(No Model.)

3 Sheets—Sheet 1.

E. GILLET.

BOILER.

No. 414,806. Patented Nov. 12, 1889.

Fig. 1.

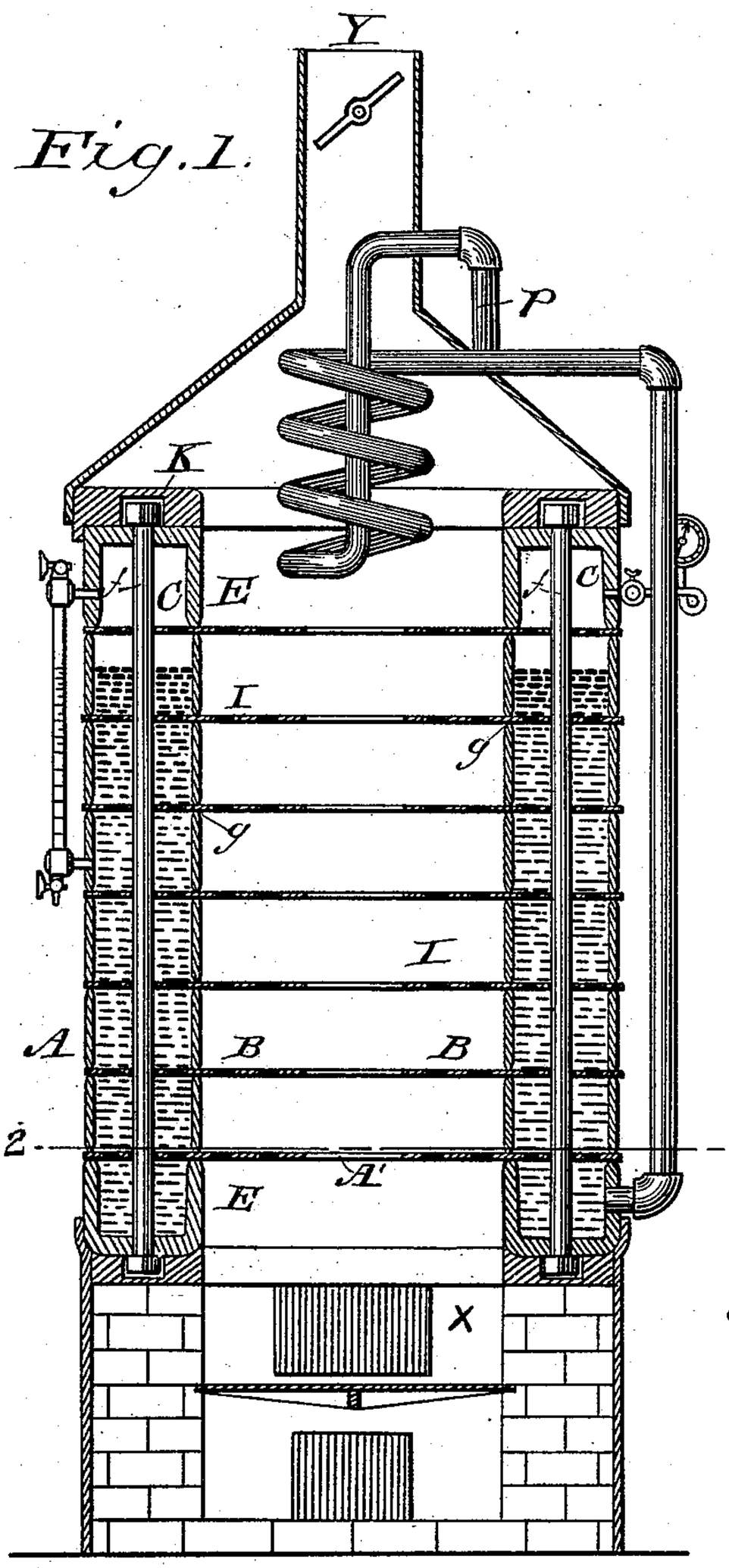


Fig. 3

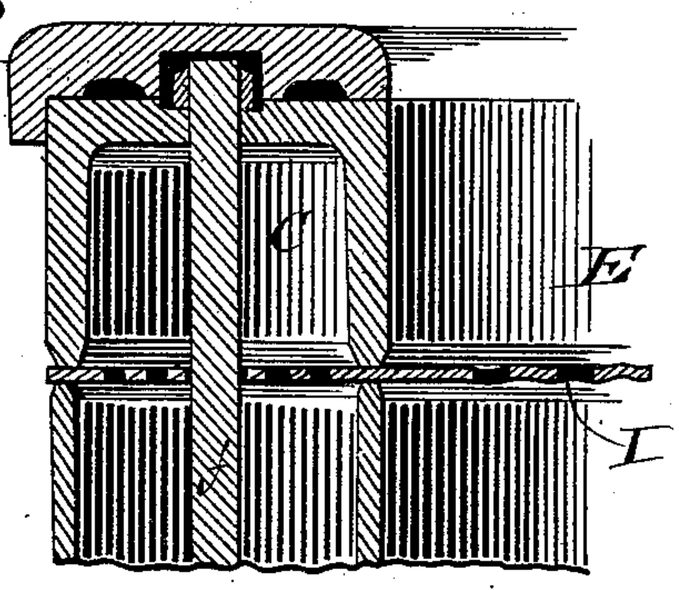


Fig. 2.

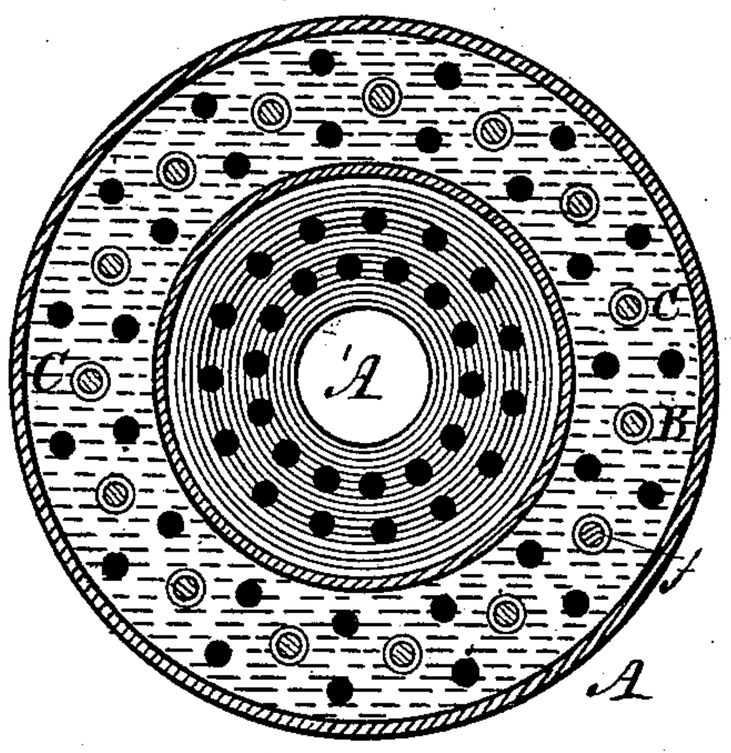
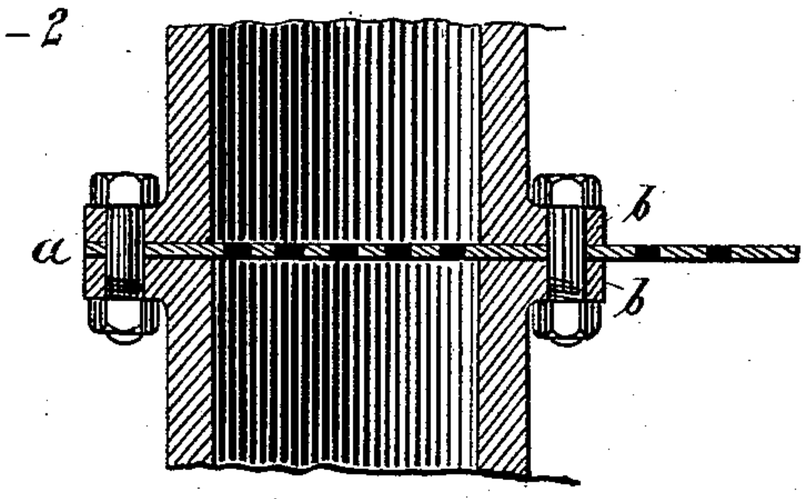


Fig. 4.



WITNESSES

H. C. Newman.
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Etienne Gillet.

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(No Model.) 3 Sheets—Sheet 2.

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Fig. 6.

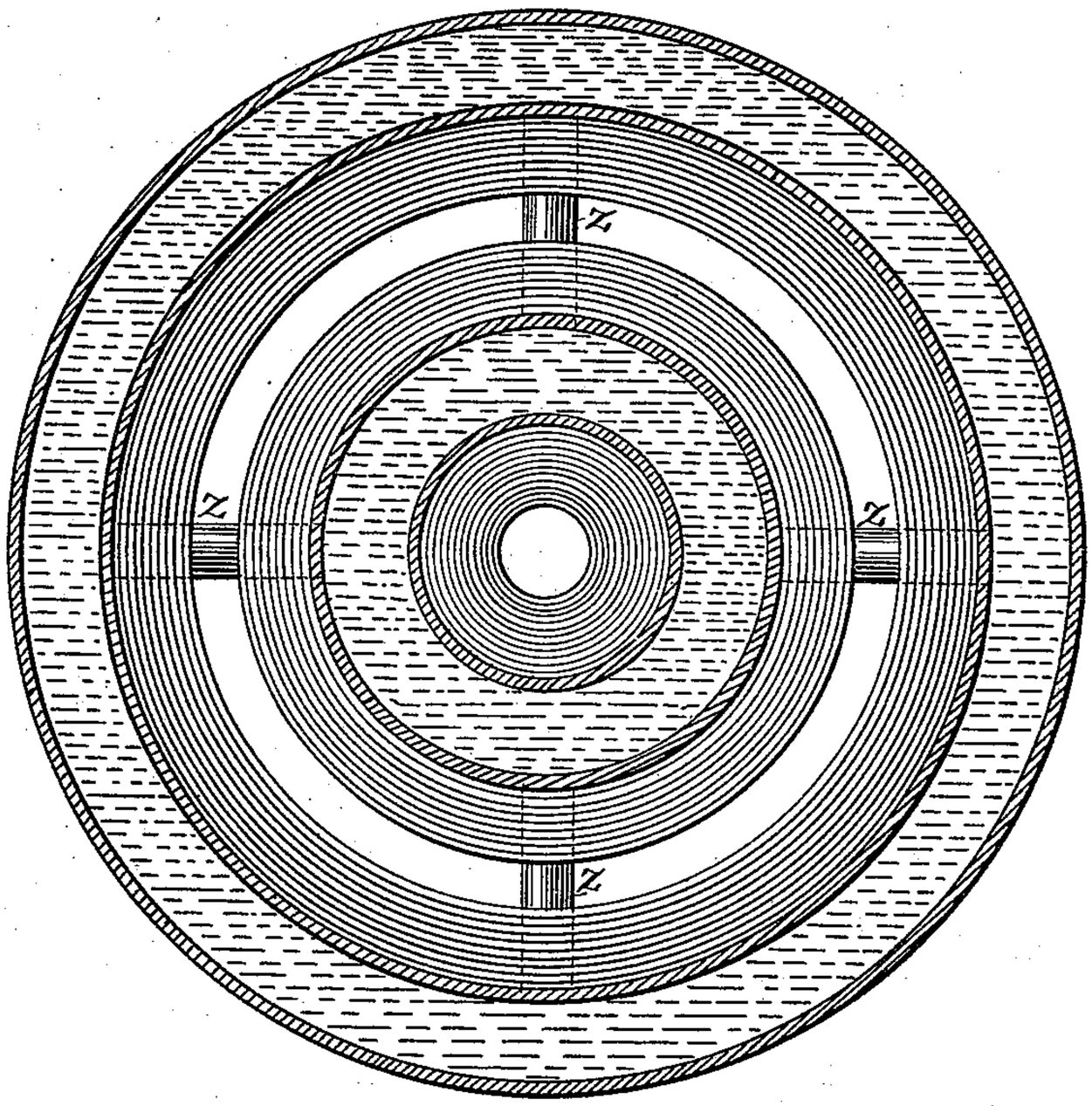

Fig. 5.

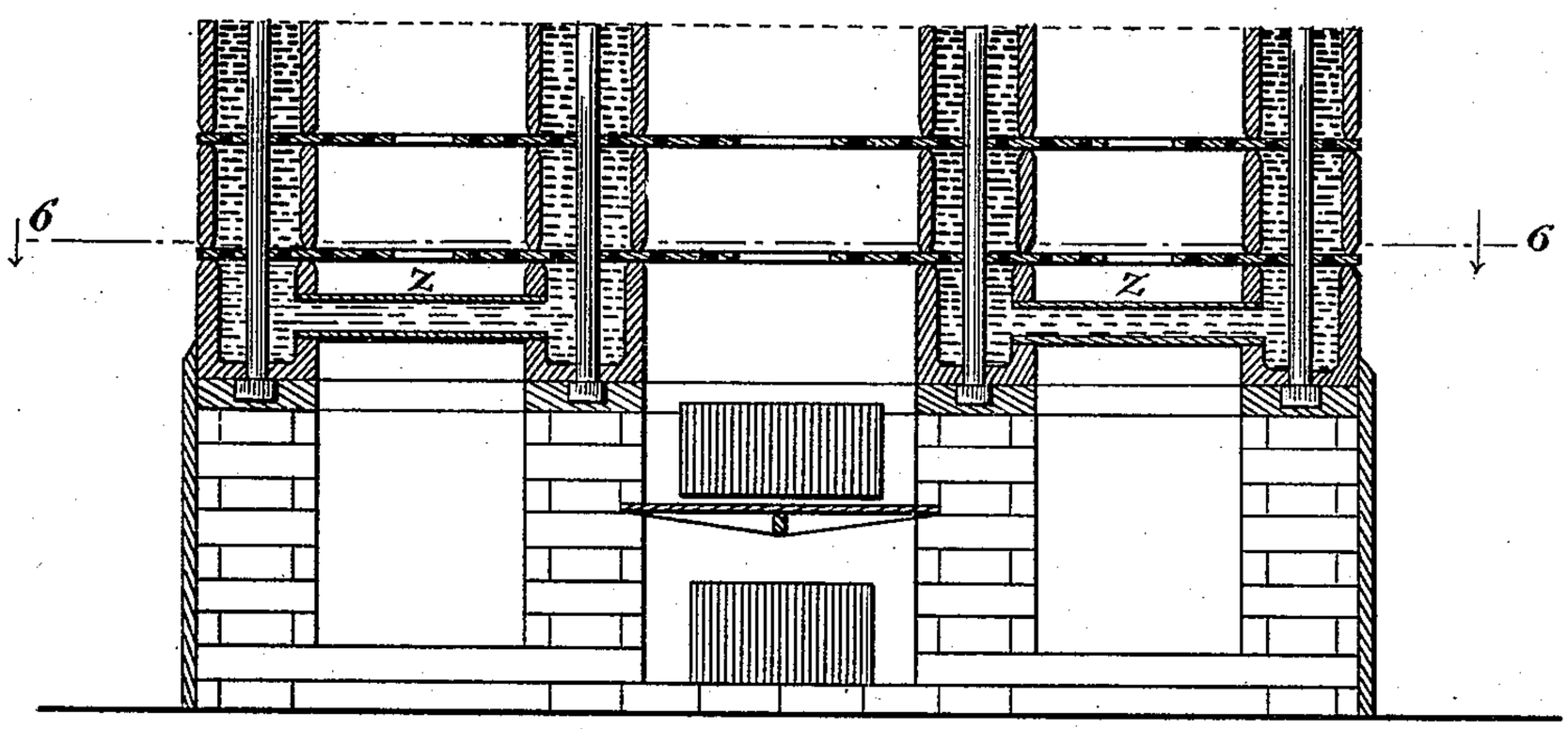

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Fig. 7.

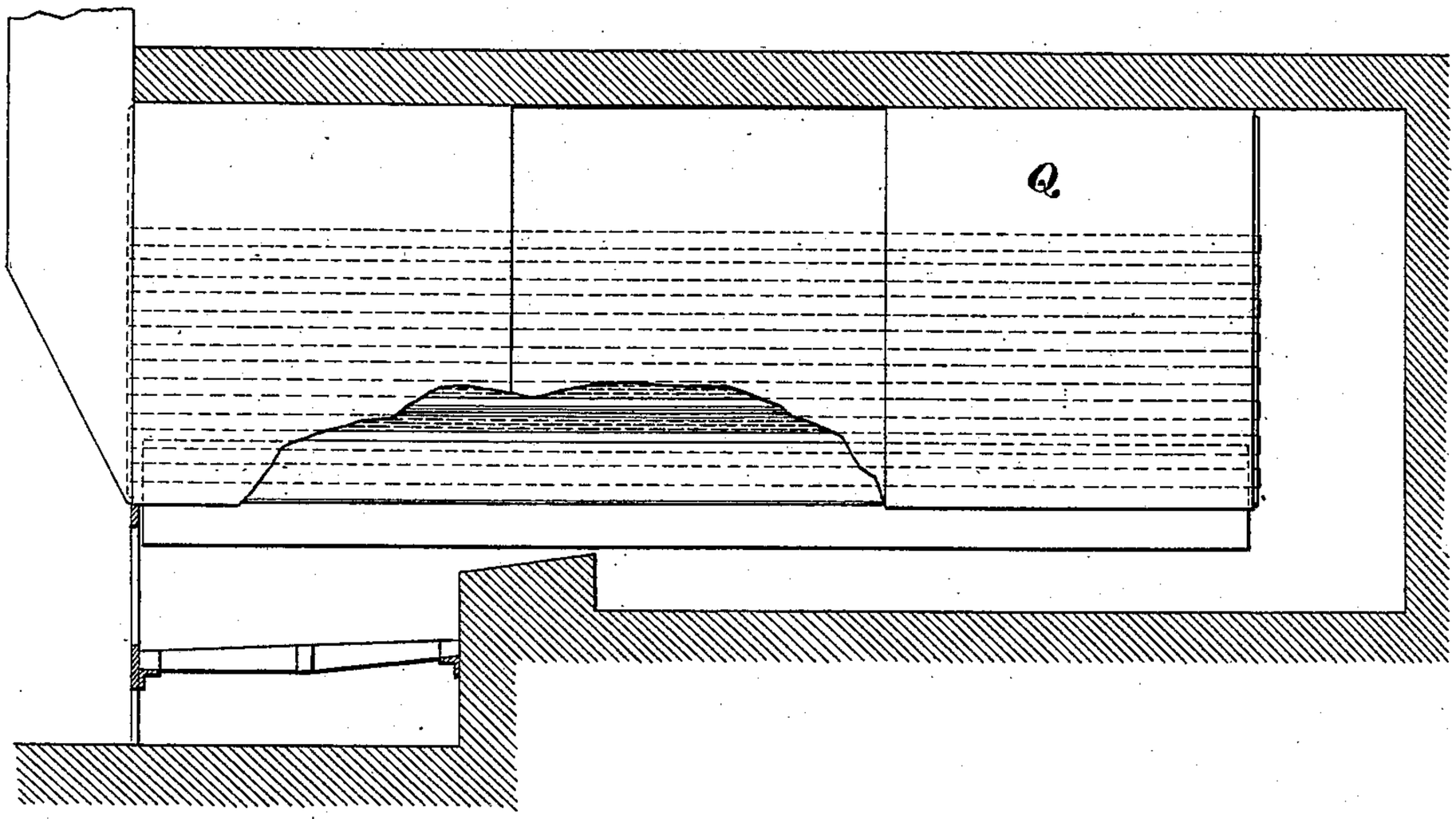
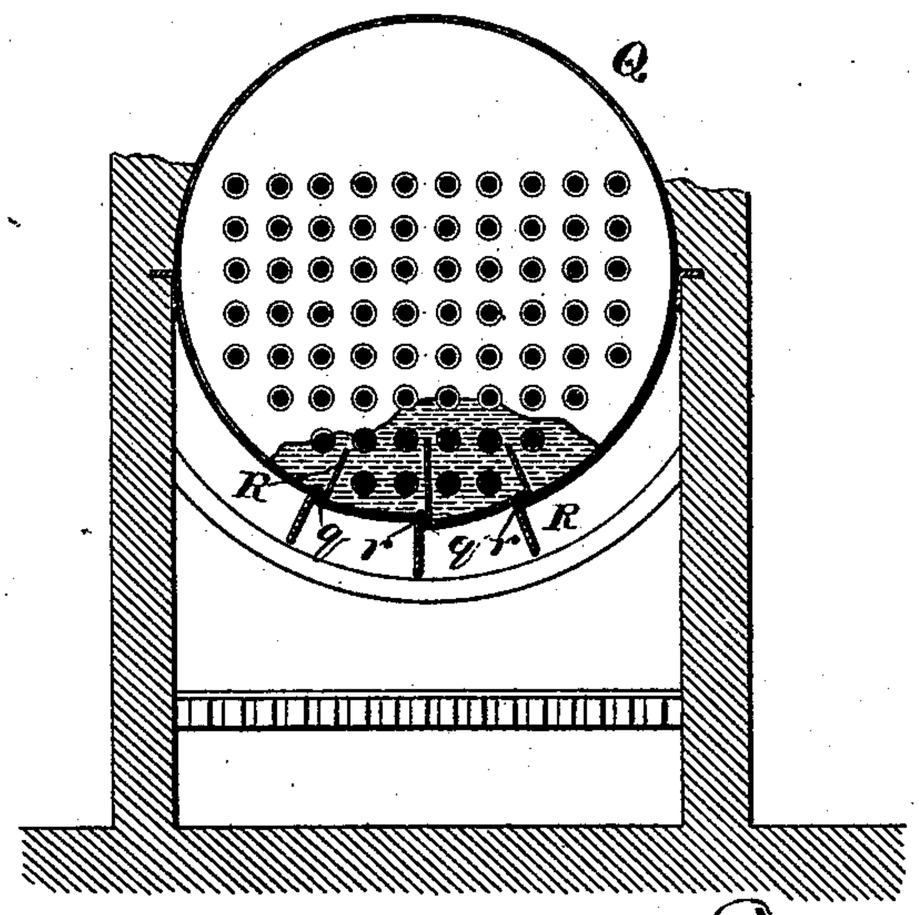


Fig. 8.



Attest:

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Inventor:

Etienne Gillet

By Baldwin, Davidson & Wright

His Attorneys.

UNITED STATES PATENT OFFICE.

ETIENNE GILLET, OF NEW YORK, N. Y., ASSIGNOR TO ELIZABETH ALINE GILLET, OF SAME PLACE.

BOILER.

SPECIFICATION forming part of Letters Patent No. 414,806, dated November 12, 1889.

Application filed May 11, 1888. Serial No. 273,639. (No model.)

To all whom it may concern:

Be it known that I, ETIENNE GILLET, a citizen of the United States, residing in the city of New York, in the State of New York, have invented certain new and useful Improvements in Boilers, of which the following is a specification.

In steam-boilers, notwithstanding the advances which have been made, there is an enormous waste of heat carried off with the products of combustion, and the percentage of efficiency compared with the amount of heat liberated by the combustion of the fuel is comparatively small.

The primary object of my invention is to improve the construction and increase the efficiency of steam-boilers.

In carrying out my invention I increase the heating-surface in a boiler of any given dimensions far beyond anything heretofore attained, and, in fact, may readily increase the boiler-surface to any desired degree deemed expedient in view of the amount of fuel consumed and the work to be done.

All the structural and economical features of my invention will be clearly apparent from the following description and accompanying drawings, in which I have described and illustrated one practical and efficient embodiment of the invention.

That other forms of boilers than that shown in the drawings, utilizing the principles of construction herein described, may be made and used with advantage, and that, in boilers of the general type illustrated, the details of construction and manner of connecting or assembling the parts may be varied, there is no doubt.

In the accompanying drawings, Figure 1 is a vertical longitudinal section through one form of boiler embodying the principles of my invention; Fig. 2, a transverse section on the line 2 2 of Fig. 1; Fig. 3, a detail sectional view illustrating one manner of joining the boiler-sections, and also showing a cast-iron cap-plate for protecting the top of the boiler; Fig. 4, a detail sectional view illustrating another way of uniting the boiler-sections; Fig. 5, a vertical longitudinal section through a portion of a compound boiler having concentric boilers constructed and provided with surface-increasing plates after the manner shown in Fig. 1. Fig. 6 is a horizontal section through the same on line 6 6 of Fig. 5, omitting the tie-bolts and perforations in plates; and Fig. 7 is a side and Fig. 8 an end view illustrating an ordinary tubular boiler having surface-increasing plates introduced at some of the joints.

The boiler illustrated is formed in sections properly secured and clamped together, and between the sections and at each joint, if desired, I may introduce one or more plates of metal, which project into the boiler-space, and also into the combustion or heating chamber. These plates are preferably made of a metal possessing a high degree of heat-conductivity—such, for instance, as copper, or alumina, or phosphor-bronze, or other suitable metal having sufficient refractoriness to stand the temperature to which it is subjected.

A and B respectively represent exterior and interior metal rings, which may be built up one upon another to form an annular boiler-chamber C and an interior combustion-chamber A′. Preferably at the top and bottom of any such aggregation of sections forming a boiler I prefer to employ a cast-iron end section E, the end sections and all the intermediate sections being tied together by bolts or rods *f*, extending from the lower casting E through the cast-iron top piece and having suitable nuts or other fastening devices. At the joints *g* between the sections of the boiler, and preferably at each joint, I introduce metal plates I, which project into the water-space of the boiler, and also into the central combustion-chamber A′. Where the plates cross the annular boiler-chamber, and are clamped also between the exterior rings A, their portions within the boiler are perforated. They may also be perforated, as shown, where they project into the combustion-chamber; but this may be considered unnecessary, and perhaps for some reasons it may not be desirable. The plates may also be corrugated, as shown in Fig. 3. The joints between the boiler-sections and plates may of course be constructed in any manner affording sufficient strength and tightness. In the detail view, Fig. 3, I

have shown the edges of the boiler rings or sections (which preferably are carefully turned or ground) as chamfered or formed somewhat wedge-shaped. When these wedge-shaped edges are brought into contact with the relatively-soft heat-conducting plates between them and all are drawn together with sufficient force, a close joint is formed by the indentation or embedding of the edges in the surfaces of the plates; or the boiler-sections may be formed with flanges *a b* and bolted together, as indicated in Fig. 4; or any suitable joint may be employed and rendered tight, either by packing or otherwise.

The examples I have given are sufficient for illustration, and it is needless to multiply or suggest modifications either in this or other parts of the invention.

In Figs. 1 and 3, K indicates a cast-iron cover, which may be placed over the threaded ends and bolts of the tie-rod to protect them from the heat. Instead of introducing one heat-conducting plate at a joint, I may use two or more. Of course the joint would be formed in precisely the same way; but the boiler-surface will be increased. When two or more plates are employed, they would by preference be bent to stand out of contact with each other, both in the combustion-chamber and in the boiler.

X represents an ordinary fire-box, and Y the stack.

As is common in many classes of steam-boilers, the feed-water can be heated by the escaping products of combustion. This may be accomplished in the following manner: The pipe *p* from the feed-water pump passes up to the stack or upper portion of the combustion-chamber, in which it is coiled, and then passes down to the water-space of the boiler. Suitable pressure and level gages and safety-valves of any ordinary construction will be employed.

From what has been said it will be obvious that the surface-increasing plates conduct the heat from the combustion-chamber or from the products of combustion directly into the body of water within the boiler, and that consequently not only can steam be gotten up with the utmost rapidity, but a marked economy is attained, in that the heat is utilized for the formation of steam to a far greater extent than has ever before been done. Of course the sections of the boiler may be made of such size or height as may be desired to afford the necessary number of plates at the joints, and of course one or more plates will be used at a joint, according to the requirements for any given boiler. The most efficient amount of boiler-surface may be readily theoretically calculated and form a basis for the construction of the boiler, size of plates, &c.

One considerable advantage incident to my improved construction is that boilers of great or small capacity may be constructed merely by using a greater or less number of sections. For making boilers, therefore, of many different sizes it is only necessary to provide a stock of top and bottom end pieces, the intermediate boiler rings or sections, (which may be made of cast or wrought metal, but preferably of wrought metal,) and also to form certain of the sections with suitable connections for water and steam for the gages, safety-valves, &c. Then by using a greater or less number of sections a boiler of any desired capacity may be constructed. This, in connection with the surface-increasing plates, I consider an important feature of my invention.

Whenever a boiler becomes foul or incrusted, it is only necessary to loosen the tie-rods or such other holding or clamping devices as may be employed (I do not limit myself to any particular construction in this regard) and take the sections of the boiler apart. The sections and surface-increasing plates may then readily be cleaned with much less difficulty and expense than is possible with ordinary boilers, and all the parts again assembled with but slight expense and delay. The value of thus being able to clean the sections and surface-increasing plates will be readily comprehended when one considers the great difficulty, delay, and cost involved in removing incrustation from an ordinary locomotive or other tubular boiler. Where the plates are introduced into the steam-space of the boiler, one being so shown in Fig. 1, they serve as driers of the steam.

Figs. 5 and 6 show a compound boiler similar in details of construction to that illustrated in Fig. 1. Two boilers are arranged concentrically, and the surface-increasing plates project into the combustion or heating chamber and into the boiler exactly as in Fig. 1. In other words, these figures illustrate a duplication or aggregation of boilers of the type shown in Fig. 1. Each annular section of the boiler is connected with its adjoining section by one or more cross-pipes or passage-ways *z*, and all the sections will be preferably connected with a common steam space or dome. Part of the products of combustion may pass up through the central chamber and part be directed by means of suitable dampers into the chamber between the inner and outer boilers, and thence to the stack.

The invention is not limited to any specific form of plate for conducting the heat into the water. So far as I am aware I am the first to make a sectional boiler having introduced at the joints metallic surface-increasing plates or bodies. Also, aside from the peculiar type of boiler illustrated, I am, so far as I am aware, the first to introduce at the joints or seams of steam-boilers surface-increasing plates.

My invention is equally applicable to ordinary types of boilers in which surface-increasing plates may be introduced at the seams and the three plates secured by the rivets which ordinarily hold the two overlapping plates. For instance, that portion of

the ordinary boiler-surface just above the fuel in the furnace is the most active, and at this point, as well as other advantageous points where there are seams or where seams may be formed, surface-increasing plates may be introduced. Such a construction is shown in Figs. 7 and 8.

Q represents an ordinary boiler-iron boiler, at the seams *q* of which, above the fire-box and along the under face of the boiler, surface-increasing plates R are introduced. They are bent so as to leave a central portion *r*, over which the adjoining edges of the boiler-iron lap, and all three thicknesses are secured by the same rivets.

What I claim as my invention is—

1. The combination, with a sectional boiler, of heat-conducting surface-increasing plates introduced between the sections and projecting into the boiler.

2. The combination, in an annular sectional boiler, of the annular sections and annular heat-conducting surface-increasing plates introduced between the sections and projecting into the boiler and into the heating or combustion chamber.

3. The combination of the interior and exterior boiler rings or sections, superposed one upon the other so as to form an annular boiler having a central combustion-chamber, and heat-conducting plates clamped between the rings and extending into the boiler and into the combustion-chamber.

4. The combination of the boiler sections or rings, the heat-conducting plates introduced at the joints, and the tie-rods for binding the parts together.

5. In a steam-boiler, the combination, with the boiler, of heat-conducting surface-increasing plates introduced at the joints of the boiler and projecting into the water-space.

6. The combination, with a steam-boiler having seams or joints, of heat-conducting surface-increasing plates introduced at such seams or joints and extending into the boiler and into a heating or combustion chamber of the boiler.

In testimony whereof I have hereunto subscribed my name.

ETIENNE GILLET.

Witnesses:

LOUIS E. DELOW,

EDWARD C. DAVIDSON.