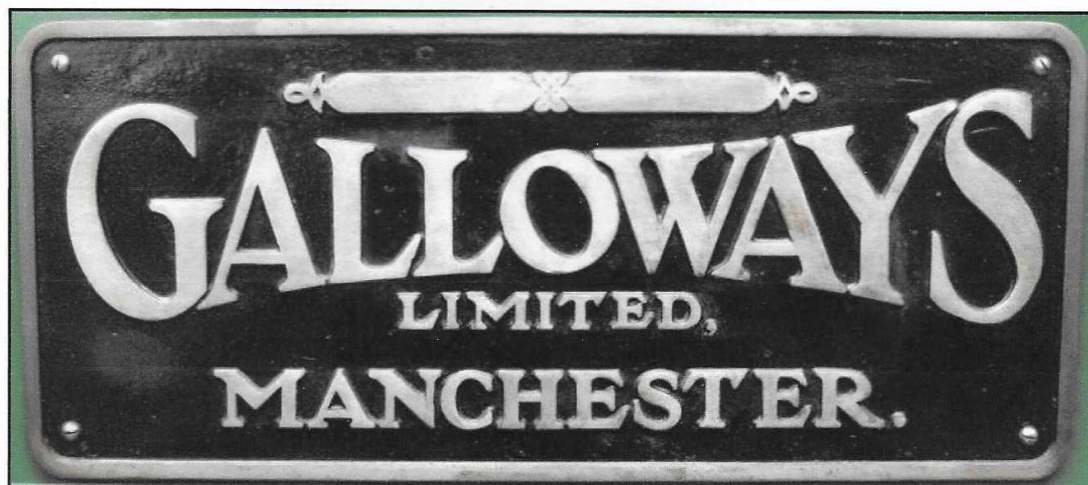


*W & J Galloway & Sons*



**EXTRACTS FROM BRITISH PATENTS  
RELATING TO GALLOWAY STEAM  
BOILERS AND APPARATUS  
1848-1861**



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A.D. 1848 . . . . . N° 12,244.

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**Steam Engines.**

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**W. & J. GALLOWAY'S SPECIFICATION.**

TO ALL TO WHOM THESE PRESENTS SHALL COME, we, WILLIAM GALLOWAY and JOHN GALLOWAY, of Knott Mill Iron Works, Hulme, in the Borough of Manchester and County of Lancaster, Engineers, send greeting.

WHEREAS Her present most Excellent Majesty Queen Victoria, by Her  
5 Letters Patent under the Great Seal of the United Kingdom of Great Britain and Ireland, bearing date at Westminster, the Seventeenth day of August, in the twelfth year of Her reign, and in the year of our Lord One thousand eight hundred and forty-eight, did give and grant unto us, the said William Galloway and John Galloway, our eñors, adñiors, and assigns, Her especial license, full  
10 power, sole privilege and authority, that we, the said William Galloway and John Galloway, our eñors, adñiors, and assigns, and such others as we, the said William Galloway and John Galloway, our eñors, adñiors, or assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term of years therein mentioned, should and lawfully might make, use,  
15 exercise, and vend, within that part of the United Kingdom of Great Britain and Ireland called England, Her Dominion of Wales, and Town of Berwick-upon-Tweed, our said Invention of "CERTAIN IMPROVEMENTS IN STEAM ENGINES;" in which said Letters Patent there is contained a proviso requiring that we, the said William Galloway and John Galloway, shall particularly  
20 describe and ascertain the nature of our said Invention, and in what manner the same is to be performed, by an instrument in writing under our hands and seals, to be inrolled in Her said Majesty's High Court of Chancery within six calendar months next and immediately after the date of the said in

*W. & J. Galloway's Improvements in Steam Engines.*

part recited Letters Patent, as, reference being thereunto had, will more fully and at large appear.

NOW KNOW YE, that in compliance with the said proviso, we, the said William Galloway and John Galloway, do hereby declare that the nature and particulars of our said Invention, and the manner in which the same is to be performed and carried into effect, are particularly set forth, illustrated, and described in and by this present instrument in writing and the several Sheets of Drawings hereto annexed, which Drawings, and the various figures thereon, are progressively numbered, the scale or proportionate size to which such figures are made being also marked upon the Drawings, while the same letters, indices, and numeral figures of reference used to indicate any particular part or parts of the machinery or apparatus are also used to indicate the same part or parts thereof throughout the several Figures, in which different views of such machinery or apparatus are shewn, that is to say :—

Our Invention relates,— 15

First, to certain novel and improved arrangements respecting the second or high-pressure cylinder of compound steam engines.

Second, to certain mechanical combinations whereby the rotation of the cam or valve shaft is effected without the intervention of toothed gearing.

Third, to certain improved modes of working and of regulating the action of "expansion valves" in ordinary and compound steam engines. 20

Fourth, to the application of an additional exhaust valve or valves to the condensing cylinder of steam engines.

Fifth, to certain novel methods of heating water by means of the exhaust steam passing from the cylinder previous to its condensation. 25

Sixth, to improvements in the construction of pistons for the working cylinders of steam engines, in the construction of the air pump buckets, the foot and delivery valves, and the buckets and clacks of the hot and cold water pumps made use of in steam engines.

Seventh, to certain improvements in the generation of steam, and in the application of steam thus generated to steam engines generally. 30

Eighth, to the construction of an improved gauge for measuring or determining the working pressure of steam in steam engines.

Having thus set forth the particular nature of our improvements, we shall proceed to exemplify their practical application by the following. 35

## DESCRIPTION OF THE DRAWINGS.

As the ordinary and well-known parts of steam engines are generally understood, we have not entered into any description of their arrangements or action,

A. D. 1888, and U.S. PATENT  
NO. 371,667, issued February 14,  
1887.

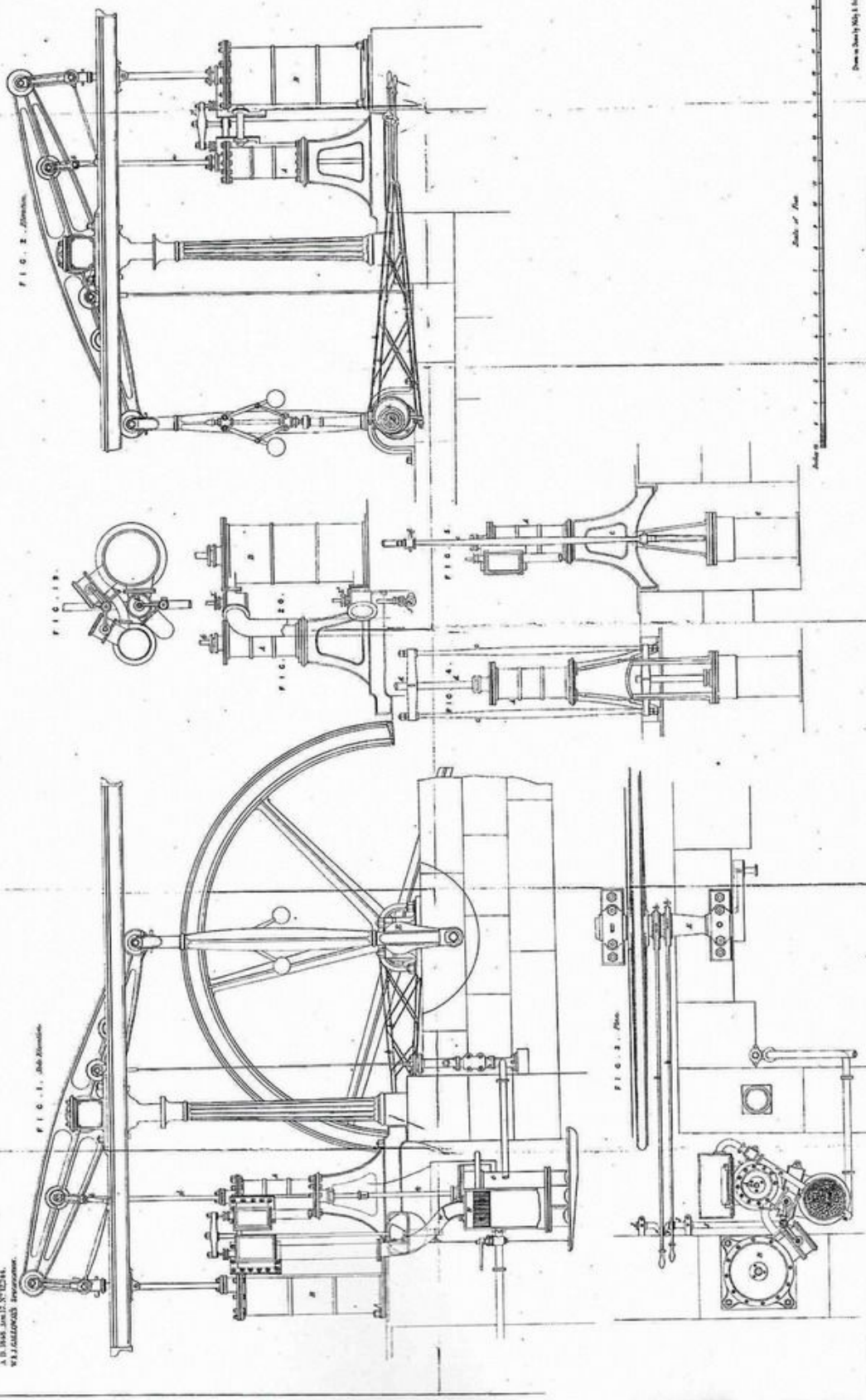


FIG. 1. - Side Elevation.  
FIG. 2. - Front View.  
FIG. 3. - Plan.  
FIG. 4. - Detail of Piston.  
FIG. 5. - Detail of Valve Gear.  
FIG. 6. - Detail of Piston Rod.  
FIG. 7. - Detail of Piston.  
FIG. 8. - Detail of Valve.  
FIG. 9. - Detail of Piston Ring.  
FIG. 10. - Detail of Piston Pin.  
FIG. 11. - Detail of Piston Head.  
FIG. 12. - Detail of Piston Skirt.  
FIG. 13. - Detail of Piston Ring Groove.  
FIG. 14. - Detail of Piston Ring Groove.  
FIG. 15. - Detail of Piston Ring Groove.  
FIG. 16. - Detail of Piston Ring Groove.  
FIG. 17. - Detail of Piston Ring Groove.  
FIG. 18. - Detail of Piston Ring Groove.  
FIG. 19. - Detail of Piston Ring Groove.  
FIG. 20. - Detail of Piston Ring Groove.  
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FIG. 94. - Detail of Piston Ring Groove.  
FIG. 95. - Detail of Piston Ring Groove.  
FIG. 96. - Detail of Piston Ring Groove.  
FIG. 97. - Detail of Piston Ring Groove.  
FIG. 98. - Detail of Piston Ring Groove.  
FIG. 99. - Detail of Piston Ring Groove.  
FIG. 100. - Detail of Piston Ring Groove.

The essential features of the invention are shown in the accompanying drawings.

From a Sheet of 12.



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A.D. 1849 . . . . . N° 12,782.

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**Furnaces.**

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**GALLOWAY'S SPECIFICATION.**

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, ELIJAH GALLOWAY, of Southampton Buildings, Chancery Lane, Engineer, send greeting.

WHEREAS Her present most Excellent Majesty Queen Victoria, by Her Royal Letters Patent under the Great Seal of the United Kingdom of Great Britain and Ireland, bearing date at Westminster, the Twentieth day of September (One thousand eight hundred and forty-nine), in the thirteenth year of Her reign, did, for Herself, Her heirs and successors, give and grant unto me, the said Elijah Galloway, my eñors, adñiors, and assigns, Her especial license, full power, sole privilege and authority, that I, the said Elijah Galloway, my eñors, adñiors, and assigns, or such others as I, the said Elijah Galloway, my eñors, adñiors, or assigns, should at any time agree with, and no others, from time to time and at all times during the term of years therein expressed, should and lawfully might make, use, exercise, and vend, within England, Wales, and the Town of Berwick upon Tweed, my Invention of "IMPROVEMENTS IN FURNACES;" in which said Letters Patent is contained a proviso, that I, the said Elijah Galloway shall cause a particular description of the nature of my said Invention, and in what manner the same is to be performed, by an instrument in writing under my hand and seal, to be inrolled in Her said Majesty's High Court of Chancery within six calendar months next and immediately after the date of the said in part recited Letters Patent, as in and by the same, reference being thereunto had, will more fully and at large appear.

NOW KNOW YE, that in compliance with the said proviso, I, the said Elijah Galloway, do hereby declare that the nature of my said Invention, and the manner in which the same is to be performed, are fully described and

*Galloway's Improvements in Furnaces.*

ascertained in and by the following statement thereof, reference being had to the Drawing hereunto annexed, and to the figures and letters marked thereon, that is to say:—

My Invention is intended to be applied to the description of furnaces having grate bars, such as are adapted for steam boilers, and all other operations of boiling, but it is not applicable to furnaces where there are no bars to carry or support the fire. 5

Figure 1 represents a side elevation of a section of my furnace, as if cut through the dotted line *a, a*, (Figure 2,) and Figure 2 is an underneath view of such portion of the said furnace, (as if the same were inverted,) as is necessary to shew the manner of constructing the same. The Invention consists in giving a particular motion to the bars, by means of excentrics, *b, b, b, b*, and *c, c, c, c*, Figures 1 and 2. These excentrics work the side bearers, colored pink and blue; that is to say, the pink-colored excentrics *b, b, b, b*, move the pink-colored bearers *h, h*, affixed thereto, in manner shewn, and the blue-colored excentrics move the blue bearers *i, i*. It will further be seen that the excentrics are set on their axes *d, d*, exactly opposite each other (the excentric caps being supposed to be removed in Figure 2, to shew their relative positions). Now, if these axes are made to revolve by means of the worms and wheels *e', f'*, (or by other convenient apparatus worked slowly from the engine,) every part of the bearers, and each point in a fire bar, will describe a circle corresponding to that described by the central point of the excentrics, but so that each pair of bearers will be traversing the opposite points of the circles; one pair ascending when the other are descending, or one pair moving forwards when the other are moving backwards, and hence the whole length of the bar will be alternately raised and lowered. 10 15 20 25

The bars are formed as shewn in Figure 1, being forged or cast with the hooks *e, e, e, e*, and being thicker at *f, f, f, f*, to keep them at proper distances from each other, the blue bars are also thicker from *r* to *s* (Figure 2) to prevent the unignited fuel from falling through between the bars. They are secured by clips, hooks, or other convenient means to the front transverse bearers, so as to be held down and compelled to move therewith; *g, g*, and *h', h'*, are transverse rods respectively affixed to the bearers with whose color they correspond. These rods are the supports of the fire bars, and will obviously describe the same circles as the bearers *h, h*, and *i, i*, and the red and blue bars which are attached to the bearers by the hooks *e, e*, and secured by a pin at *j*, (Figure 1,) are compelled thereby to move with those bearers and excentrics, which are of the same color. The sides of the furnace will be constructed so as nearly to reach the outside bars, and it will be narrower 30 35

FIG. 1.

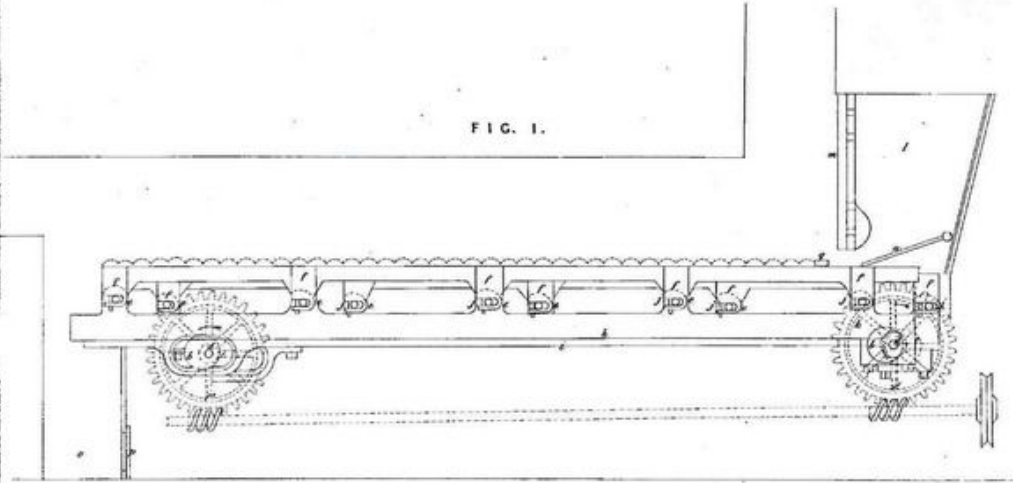


FIG. 2.

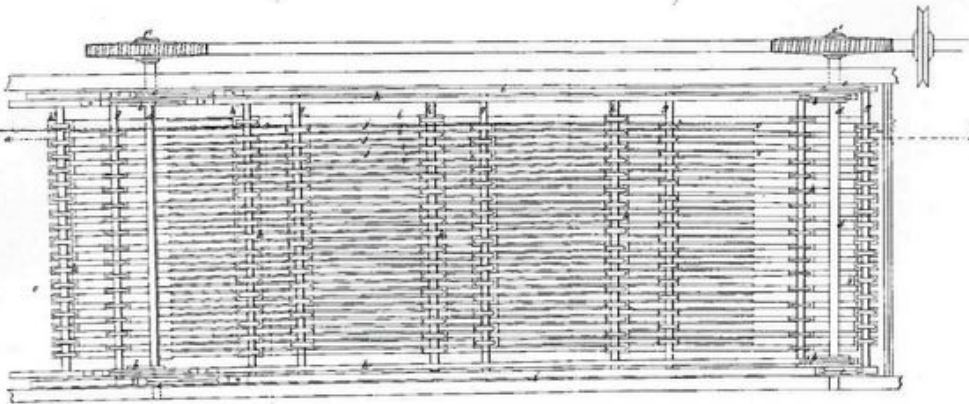
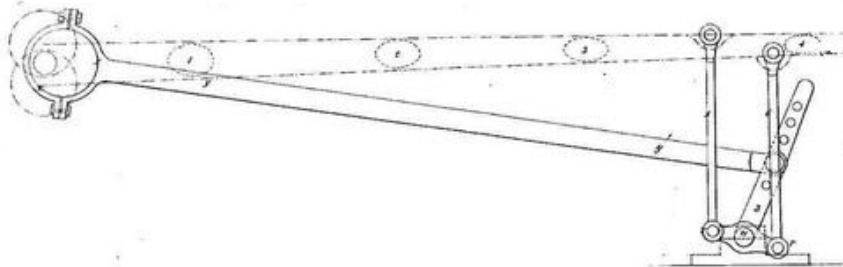


FIG. 3.



*The enrolled drawing is partly altered.*

Milly & Sons, 72b



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A.D. 1851 . . . . . N° 13,552\*.

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**Steam Engines and Boilers.**

**W. & J. GALLOWAY'S DISCLAIMER AND MEMORANDUM  
OF ALTERATION.**

In the Matter of Letters Patent granted to William Galloway and John Galloway, of Manchester, in the County of Lancaster, for an Invention of "IMPROVEMENTS IN STEAM ENGINES AND BOILERS," bearing date at Westminster, the Eleventh day of March One thousand  
5 eight hundred and fifty-one.

**DISCLAIMER AND MEMORANDUM OF ALTERATION** entered pursuant to an Act passed in the fifth and sixth years of the reign of His late Majesty King William the Fourth, intituled "An Act to amend the Law touching Letters Patent for Inventions."

10 **TO ALL TO WHOM THESE PRESENTS SHALL COME**, we, **WILLIAM GALLOWAY** and **JOHN GALLOWAY**, of Manchester, in the County of Lancaster, send greeting.

**WHEREAS** Her Majesty Queen Victoria, by Her Letters Patent under the Great Seal of the United Kingdom of Great Britain and Ireland, bearing  
15 date at Westminster, the Eleventh day of March, One thousand eight hundred and fifty-one, did grant unto the said William Galloway and John Galloway, their exors, admors, and assigns, the sole privilege of making, using, exercising, and vending their Invention of "IMPROVEMENTS IN STEAM ENGINES AND BOILERS,"  
20 within England, Wales, and the Town of Berwick-upon-Tweed, and in the Islands of Jersey, Guernsey, Alderney, Sark, and Man, and also in all Her Majesty's Colonies and Plantations abroad during the term of fourteen years thence next ensuing: And whereas in pursuance of a proviso in the said Letters Patent contained, the said William Galloway did, within six calendar months next and immediately after the date of the said Letters Patent, cause



*W. & J. Galloway's Improvements in Steam Engines and Boilers.*

an instrument in writing under his hand and seal, particularly describing and ascertaining the nature of the said Invention, and in what manner the same was to be performed, to be duly enrolled in the High Court of Chancery: And whereas since the enrollment of the said Specification, we have been advised and ascertained that it is doubtful whether certain parts of the said 5 Invention claimed therein are of sufficient novelty and utility to render it expedient to retain the same. And whereas we are desirous, for the better protection of our rights in the said Letters Patent, to disclaim such parts of the said Letters Patent and Specification.

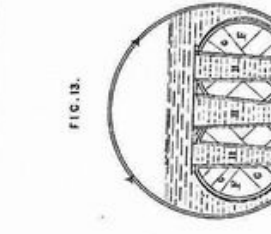
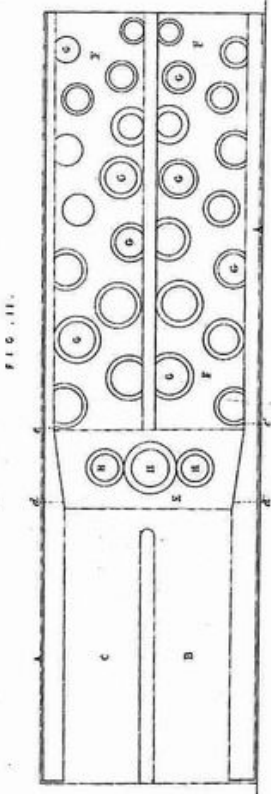
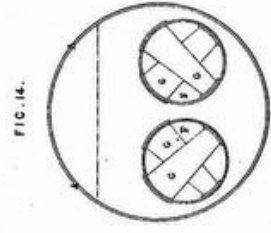
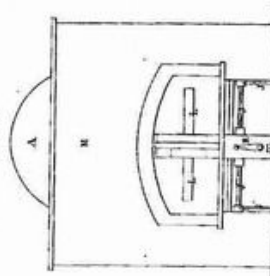
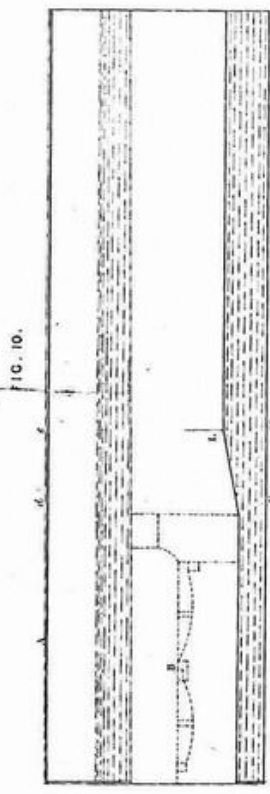
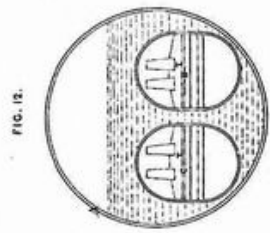
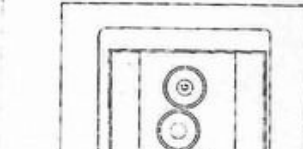
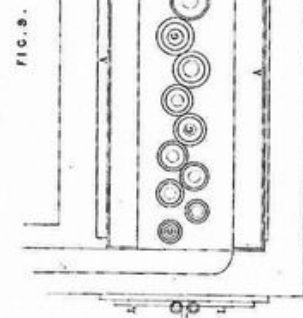
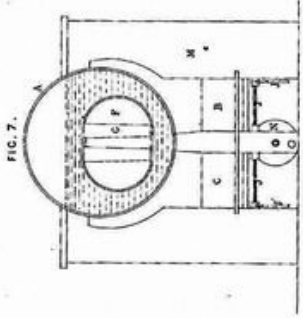
**NOW KNOW YE**, that by and with the leave of Her Majesty's Attorney- 10 General, and for the reasons aforesaid, we, the said William Galloway and John Galloway, do hereby disclaim the parts following of the said Specification, as the same appears in the print of the Specification, No. 13,552, as issued under the direction of the Commissioners of Patents, that is to say:—

The part on page 2 beginning with the words on line 14 "to a method," 15 and ending with the words "boiler. Fifthly" on line 19; the part on page 3 beginning with the words on the line 8 "When the conical" and ending with the word "tube" on line 11; the part beginning with the words on page 5, line 24 "Sheet 4," and ending with the words "both furnaces with fuel" on page 6, line 33; the part beginning with the words on page 7, line 32, 20 "Figures 35," and ending with the words "the valve E" on page 10, line 10; the part on page 10 beginning with the words on line 13 "the constructing," and ending with the words "Secondly" on line 18; the part beginning with the word on page 10, line 25, "Fourthly," and ending with the words "hereinbefore described" on page 11, line 10; the part on page 11 beginning with 25 the word on line 21 "Fifteenthly," and ending with the words "or both" on line 34. And we do disclaim such parts of the Drawings annexed to the said Specification as are referred to and relate exclusively to the parts hereinbefore disclaimed. And in order that the Specification as altered by striking out the parts hereinbefore disclaimed may read correctly and consistently, 30 we do, with leave as aforesaid, amend the said Specification, by substituting the word "Secondly" for the word "Thirdly," on page 10, line 22, and by substituting the words "Thirdly," "Fourthly," and "Fifthly," for the words "Twelfthly," "Thirteenthly," "Fourteenthly," respectively on page 11, lines 11, 14, and 18 respectively; and we do declare that the Specification when 35 altered as aforesaid, will be as follows:—

**TO ALL TO WHOM THESE PRESENTS SHALL COME**, we, WILLIAM GALLOWAY and JOHN GALLOWAY, of Manchester, in the County of Lancaster, Engineers, send greeting.

A. D. 1861, March 11, No. 13,552.  
 W. & J. GALLOWAY'S SPECIFICATION.

(7 SHEETS)  
 SHEET 2.



The dotted drawing is partly altered.

London: Printed by George Johnson, Printer and Stationer, Great Court Yard, St. Dunin's Church, Fleet Street.

Mulby & Sons 26.

A. D. MARCHETTI 1852  
W. & J. GULLOY'S SPECIFICATION.

FIG. 15.

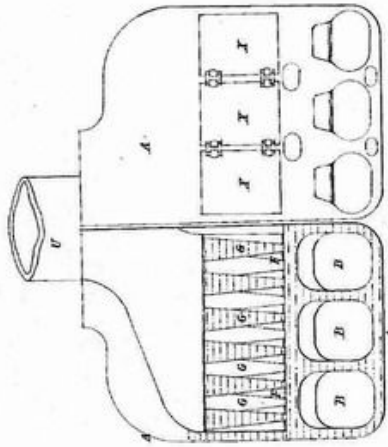


FIG. 17.

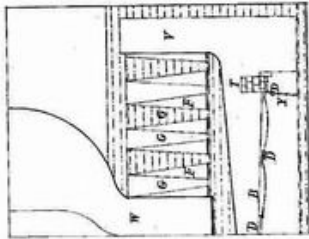


FIG. 19.

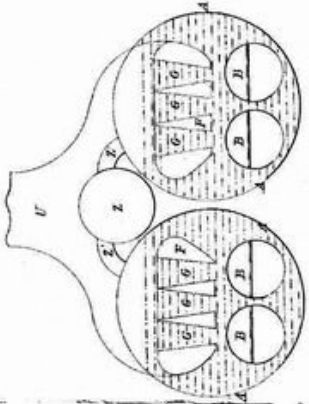


FIG. 20.

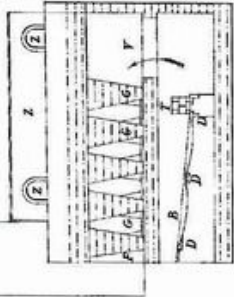


FIG. 16.

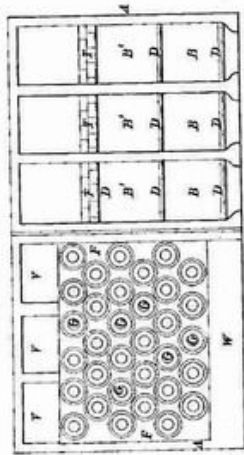
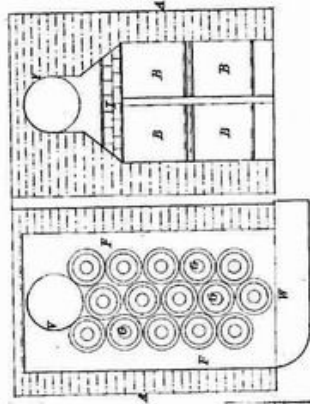


FIG. 18.



The essential drawing is partly altered.

London: Printed by GEORGE EDWARDS KNOX and WILLIAM SPENCERSON.  
Printers to the Queen's most Excellent Majesty. 1852.

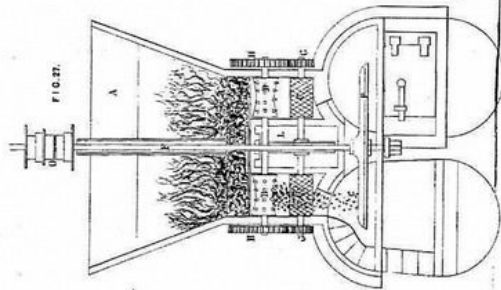


FIG. 27.

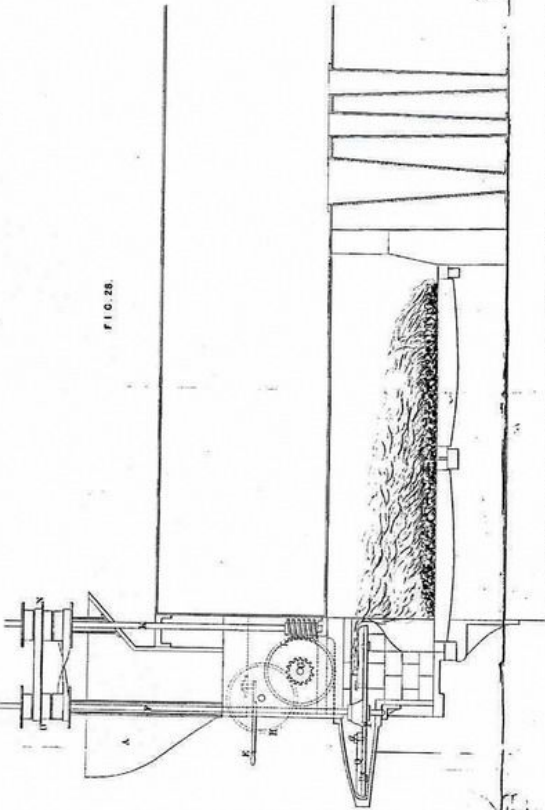


FIG. 28.

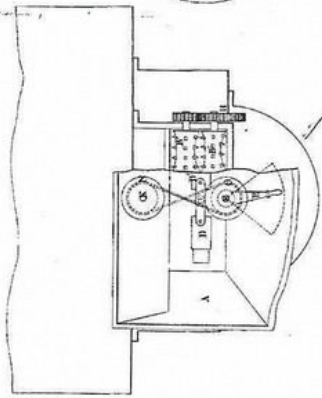


FIG. 29.

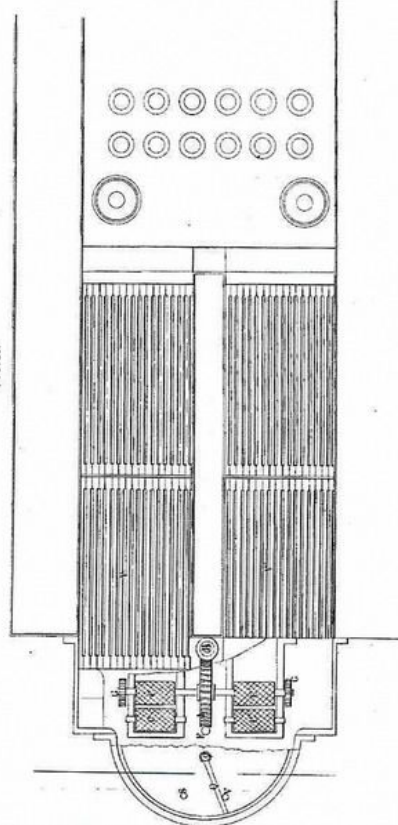


FIG. 30.



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A.D. 1860, 3rd DECEMBER. N<sup>o</sup> 2960.

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**Steam Boilers.**

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**LETTERS PATENT** to William Galloway and John Galloway, both of Manchester, in the County of Lancaster, for the Invention of "IMPROVEMENTS IN STEAM BOILERS."

Sealed the 28th May 1861, and dated the 3rd December 1860.

---

**PROVISIONAL SPECIFICATION** left by the said William Galloway and John Galloway at the Office of the Commissioners of Patents with their Petition, on the 3rd December 1860.

We, WILLIAM GALLOWAY and JOHN GALLOWAY, both of Manchester, in the County of Lancaster, do hereby declare the nature of the said Invention for "IMPROVEMENTS IN STEAM BOILERS," to be as follows:—

Our Invention relates to improvements in steam boilers of a form originally described, we believe, in the Specification of a Patent granted to David Napier on the Ninth day of August, One thousand eight hundred and  
10 forty-two, No. 9439. In these boilers an outer shell, generally of cylindrical form, with dome top, contains a cylindrical fire-box, at or near the bottom of which are the fire-bars. From the centre of the top of the fire-box the chimney is conducted upwards through the outer shell. Inside the fire-box, and a little distance above the fire, is a shallow circular box, connected by a  
15 number of small vertical tubes with the top of the fire-box, and also connected at one or more points with some part of the water casing, so as to promote circulation through the tubes. The flame strikes first against the bottom of

[Price 8d.]

FIG. 1.

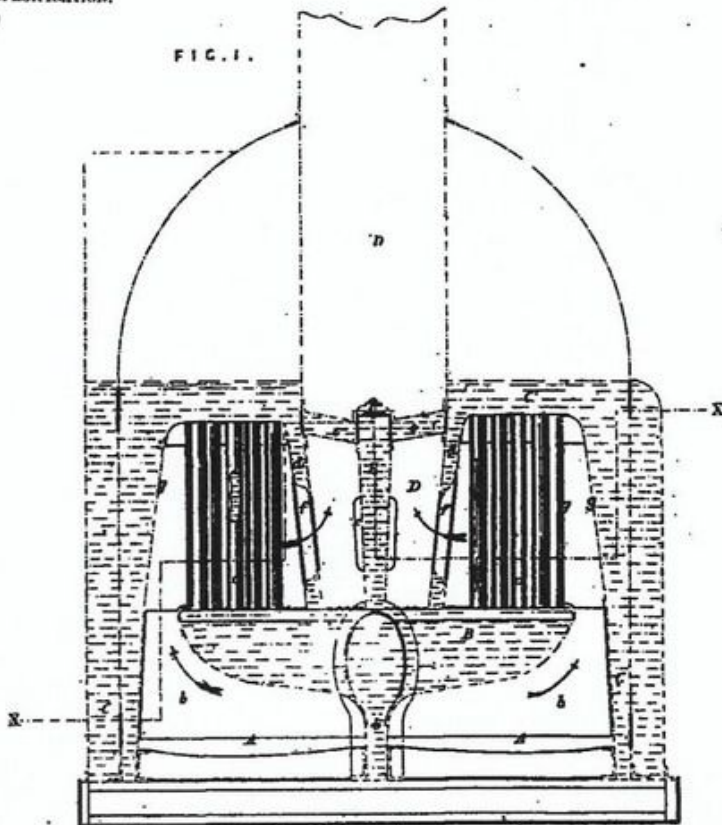
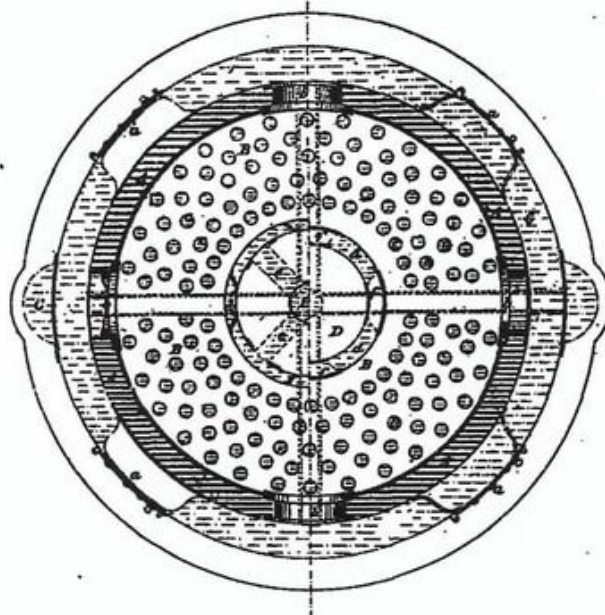


FIG. 2.  
Sectional Plan on line X.X.



The filed drawing is colored

A.D. 1860. Dec. 3. N: 2960.  
W. & J. GALLOWAY'S SPECIFICATION.  
(2<sup>nd</sup> Edition)

(5 SHEETS)  
SHEET 1.  
PLATE 1.

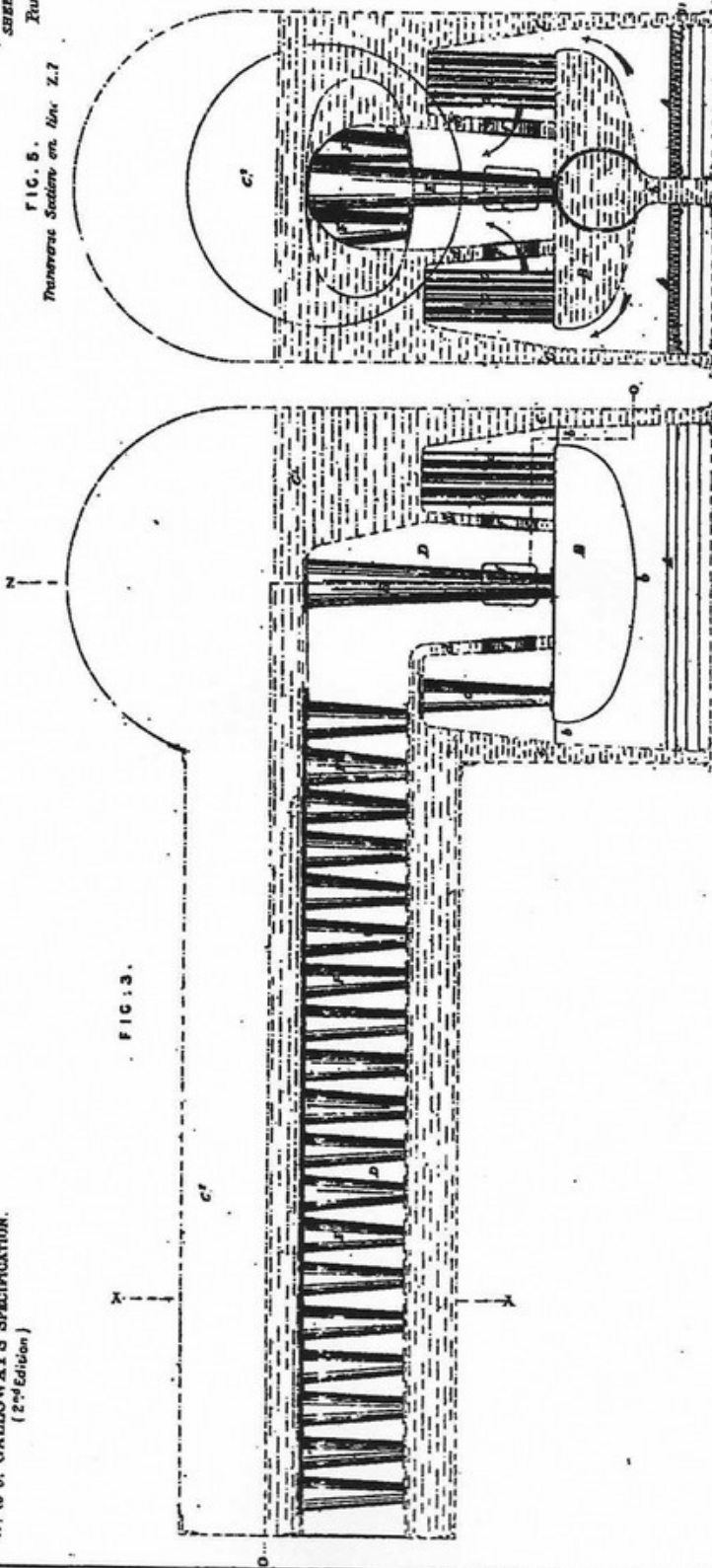


FIG. 3.  
Transverse Section on line X. X.

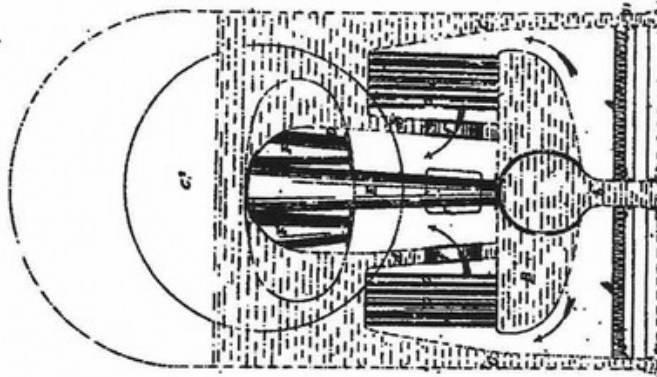


FIG. 4.  
Sectional Plan on line O. O.

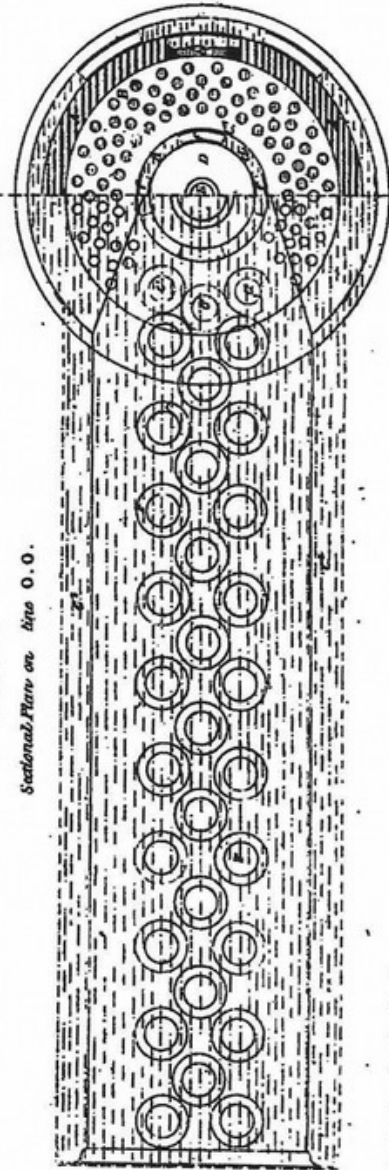
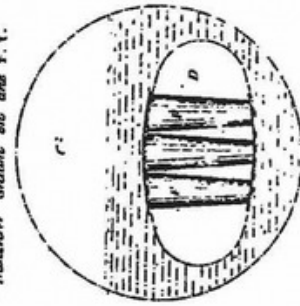


FIG. 5.  
Transverse Section on line Y. Y.



This filed drawing is colored.



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A.D. 1861, 6th AUGUST, N<sup>o</sup> 1948.

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Steam Boilers, &c.

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**LETTERS PATENT** to William Galloway and John Galloway, of the City of Manchester, Engineers, and John William Wilson, of Barnsley, in the County of York, Timber Merchant, for the Invention of "**IMPROVEMENTS IN STEAM BOILERS, AND IN APPARATUS CONNECTED THEREWITH.**"

Sealed the 5th February 1862, and dated the 6th August 1861.

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**PROVISIONAL SPECIFICATION** left by the said William Galloway, John Galloway, and John William Wilson, at the Office of the Commissioners of Patents, with their Petition, on the 6th August 1861.

We, **WILLIAM GALLOWAY** and **JOHN GALLOWAY**, of the City of Manchester, Engineers, and **JOHN WILLIAM WILSON**, of Barnsley, in the County of York, Timber Merchant, do hereby declare the nature of the said Invention for "**IMPROVEMENTS IN STEAM BOILERS, AND IN APPARATUS CONNECTED THEREWITH,**" to be as follows:—

The nature of our Invention consists, first, in an improved combination and  
10 arrangement of parts forming a vertical steam boiler, wherein two or more sets or stories of tubes connected by water chambers are employed, or can be introduced. In performing this part of our Invention we place the fire-grate at the lower part of the boiler, the products of combustion pass around or through vertical or horizontal tubes, and then round a water chamber, after  
15 that they circulate through or around other tubes, and then around a second water chamber; additional sets or stories of tubes and water chambers may

[Price 8d.]



*W. and J. Galloway & Wilson's Improvements in Steam Boilers, &c.*

be used. The products of combustion then enter the chimney or a flue in communication with the chimney. The fire-grate is either stationary or revolving, and it is in some cases divided into two parts by fire-bricks, or by a water partition, each part being supplied with fuel by a separate door. When a water partition is used, vertical pipes open to the atmosphere, or connected to a blast, are introduced for supplying air to assist the combustion.

Our improvements in horizontal boilers with two furnaces consist in applying two water chambers beyond and near the bridge, projecting from the sides of the flue, the object of which is to divert the currents of the products of combustion, and thus to increase the consumption of the smoke.

Another part of our Invention consists in making the bridge into a water chamber, which is connected by vertical tubes to the upper part of the flue, to insure circulation in the water.

Another part of our Invention consists in applying glasses to the shell of the boiler, through one of which light is reflected, and through the other the interior of the boiler can be examined when the boiler is at work.

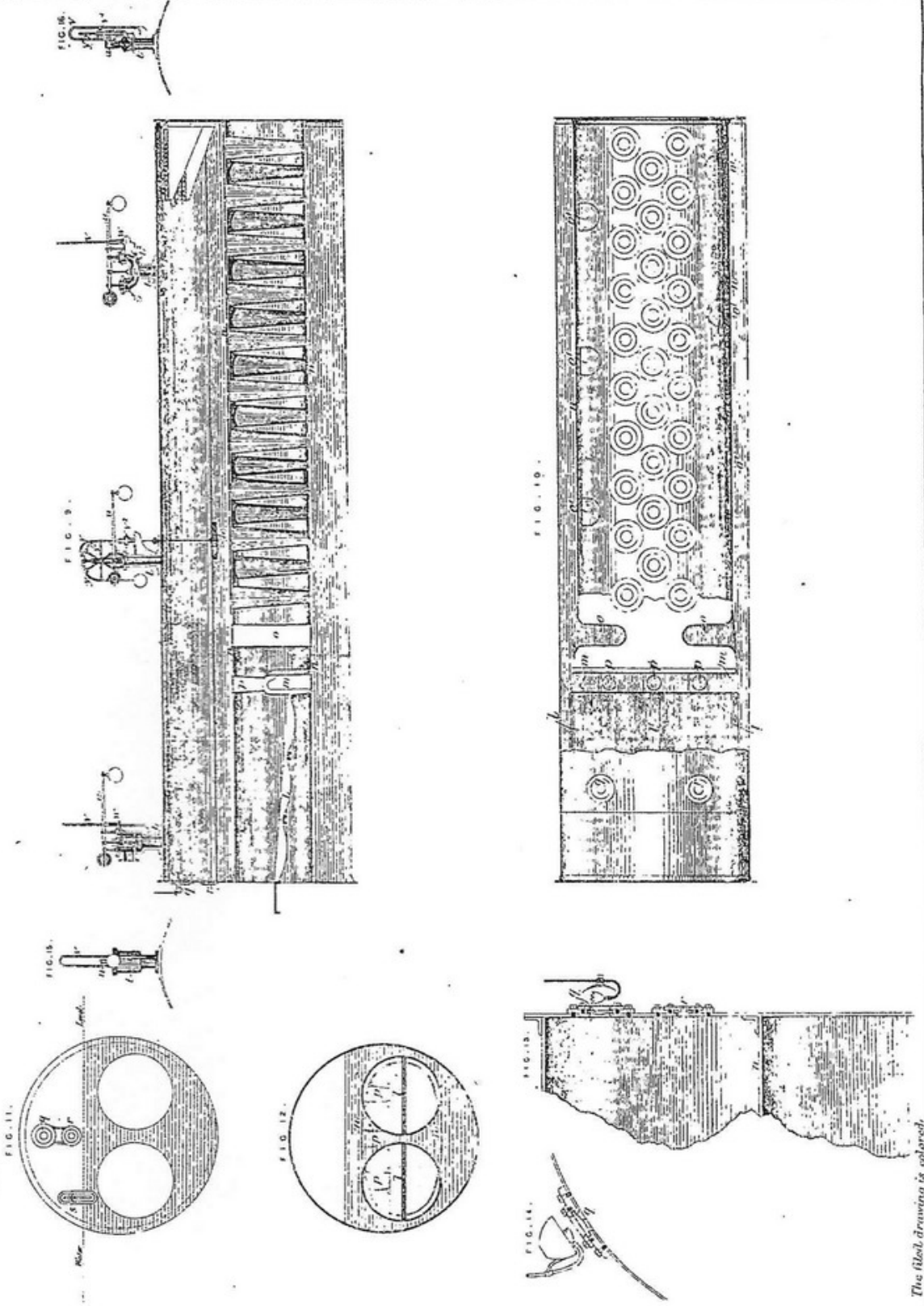
Another part of our Invention consists in dispensing with the taps and detached glass tubes or plates now employed for ascertaining the level of the water in the boiler, and in applying a glass plate to the end of the boiler, through which the level of the water can be seen.

The last part of our Invention relates to safety valves. Our improvements consist in admitting the steam from the boiler to a bent tube, the end of which is in connection with a ram or disc acting on the lever of the safety valve, which is either single acting or duplex.

Another of our improvements in safety valves consists in connecting two valves to the same weighted lever, one valve opening outwards, and the other inwards. The bent tube with the ram or disc above referred to, acts in the same manner on the weighted lever.

Our further improvements in safety valves consist in applying a water float and wheel in connection with a tap in the bent tube above referred to; this tap is opened by the action of the float when the water descends below its proper working level, thus admitting steam to the ram or disc before referred to, and causing the weighted lever to lift the safety valve, and thus to allow the steam to blow off when the water descends to an unsafe level.





The fibel drawing is colored.