

# **Specification of Andrew Robertson and Alexander Ritchie : steam boiler and other furnaces, &c.;**

## **Contributors**

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Ritchie, Alexander.

## **Publication/Creation**

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A.D. 1860, *17th May.* N° 1218.

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S P E C I F I C A T I O N

OF

ANDREW ROBERTSON  
AND  
ALEXANDER RITCHIE.

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STEAM BOILER AND OTHER FURNACES, &c.

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L O N D O N :

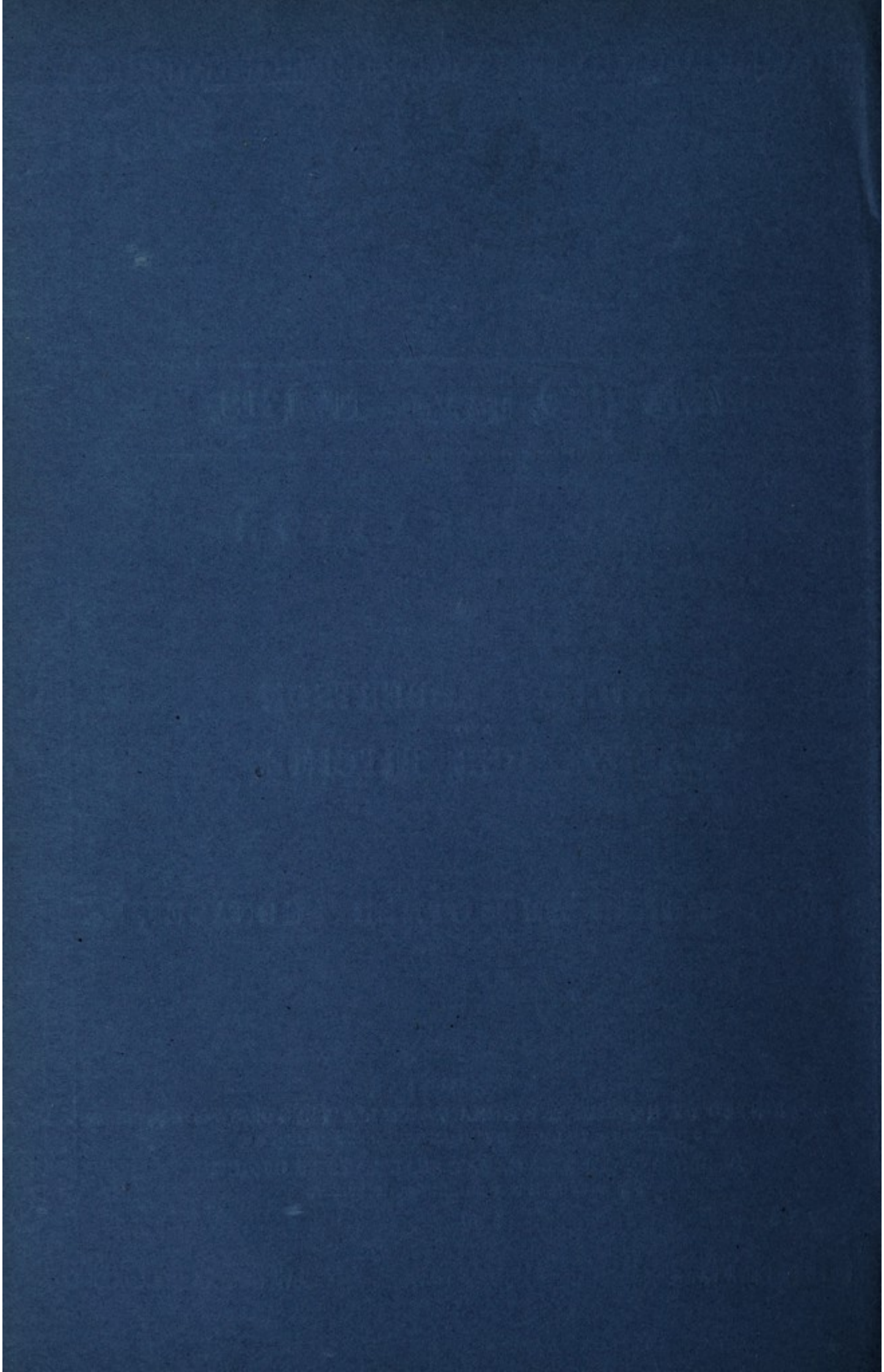
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*Price 10d.*

1860.









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A.D. 1860, 17th *MAY*. N° 1218.

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**Steam Boiler and other Furnaces, &c.**

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**LETTERS PATENT** to Andrew Robertson, of Neilston, in the County of Renfrew, Bleacher, and Alexander Ritchie, of Glasgow, in the County of Lanark, North Britain, Accountant, for the Invention of "**IMPROVEMENTS IN STEAM BOILER AND OTHER FURNACES, AND IN THE PREVENTION OF SMOKE.**"

Sealed the 9th November 1860, and dated the 17th May 1860.

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**PROVISIONAL SPECIFICATION** left by the said Andrew Robertson and Alexander Ritchie at the Office of the Commissioners of Patents, with their Petition, on the 17th May 1860.

We, **ANDREW ROBERTSON**, of Neilston, in the County of Renfrew, Bleacher,  
5 and **ALEXANDER RITCHIE**, of Glasgow, in the County of Lanark, Accountant,  
do hereby declare the nature of the said Invention of "**IMPROVEMENTS IN  
STEAM BOILER AND OTHER FURNACES, AND IN THE PREVENTION OF SMOKE,**" to be as  
follows, that is to say :—

This Invention relates to improved means for preventing smoke, and for  
10 increasing the calorific effect in furnaces of various kinds, and to improved  
arrangements in connection with steam boilers for the better application  
thereto of the heat evolved.

The Invention consists, in the first place, in systematically and constantly  
admitting air from the ash-pit through and between the fire-bars, by preference  
15 at their front ends, the extent of aperture being regulated, according to one  
plan, by simply arranging the fuel so as to uncover the front ends of the fire



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*Robertson & Ritchie's Improvements in Steam Boiler and other Furnaces, &c.*

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bars more or less. Special contrivances may be adopted in connection with this plan, and to assist in carrying it out, but without such it is capable of more or less complete application to almost all ordinary furnaces.

The second part of the Invention consists in admitting into the inside of hollow furnace bars, or equivalent tubular passages, streams of water or steam, which will escape from apertures of a regulated size immediately in front of the fire or at other points, the intention being to effect the decomposition of the water or steam, so that its component gases may contribute to the effect of the fire.

According to the third part of the Invention, which refers to the application to a steam boiler of the heat obtained in the furnace, the fire grate is situated apart from the boiler, and the fire gases are admitted into the upper part of a chamber or of spaces wherein the heat is to be applied to the boiler.

According to one modification the chamber constitutes a kind of oven, surrounding the boiler up to within a few inches of the water line, and is made of sufficient size, as compared with the outlet passage, for the fire gases, to insure these gases being kept for a considerable time in contact with the boiler surface, and to cause, as it were, an accumulation of heat in the chamber. The outlet from the chamber for the fire gases is situated at the lowest part of the chamber, and at the point most distant from the furnace, so that the gases which issue at it shall be what have become partly cooled from having communicated heat to the boiler. The boiler may be of various forms, and the heating space or spaces may be wholly external, partly external and partly internal, or wholly internal, and within the outer shell of the boiler, provided the final outlet is arranged to take away the coolest or most exhausted portions of the gases, and is of so small an area, as compared with the heating chamber or spaces, as to insure the gases being in contact with the boiler surface a considerable time as compared with what occurs with ordinary steam boiler furnaces.

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**SPECIFICATION** in pursuance of the conditions of the Letters Patent, filed by the said Andrew Robertson and Alexander Ritchie in the Great Seal Patent Office on the 17th November 1860.

**TO ALL TO WHOM THESE PRESENTS SHALL COME**, we, **ANDREW ROBERTSON**, of Neilston, in the County of Renfrew, Bleacher, and **ALEXANDER RITCHIE**, of Glasgow, in the County of Lanark, North Britain, Accountant, send greeting.



*Robertson & Ritchie's Improvements in Steam Boiler and other Furnaces, &c.*

WHEREAS Her most Excellent Majesty Queen Victoria, by Her Letters Patent, bearing date the Seventeenth day of May, in the year of our Lord One thousand eight hundred and sixty, in the twenty-third year of Her reign, did, for Herself, Her heirs and successors, give and grant unto us, the  
5 said Andrew Robertson and Alexander Ritchie, Her special licence that we, the said Andrew Robertson and Alexander Ritchie, our executors, administrators, and assigns, or such others as we, the said Andrew Robertson and Alexander Ritchie, our executors, administrators, and assigns, should at any time agree with, and no others, from time to time and at all times there-  
10 after 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 "IMPROVEMENTS IN STEAM BOILER AND OTHER FURNACES, AND IN THE PREVENTION OF SMOKE," upon the condition (amongst others) that we, the said Andrew Robertson and  
15 Alexander Ritchie, our executors or administrators, by an instrument in writing under our, 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 we, the said Andrew Robertson and Alexander Ritchie, do hereby declare the nature of our said Invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement in writing, reference being  
25 had to the accompanying Drawings and to the letters and figures marked thereon, that is to say:—

Our said Invention relates to improved means for preventing smoke, and for increasing the calorific effect in furnaces of various kinds, and to improved arrangements in connection with steam boilers, for the better application  
30 thereto of the heat evolved.

And in order that our said Invention may be properly understood and carried into effect, we have hereunto appended a Sheet of explanatory Drawings, to which we shall refer in particularly describing the application of our improvements.

35 The present Invention has partly for object the combining of sundry additional improvements, developments, or extended applications relating to the obtainment and application of heat, with a certain system or procedure for preventing smoke, already protected by Letters Patent for Great Britain,



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*Robertson & Ritchie's Improvements in Steam Boiler and other Furnaces, &c.*

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granted to Andrew Robertson, one of the present Patentees, on or about the 11th May 1860 (No. 1166).

The said system, the application of which to ordinary furnaces is more fully detailed in the Specification of the Letters Patent referred to, may here be briefly stated to consist in admitting air from below through the front ends of the fire bars kept uncovered to the requisite extent. In some cases a defining bar A is used to limit or determine the amount of opening, as shown in Figure 1 of the accompanying Drawings, which is a longitudinal vertical section of a steam boiler furnace, embodying a modification of our several improvements.

Figure 2 is a longitudinal vertical section, showing another modification of our improved arrangements, and Figure 3 is a transverse vertical section through the boiler and external heating space or chamber corresponding to both Figures 1 and 2. In other cases a separate grating or set of smaller bars B is fitted in front and continuation of the main fire bars C, as shown in Figure 2, the air passing through this grating B, which is provided with a valve or slide D for regulating or adjusting the quantity admitted. In combination with such admission of air, we, by the present Invention, admit into the inside of hollow furnace bars, or equivalent tubular passages, streams of water or steam, which will escape from apertures of a regulated size in front or at other parts of the fire, the intention being to effect the decomposition of the water or steam, so that its component gases may contribute to the effect of the fire.

In Figure 2 of the accompanying Drawings we show one convenient modification of arrangements for practically carrying out this part of our Invention. Instead of altering the ordinary fire bars C, we in this instance introduce the water or steam into the bearers E thereof, made hollow for the purpose. Between these hollow bearers E, and communicating with them, a series of small tubes F are placed, so as to lie between the fire bars C, and it is these tubes F which are perforated for the escape of the water or steam for the purpose herein-before pointed out.

According to another portion of the present Invention, which refers to the application to a steam boiler of the heat obtained in the furnace, the fire grate or chamber G, for combustion or the obtainment of heat, is situated apart from the boiler H, in order that a too early taking up of heat by the boiler may not check the thorough combustion or heat-yielding combination of the matters in the furnace, that is to say, of the constituents of the fuel, water, and air. This system may be practically carried out according to its simplest



*Robertson & Ritchie's Improvements in Steam Boiler and other Furnaces, &c.*

modification by means of the arrangements shown in Figure 1 of the accompanying Drawings. Here the evolution and combustion chamber G is separated from what may be termed the application chamber I, by a bridge or partition J, and the fire gases are admitted into the application chamber I 5 by an opening K, by preference at the upper part of the partition. The chamber I constitutes a kind of oven surrounding the boiler H up to within a few inches of the water line. In this instance the boiler H is a plain cylindrical one, with hemispherical ends built into its place, and supported by stools L a short distance above the bottom of the chamber I. This chamber I 10 is made of a large size as compared with the inlet K and outlet M, for the fire gases, to insure these being kept for a considerable time in contact with the boiler surface, and to cause, as it were, an accumulation of heat in the chamber. The outlet M for the fire gases is situated at the lowest part of the chamber I, and at the point most distant from the inlet K from the 15 furnace or evolution and combustion chamber G, so that the gases which issue at this outlet shall be what have become partly cooled from having communicated heat to the boiler. The boiler may be of various forms, and the space or spaces for the application thereto of the heat may be either external or internal, or both, provided the heat is obtained in a furnace or 20 chamber apart, and provided the outlet is arranged distinct from the inlet, and so as to take away the coolest or most exhausted portions of the gases, and is of so small an area, as compared with the heating or application chamber or spaces, as to insure the gases being in contact with the boiler surface a considerable time, as compared with what occurs with ordinary steam boiler 25 furnaces. To further insure the thorough development of heat obtainable from the combustible gases prior to its application to the boiler, we in some cases employ a separate evolution chamber G<sup>1</sup>, with a combustion chamber G<sup>2</sup>, as shown in Figure 2, instead of the single furnace G (Figure 1). The chambers G<sup>1</sup>, G<sup>2</sup>, are separated by a partition or bridge N, the upper parts 30 of which consists of bricks arranged with numerous interstices for the passage across of the gases in separate streams, so as to induce a thorough comingling in the combustion chamber G<sup>2</sup>. With this arrangement the gases evolved in or introduced into the chamber G<sup>1</sup>, and only partially ignited therein, will in the chamber G<sup>2</sup> become more completely ignited, and the combustion in this 35 second chamber may be assisted and the calorific effect further increased by the admission into it of steam, and in some cases air also. In Figure 2 the ash-pit O is shown closed, provision being made for introducing the air by a passage P, opening just beneath the inner end of the fire bars C, in consequence of which the air entering at B will take up and utilise heat radiated



*Robertson & Ritchie's Improvements in Steam Boiler and other Furnaces, &c.*

into the ash-pit O. The air entering by the passage P may also be otherwise heated, and it may be forced in by a fan or otherwise. For the purpose of supplying air, if found advantageous, to the gases in the combustion chamber G<sup>2</sup>, the air passage P is formed with a branch Q, communicating with that chamber by a perforated tile, which causes it to enter in numerous small streams, and at the same part a branch water or steam pipe R is also introduced. Valves may, of course, be applied to regulate the quantity of air, water, or steam thus admitted. Finally, in case the gases should not be completely ignited on leaving the combustion chamber G<sup>2</sup>, a pipe S is provided for introducing a small regulated quantity of air into the front end of the application chamber I.

Having thus particularly described our said Invention, and the manner in which the same is or may be used or carried into effect, we have to state that we do not restrict ourselves to the precise details herein described or delineated, but that what we consider to be novel and original, and claim as the Invention secured to us by the herein-before in part recited Letters Patent, is, generally the combined system of obtaining and applying heat and preventing smoke in connection with steam boiler and other furnaces, substantially as herein-before described, and the employing, in connection with steam boilers, of external or internal heat-application spaces or chambers distinct from the heat-obtainment furnace chamber or chambers, and with an outlet situated so as to take away the coolest or most exhausted portions of the fire gases, substantially as herein-before described.

In witness whereof, we, the said Andrew Robertson and Alexander Ritchie, have hereunto set our hands and seals, this Fifteenth day of November, in the year of our Lord One thousand eight hundred and sixty.

ANDREW ROBERTSON. (L.S.)

ALEX. RITCHIE. (L.S.)

Witness,

EDMUND HUNT, Patent Agent,  
28, St. Enoch Square,  
Glasgow.

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Printed by GEORGE EDWARD EYRE and WILLIAM SPOTTISWOODE,  
Printers to the Queen's most Excellent Majesty. 1860.



FIG. 1.

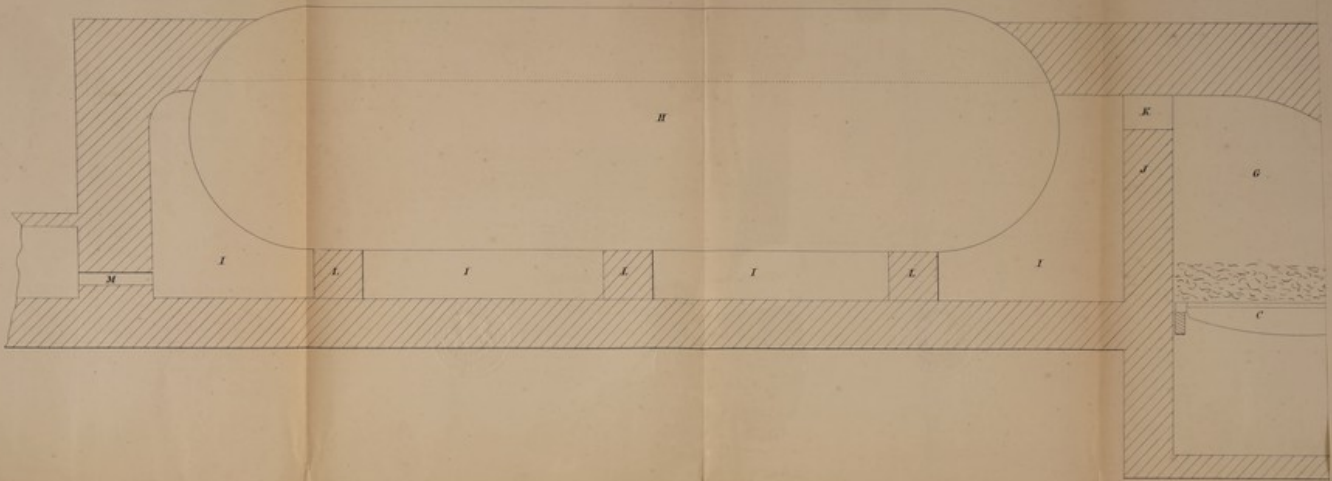


FIG. 3.

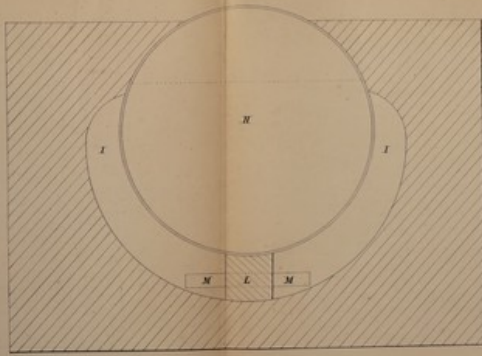
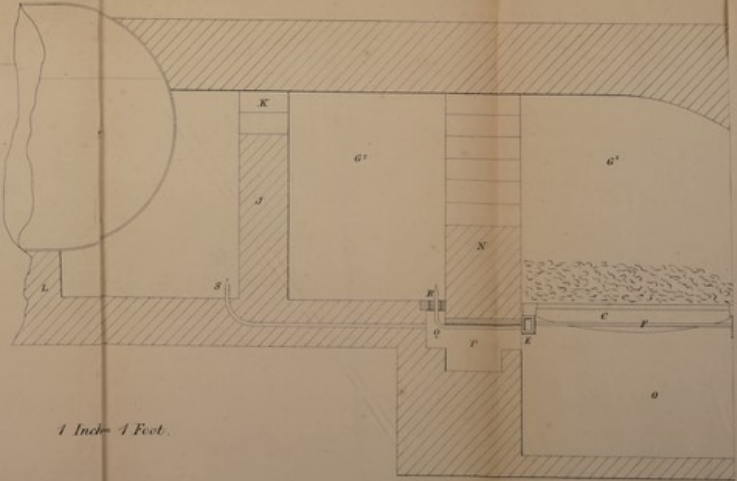


FIG. 2.



1 Inch = 4 Feet.

The filed drawing is not colored.



The first drawing is not colored.