pipes E F, substantially as and for the purpose herein described.

2nd—In a smelting furnace having the inner and outer walls A B, the tuyères or air blast openings C, and the discharge door D, the intermediate shell G, supported so as to form spaces between itself and the outer and the inner shells respectively, and passages H above and below it, in combination with the water pipes E F, substantially as and for the purpose herein described.

In witness whereof, I the said Albert Paulding Brayton have hereunto set my hand and seal, this second day of September, 1882.

Witness—
FRANK A. BROOKS.

ALBERT PAULDING BRAYTON.

This is the specification, marked A, referred to in the annexed Letters of Registration granted to Albert Paulding Brayton, this thirteenth day of December, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

The application of Mr. Albert Paulding Brayton, for Letters of Registration for an invention entitled "Improvements in Water Jackets for Smelting Furnaces," 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.,
A. LEIBIUS.
CHAS. WATT.

The Under Secretary of Justice.

B.

1173

FIG. 2.

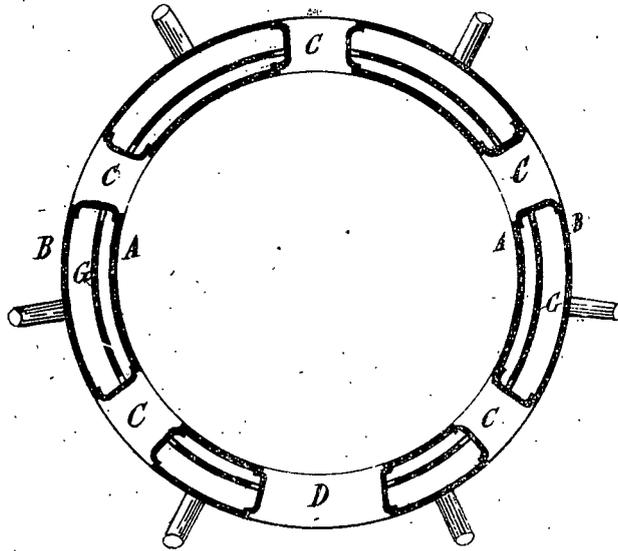
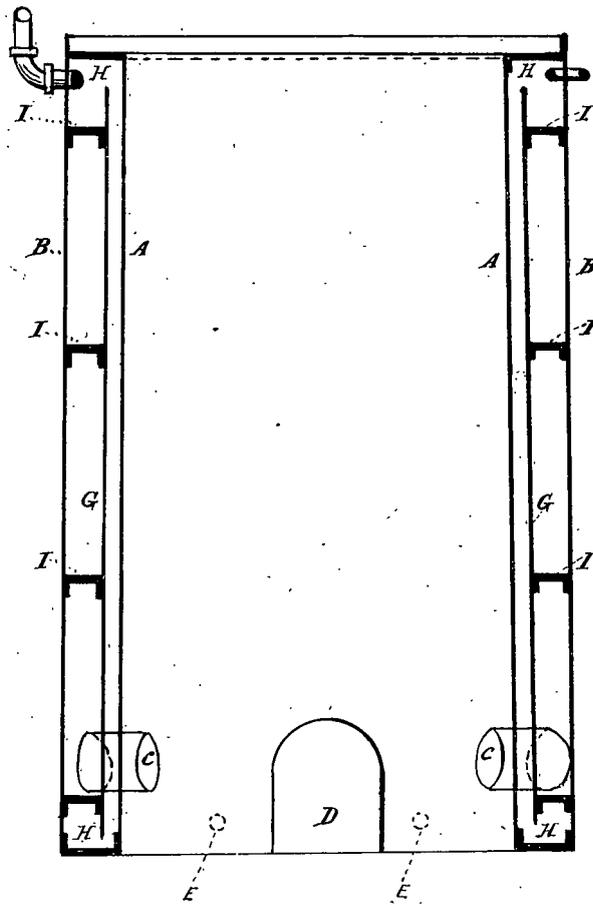


FIG. 1.



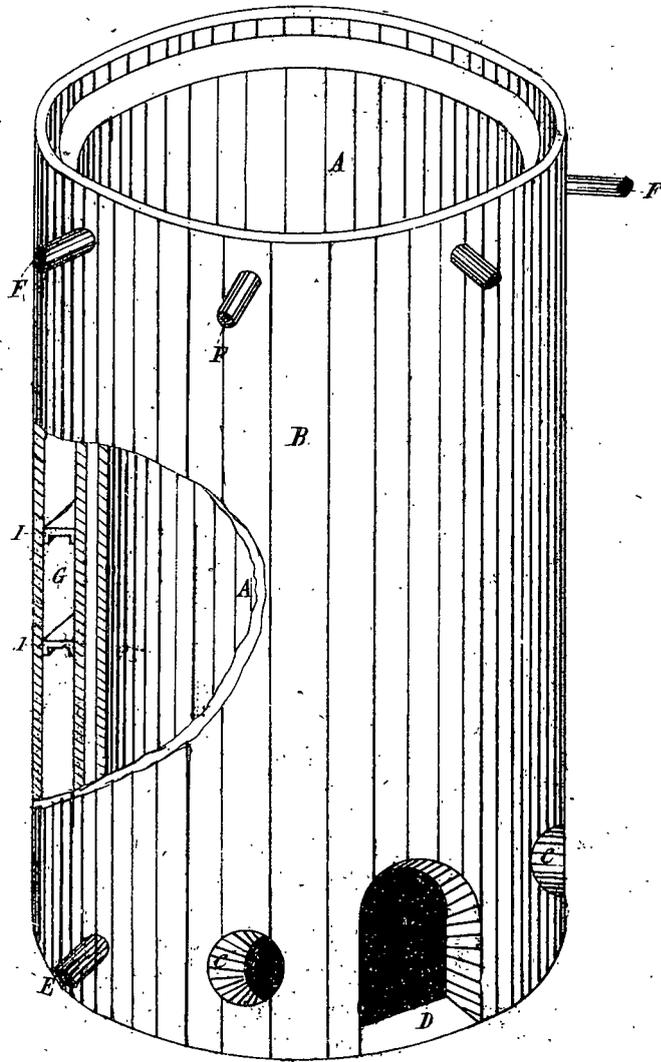
This is the Sheet of Drawings marked B referred to in the annexed Letters of Registration granted to Albert Paulding Brayton this 13th day of December, A.D. 1882.

Augustus Loftus.

C.

[1173]

FIG. 3.



*This is the Sheet of Drawings marked C referred to in the
annexed Letters of Registration granted to Albert Paulding
Brayton, this thirteenth day of December, A.D. 1882.*

Augustus Loftus.

(Sig. 32-)



A.D. 1882, 28th December. No. 1174.

IMPROVEMENTS IN LEAF SPRINGS.

LETTERS OF REGISTRATION to Henry Hudson, for Improvements in Leaf Springs.

[Registered on the 29th day of December, 1882, 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 HUDSON, of Redfern, near Sydney, in the Colony of New South Wales, hath by his Petition humbly represented to me that he is the assignee of Thomas Midelton, of Sydney aforesaid, engineer, who is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "Improvements in Leaf Springs," 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 Hudson, 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 Hudson, 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 Hudson 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 December, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvements in Leaf Springs.

SPECIFICATION of HENRY HUDSON, of Redfern, near Sydney, in the Colony of New South Wales, the assignee of Thomas Midelton, of Sydney aforesaid, engineer, the author or designer of an invention entitled "Improvements in Leaf Springs."

THIS invention of improvements in leaf springs relates first to the introduction of friction rollers between each of the plates or leaves, and, second, to the combination with such friction roller leaf springs of distance pieces between each plate or leaf at the centre, and holding them together by means of a buckle put on cold and fastened by a cotter.

The introduction of rollers, preferably of steel, at the ends of and between each plate, greatly reduces the friction between them, and fully develops the elasticity and useful effect of each plate composing the spring, the liability of breaking being almost entirely removed. In ordinary springs the leaves touch each other during their entire length, whereas in my case the only points of friction are on the friction rollers. The steel rollers referred to are made with heads at each end, to prevent any lateral movement of the spring plates, and thus avoid the necessity for making the usual projection and recess in the ends of the said plates to keep them in their proper place.

The central strap or buckle for holding the spring-plates together I put on cold, and draw the said plates closely and accurately together by means of a cotter, instead of by the usual method of heating the said buckle and then cooling it in water. The "temper" of the spring-plates is not destroyed at the centre by this method of construction, but remains always constant throughout; and, no matter what load may be on the spring, the buckle is not loosened as in ordinary springs, because the plates are held by a line of contact at the top and the full contact of the width of the buckle at the bottom.

The elasticity of springs made on this system is always the same whether loaded or unloaded, which is contrary to the usual bearing springs, which are practically solid when loaded.

Referring to my drawings, figure 1 is a bottom plan of one of my springs; figure 2, side elevation; and figure 3, top plan of same; figures 4 and 5 show side and sectional detail of roller; and figures 6 and 7, end elevation and section of plates. A A are the rollers between the plates or leaves B B; C C are the distance pieces in the centre; D, the buckle; and E, the cotter.

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 number of plates or leaves in my springs, nor to the number or precise position of the rollers between them, nor to the materials of which any of the parts may be made; but I prefer the plates and springs to be of steel, and to be arranged and constructed in the manner substantially as herein described and explained, and as illustrated in my drawings. What I believe to be new, and therefore claim as my improvements in leaf springs, is—

First—The introduction of friction rollers between the leaves or plates of such springs.

Second—In combination with such friction roller leaf springs, placing distance pieces between each plate or leaf at the centre, and fastening the whole together by means of a buckle put on cold and a cotter, substantially as herein described and explained.

In witness whereof, I, the said Henry Hudson, have hereto set my hand and seal, this first day of November, one thousand eight hundred and eighty-two.

EDWD. WATERS, Agent.

HENRY HUDSON.

This is the specification referred to in the annexed Letters of Registration granted to Henry Hudson, this twenty-eighth day of December, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT.

Sir,

The application of Mr. Henry Hudson for Letters of Registration for "Improvements in Leaf Springs" having been referred to us, we have examined the plans and 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.,

JAMES BARNET.

WILLIAM C. BENNETT.

The Under Secretary of Justice.

FIG 1

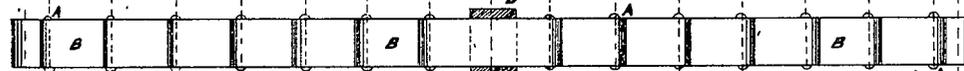


FIG 6

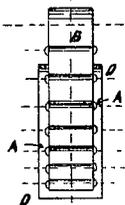


FIG 2

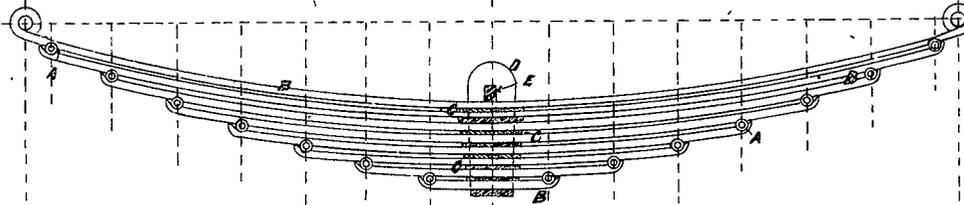


FIG 7

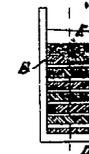


FIG 3

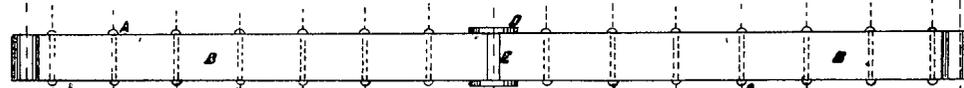


FIG 4

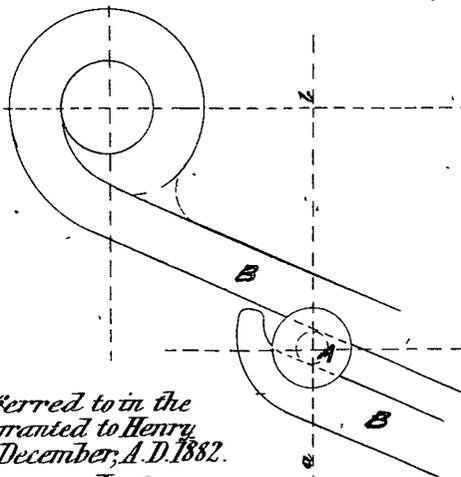
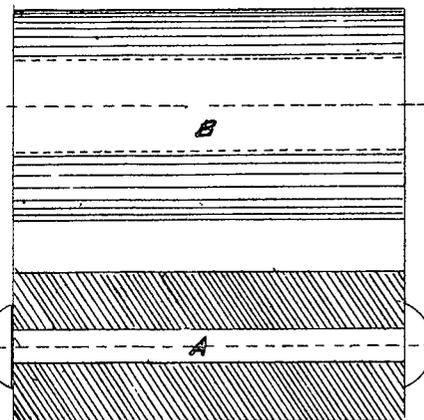


FIG 5



This is the Sheet of Drawings referred to in the annexed Letters of Registration granted to Henry Hudson, this twentyeighth day of December, A. D. 1882.

Augustus Loftus.



A.D. 1882, 28th December. No. 1175.

IMPROVEMENT IN THE PURIFICATION OF JUICE FROM THE SUGAR-CANE, &c.

LETTERS OF REGISTRATION to Paul Laurence Edmund Icery, Leon Ehrmann, and Clare Bernard, for 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.

[Registered on the 29th day of December, 1882, 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 LAURENCE EDMUND ICERY, of the Ward of the Plains Wilkilm, in the Island of Mauritius, doctor of medicine, and LEON EHRMANN and CLARE BERNARD, of Port Louis, in the said Island, chemists, have by their Petition humbly represented to me that the said Paul Laurence Edmund Icery is the author or designer of a certain invention or improvement in manufactures, that is to say, of an invention entitled "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," which is more particularly described in the specification which is hereunto annexed; and that they, the said Petitioners, are the assignees of the said Paul Laurence Edmund Icery of and in the said invention; 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 Paul Laurence Edmund Icery, Leon Ehrmann, and Clare Bernard, 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 Paul Laurence Edmund Icery, Leon Ehrmann, and Clare Bernard, 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 Paul Laurence Edmund Icery, Leon Ehrmann, and Clare Bernard, 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 December, in the year of our Lord one thousand eight hundred and eighty-two.

[L.S.]

AUGUSTUS LOFTUS.

Improvement in the purification of Juice from the Sugar-cane, &c.

SPECIFICATION.

1. The process for which we apply for a patent has for object to arrive at a purification of juice from the sugar-cane, and of the syrups produced in the course of converting it into sugar, much greater than has hitherto been realized, and at the same time to obtain from the juice and the syrups a large yield of sugar, by removing the principal cause which at different stages of their treatment occasions the alteration of a large part of the crystallizable sugar, and transforms it into interverted or uncrystallizable sugar.

2. The explanation which we have to give of this process, and the advantages which it offers, will be better understood if we begin by stating some of the conditions under which the manufacture of sugar is now conducted in Mauritius and other Colonies.

PREAMBLE.

3. These conditions are nearly those which Mr. Icery suggested about eleven years ago, when he took out two patents—the one for an apparatus now in use in nearly all the sugar-houses of the Colony for the making of sulphurous acid and sulphites, and the other for the purification of the cane-juice and syrups by the use of the monosulphite of lime, prepared at the moment when wanted for use.

4. At the time when these patents were issued to Mr. Icery, the sugars made in Mauritius were generally of inferior quality. The adoption of Mr. Icery's system was followed immediately by a great improvement in the manufacture. This improvement was due to two reasons—(1) to the employment of the substance indicated in Mr. Icery's patent; (2) to the general rules which Mr. Icery pointed out, and which are still followed in nearly all the sugar-works of the island, conformably to the results of science and experience.

5. One of the most important of these rules is, that as the juice of the cane is naturally acid, and always contains levogyre sugar, of which sugar the quantity is always greater in proportion as the juice is less rich, it should, during the whole of the operation of defecation and evaporation, be kept acid, if it is desired to obtain sugar of fine quality. This rule, properly applied, with the aid of mono-sulphite of lime, or the other substances which Mr. Icery pointed out at the time, has enabled nearly all the planters of Mauritius to make fine white sugar, which has raised the average value of their produce 25 per cent., and thus to find a considerable compensation for the reduction in quantity occasioned by disease upon the best kinds of canes, and by damage from the insects which have found their way into the island.

6. But although by means of this process, and of the rules which Mr. Icery had pointed out, the mode of manufacture has been modified with much advantage, Mr. Icery did not disguise to himself that that process had two defects—it does not procure a sufficient defecation of the cane-juice and syrups, and maintains in them a degree of acidity, which, however slight, always produces the intervention of a part of the crystallizable sugar. This last defect is more especially shown when the work is entrusted to persons wanting in care or experience. The acidity, when it ceases to be very slight, occasions an alteration, often considerable, of the crystallizable sugar, and this becomes the cause of much loss, chiefly in the boiling of the syrups, which crystallize with difficulty, or undergo vicious fermentation.

7. It would therefore be a new and important progress to be enabled, by the employment of some substance not yet taken advantage of, or by a special *modus faciendi*, to avoid keeping the juice and syrups in an acid condition during the defecation and evaporation, and nevertheless to produce sugar of fine quality. Mr. Icery has succeeded in arriving at this result, by the process which we shall now describe, and for which we apply for a patent.

DESCRIPTION OF PROCESS.

8. This process consists in the use of certain substances not hitherto employed in the manufacture of sugar, and of other substances which have been so employed; and further, in the use of all these substances in such a way that the defecation of cane-juice and syrups shall be effected when they are slightly alkaline, and the evaporation afterwards shall take place with them in a neutral state (medium).

9. The cane-juice, when it comes from the mill, is first treated in the usual way—that is, there is put into it monosulphite of lime or sulphurous acid in the form of liquid, or of gas, as indicated in Mr. Icery's pamphlet (Practical Instructions for the employment of mono-sulphite of lime, &c., &c., 1870).

10. After the cane-juice has been in contact at least twenty minutes with one of these substances, and has cleared itself from the particles in suspension, and has been allowed to settle for a sufficient time (*décantation à froid*), it is sent to the defecators, in which it is treated as follows:—

11. Carbonate of lime, as finely pulverized as possible, is to be put into the juice, in the proportion of 1 of carbonate of lime for 50 gallons or one barrel of juice. This carbonate of lime must be first mixed with water, so as to form a half-liquid paste. The juice in the defecator must be stirred so as completely to mix the carbonate with it, and then is to be added lime-water (*lait de chaux*) until the juice loses its acidity and becomes alkaline.

12. The quantity of lime to be used for this purpose will necessarily vary according to the degree of natural acidity of juice and the quantity of sulphurous acid which has been added to it, but in no case must the quantity of lime be more than what is absolutely necessary to destroy the sulphurous acid and the natural acid of the juice, and to cause a reaction slightly though distinctly alkaline.

It is very important to take care that the juice, after defecation, should have only a very slight marked alkaline reaction; and this will be easily recognized by dipping into it a slip of red litmus paper, which ought slowly to assume a faint blue tint. The precise ascertainment of the alkalization of the juice, before as well as after the defecation, is necessary, because it is most indispensable for obtaining a complete defecation that the juice should be strongly alkaline, and because a greater degree of alkalinity than that above indicated would have, for consequence, to give to the defecated juice a greenish yellow colour, which would not allow of really white sugar being obtained.

13. This having been attended to, the juice is gradually heated till ebullition begins. At that point the defecation is effected, and the action of the heat must be stopped.

In about half an hour the scum which collects on the top of the liquid, forming a thick greyish crust, is skimmed off, and after the lower and thick portion of the juice has been let out into a separate vessel, the rest, more or less clear, is run into a decanter, in which, simultaneously, but in one dose, is poured

Improvement in the purification of Juice from the Sugar-cane, &c.

poured a solution of biphosphate of ammonia or biphosphate of lime, in quantity sufficient to give to all the juice to be received into the decanter its first acidity—that is, the acidity natural to the cane.

14. When the liquor has been at least a quarter of an hour in the decanter, there is to be added, little by little, the upper part, meantime slowly stirred, a solution of saccharate of lime, till the acidity becomes only slightly marked. This first acidity will naturally disappear later and leave the liquor neutral. The liquor is then left to settle, and when it has become perfectly limpid, which does not require much time, it is sent into Taylor's filters, whence it is drained up into the evaporating pans.

15. What precedes applies when the process is used with defecations heated by steam—when batteries or open pans, working by direct fire, are employed, the addition of carbonate of lime and of lime-water is made, as has been indicated in paragraphs 11 and 12, and the juice is then sent into the first pan, where it undergoes a commencement of defecation; and it is only when this has taken place that the solution of biphosphate of ammonia or of lime is added, partly in the second and partly in the third pan; then the cleaned juice in ebullition is from time to time sprinkled with the solution of saccharate of lime till its acidity disappears—care must be taken, as in the decanters, not to go beyond what is necessary to bring the juice to a neutral state.

DEFINITION OF THE SUBSTANCES EMPLOYED.

16. By the addition of carbonate of lime, and then lime-water, to the cane-juice and the syrups till they become slightly alkaline, they are brought to the most favourable state for parting with, under the influence of heat, the matters other than sugar which they held in solution. It is in a medium rendered alkaline by lime, that the albumenous substances in cane-juice most readily coagulate, and the contact of these matters with carbonate of lime at the moment of their separation contributes greatly to their collecting into a precipitate, heavy, but of small volume. This much aids to the clarification of the defecated liquor, and renders the treatment of the skimmings and residuums easier and less expensive.

17. The addition of carbonate of lime has, besides the result which is the principal reason for employing it, of destroying in the defecated and clarified liquor the acidity which reproduces itself under the influence of heat in the course of the evaporation. A part of this carbonate, transformed into bicarbonate by the excess of the biphosphate which has been added to the liquor after the defecation, remains in solution and resists the injurious action of the acids, by changing them into salts of lime, as they develop themselves while the evaporation is going on.

This action of the carbonate is so manifest, that a liquor introduced acid into the evaporating vessels comes out after a certain time in a neutral state, provided that the degree of acidity has not been too marked—that is, that the quantity of free acid has not been in excess of the carbonate in solution sufficient to neutralize the initial acid, and those develop themselves as the boiling of the liquor goes on. It is to be observed also that the liquor, in spite of decantation and filtration, carries with it a certain amount of carbonate of lime in a state of very fine dust, which also contributes much to annul the acids produced during the concentration, and thus to maintain the liquor in a neutral state. By taking the precaution therefore of adding enough of saccharate of lime to the liquor defecated and dosed with biphosphate nearly to deprive it of acidity, there is always a certainty of carbonate of lime held in solution or suspension controlling the acids that develop themselves during the evaporation, and consequently of realizing that important part of the process which has in view to ensure having for concentration a liquor which will maintain itself naturally in a neutral state.

The advantage that result from this neutral state of the liquor is of the greatest consequence, because it prevents the formation of interverted sugar, which takes place to the diminution of the crystallizable sugar; and further, constitutes the principal difficulty in obtaining all the sugar from the syrups that ought to be got in the second and third boilings.

18. The employment of biphosphate immediately after the alkaline defecation has for object to precipitate the lime in excess, and to restore to the liquor, during the decantation, part of its original acidity, in order to avoid the yellowish colour which would be produced by the prolonged action of lime on the small quantity of interverted sugar which at that moment exists in the defecated liquor.

The scarcely traceable influence which in these conditions phosphoric acid has on the crystallizable sugar, joined to its power of destroying the colour of certain organic matters in the juice, and to form with lime a considerable precipitate even in acid liquors, led Mr. Icery to employ it in this process, and with the best results.

19. The employment of the saccharate of lime offers great advantages; the substance being soluble, and its alkalinity being easy to regulate, it will allow of the whole mass of liquor being acted on almost at the same moment, so as readily to deprive it of its acidity without promoting the production of coloured matters of a nature to affect unfavourably the quality of the sugar to be obtained.

The saccharate of lime, under the influence of phosphoric acid, is transformed into an insoluble substance which is precipitated, and into sugar, which joins that contained in this liquor.

RESUME.

20. The process thus realizes several advantages which have been combined in no method up till now applied to the manufacture of sugar in the Colonies:—

Bleaching of the juice almost complete; elimination of albuminoid and mucilaginous matter—their precipitation in a comparatively small volume, which renders the treatment of them easy and inexpensive, and also prevention of the production of levogyre or interverted sugar and its derivatives, which are the principal obstacle to the crystallization of the mass which comes from concentrating pans (*masses cuites*), and especially of those furnished by the syrups.

SIMILAR SUBSTANCES.

21. Instead of carbonate of lime, carbonate of baryte or carbonate of magnesia might be used; but the last would, during the defecation, give a sulphate of magnesia—a soluble salt which would accumulate in the liquor and then in the syrups, and contribute to hinder crystallization. The carbonate of baryte would not be liable to the same objection. But it may be well to notice a remarkable fact not perhaps sufficiently known, which is, that all the acids which have to be neutralized in this process do not possess to the same degree the quality of being absorbed by the carbonate just spoken of.

The acids natural to the juice of the cane, or which are developed during evaporation, can be more or less quickly destroyed by these carbonates, but sulphurous acid offers more resistance to carbonate of
lime

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lime than to the other two carbonates; and phosphoric acid is not absorbed by any one of them, which necessitate the employment of saccharate of lime before the evaporation, so as to precipitate the phosphoric acid and destroy its action.

The carbonate of magnesia being more readily affected than the carbonate of baryte, and the last than the carbonate of lime, it results that in certain cases it would be better to employ the two first rather than the last.

It is preferable to employ the biphosphate of ammonia rather than the biphosphate of lime, because all the phosphoric acid of the first is utilized, and its ammonia being volatilized, it does not introduce into the liquor matters which augment the volume of the scum and of the precipitate. Besides, the biphosphate of ammonia gives to the liquor more limpidity, but the biphosphate of ammonia costs more than biphosphate of lime, which will probably command the use of the latter.

PREPARATION OF THE SUBSTANCES EMPLOYED.

22. The carbonate of lime which Mr. Icery has made use of is that known in commerce as "whiting." Mr. Icery also employed the carbonate which is obtained by slightly burning pieces of madreporas (locally called *tête de mort*), and then reducing them to a very fine powder.

Whatever be the origin of the carbonate, it is to be employed in the form of an impalpable powder, and mixed in water so as to form a paste.

23. The lime must be first washed, to get rid of all the soluble substances there may be in it, and then cleared of all the sand, which is here often found mixed with it in considerable quantities.

The sand being heavier falls to the bottom when the lime has been washed and left to settle.

24. The saccharate of lime is prepared by pouring lime, previously washed and cleared of sand, into a solution of sugar.

Sugar must be employed in excess, so as to avoid giving to the mixture a too marked alkaline reaction. A solution containing 15 per cent. of lime and 85 per cent. of sugar will meet the requirements of this process. A greater or less quantity of water is added to it to facilitate its due application.

25. In case biphosphate of lime or biphosphate of ammonia cannot be bought in the market, the substances to be employed may be prepared in the following manner:—

The impure article imported into the Colony to serve as manure, under the name of "superphosphate of lime," and which usually contains 25 to 35 per cent. of biphosphate, can be availed of. It is mixed with hot water, the dissolving of biphosphate being aided by the stirring of the whole for a sufficient time; enough water is then added to obtain a liquid marking about 10° on the areometer of the Baumé. This liquid is drawn off and employed as directed in paragraph 13.

If it is desired to use biphosphate of ammonia, the above-mentioned liquid, marking 10° aerometer Baumé, must have added to it a solution of the carbonate of ammonia of commerce, enough to render it whitish and syrupy; and the addition of carbonate of ammonia must be discontinued as soon as a slight acid reaction is shown in the liquid. A gelatinous deposit takes place, which must be removed, and the clear liquid, which is a solution of biphosphate of ammonia, is to be employed as directed in paragraph 13.

26. The preparation of monosulphite of lime and of sulphurous acid is made in the ordinary way. (Practical instructions for the employment of monosulphite of lime, &c., &c., 1870).

HISTORICAL NOTICE OF SUBSTANCES EMPLOYED.

27. The monosulphate was patented by Mr. Icery in 1869, for Mauritius, Réunion, and France.

28. Sulphurous acid, bisulphate of lime, and other substances of an analogous kind, have been for a long time employed in the manufacture of sugar in Europe. Mr. Icery made them known in Mauritius in 1870. (Practical instructions on the employment of the monosulphite of lime, &c., &c., 1870.)

29. The employment of sulphurous acid, mixed with biphosphate of ammonia, was also pointed out in a pamphlet published by me in 1870. (The claims relative to the new process of monosulphite of lime, 1870.)

30. Biphosphate of lime and biphosphate of ammonia were from an early date employed in the manufacture of sugar, but the process into which these last two substances entered have been little by little given up—first, because they were introduced into the juice before defecation, and when so employed occasioned so great a quantity of sediment and scum that these could not be worked up in time or without great loss of sugar; secondly, because those substances, employed in an impure state and under a solid form, increased, by all their own impurities, the mass of precipitates and scum.

31. The saccharate of lime and the carbonate of lime have never hitherto been employed; the first to neutralize the liquor acidified by phosphoric acid, nor the second, to reduce the volume of the scum and that of the precipitates, and to facilitate their formation, and by its presence, either dissolved or held in suspension, to prevent the transformation of crystallizable sugar into levogyre sugar during the work of evaporation.

32. The successive employment of the different substances mentioned above, and the way in which they are made to reach towards the same ends—the purifying and then the neutralization of the cane-juice and syrups—constitute a process or *modus faciendi* which has never been described nor put in practice, and is therefore a new process.

This process is new, not only by an altogether special *modus faciendi*, but also by the employment, never hitherto made, of saccharate and carbonate of lime, in the way and under the circumstances herein described.

P. L. E. ICERY,
(By his Attorney, R. A. JOSEPH).

LEON EHRMANN,
(By his Attorney, R. A. JOSEPH).

CLARE BERNARD,
(By his Attorney, R. A. JOSEPH).

This is the specification referred to in the annexed Letters of Registration granted to Paul Laurence Edmund Icery, Leon Ehrmann, and Clare Bernard, this twenty-eighth day of December, A.D. 1882.

AUGUSTUS LOFTUS.

REPORT

Improvement in the purification of Juice from the Sugar-cane, &c.

REPORT.

Sir,

Sydney, 9 October, 1882.

The application of Messrs. Paul Laurence Edmund Icery, Leon Ehrmann, and Clare Bernard, for Letters of Registration for an invention for the "Purification of Sugar-juices," 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.

We have, &c.,
CHAS. WATT.
A. LEIBIUS.

The Under Secretary of Justice.