

No. 665,515.

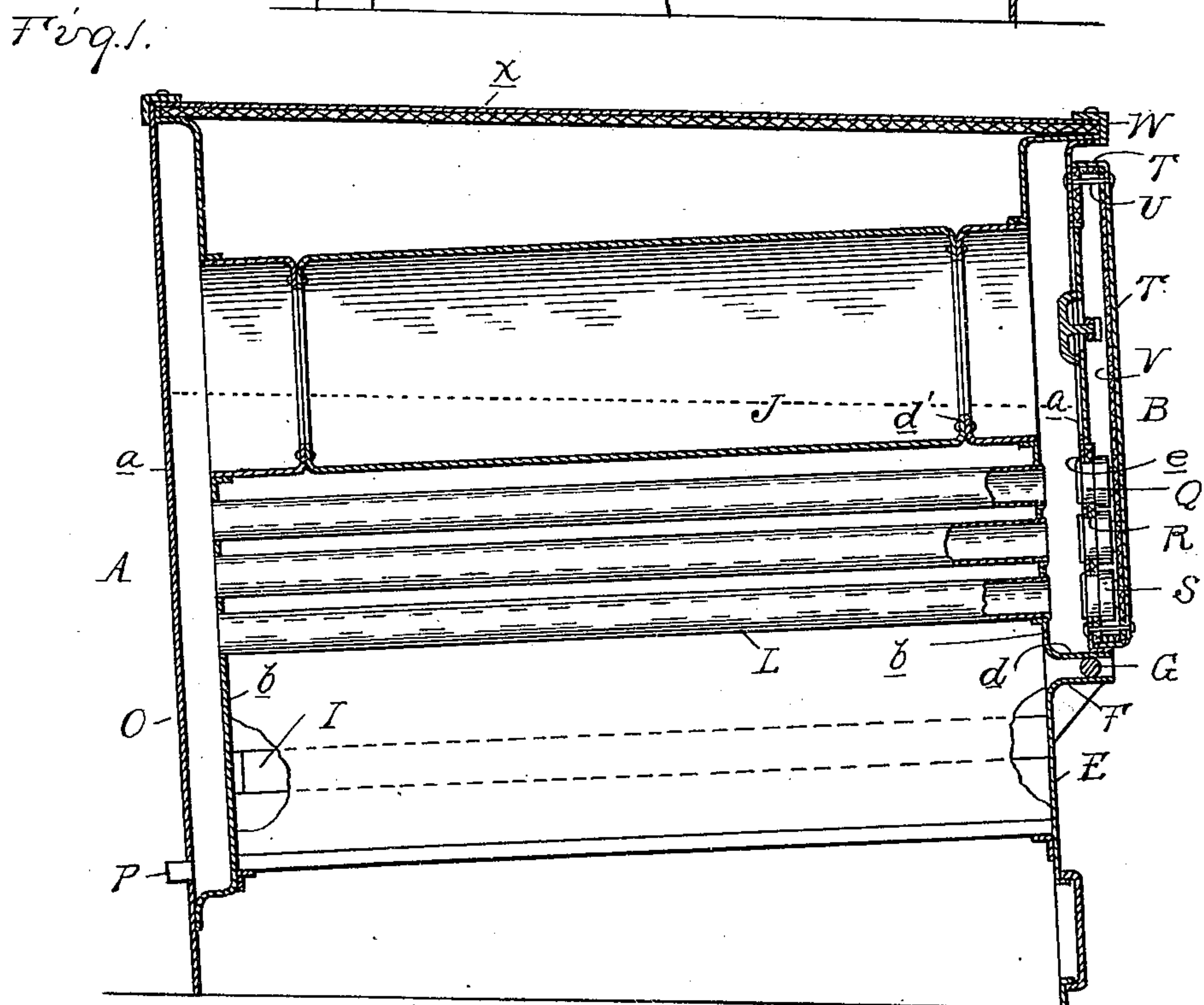
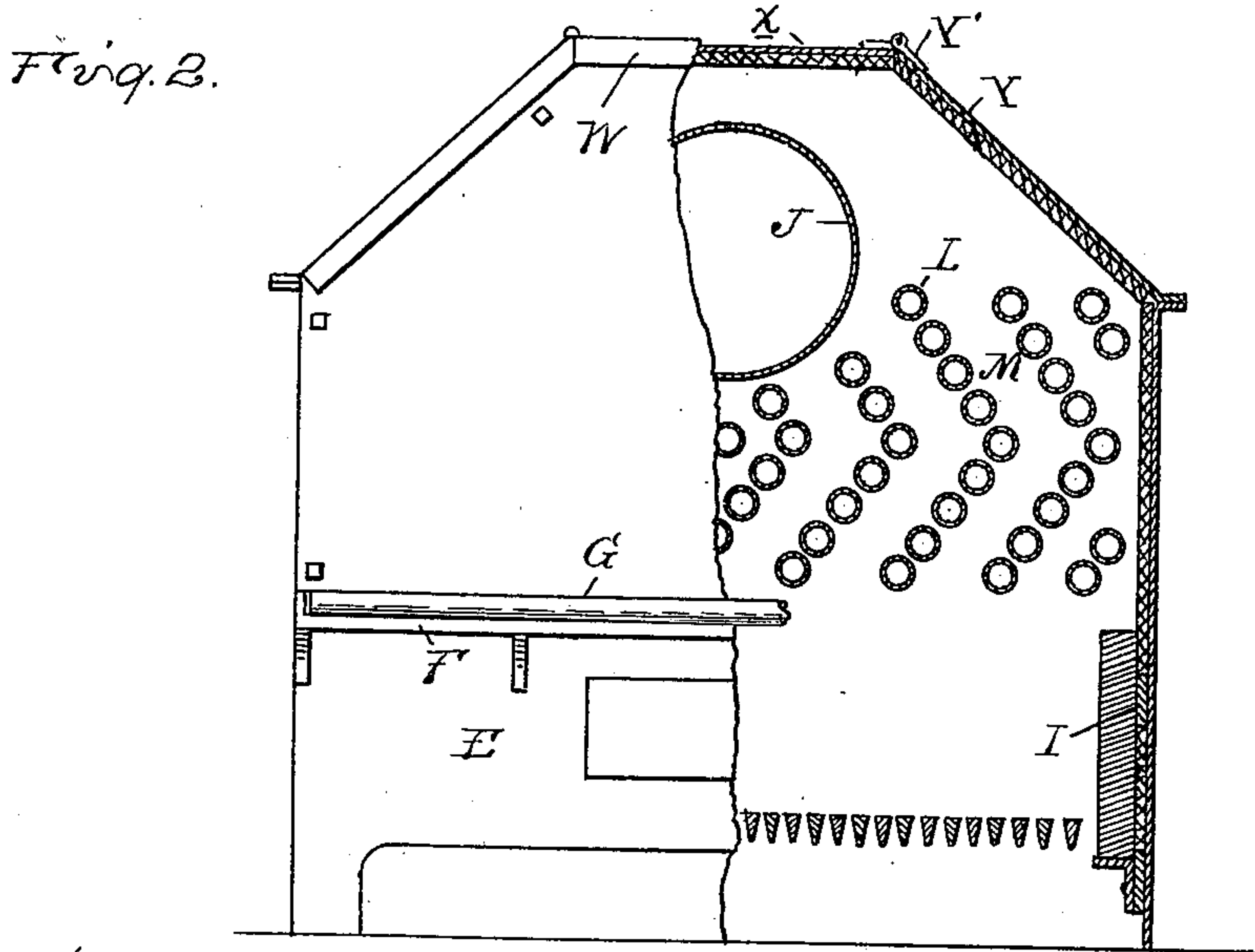
Patented Jan. 8, 1901.

H. M. FERRY.
WATER TUBE BOILER.

(No Model.)

(Application filed Mar. 19, 1900.)

2 Sheets—Sheet 1.



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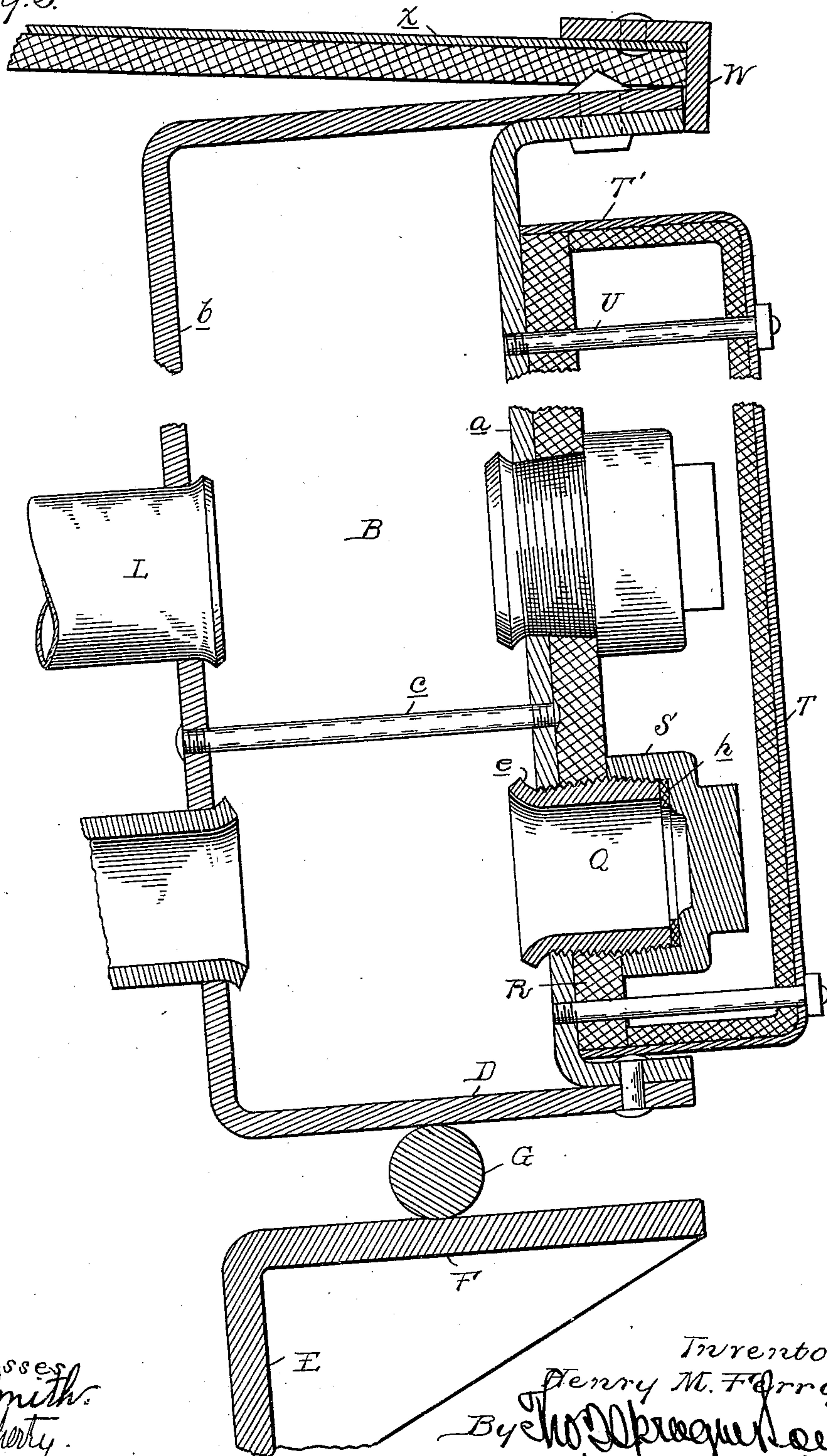
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2 Sheets—Sheet 2.

Fig. 3.



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UNITED STATES PATENT OFFICE.

HENRY M. FERRY, OF DETROIT, MICHIGAN, ASSIGNOR TO CORNELIA FERRY,
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WATER-TUBE BOILER.

SPECIFICATION forming part of Letters Patent No. 665,515, dated January 8, 1901.

Application filed March 19, 1900. Serial No. 9,310. (No model.)

To all whom it may concern:

Be it known that I, HENRY M. FERRY, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Water-Tube Boilers, of which the following is a specification, reference being had therein to the accompanying drawings.

The invention consists in the construction of a water-tube boiler, and particularly in the construction, arrangement, and combination of the parts whereby I obtain a large amount of effective heating-surface, rapid and easy circulation, prevent the foaming of the boiler, and provide ample steam-space for the superheated steam; further, in the construction of the connections to the water-tubes for cleaning the same and in the construction, arrangement, and combination of the various parts.

In the drawings, Figure 1 is a vertical central longitudinal section through a boiler embodying my invention. Fig. 2 is a front elevation thereof, partly in section, to illustrate the arrangement of the tubes and smoke-passages. Fig. 3 is an enlarged section through the front water-leg, illustrating the manner of connecting the water-tubes to the inner wall of the water-leg and also the manner of capping the aperture in the outer wall thereof opposite said water-tubes.

The boiler comprises the rear water-leg A and the front water-leg B. Each of these water-legs comprises an outer wall *a* and an inner wall *b*, spaced apart and held together by suitable shouldered bolts *c* or by any desired means. These walls are connected together at top and bottom, as plainly illustrated in Figs. 1 and 3. The front water-leg terminates in the horizontal plate D, which is at a point substantially at the top of the combustion-chamber. Below this front water-leg is the lower front section E, which terminates in the horizontal shelf F. Between the plate D and the shelf F is a longitudinal roller G, which preferably extends entirely across the front of the boiler and forms a roller-bearing to take up the movement due to the expansion and contraction of the water-tube section and at the same time forms

a tight joint between the upper and lower sections of the front. The front E has suitable furnace and ash-pit doors therein. H indicates the line of the grates, which may be of any suitable construction. The wall *a* of the rear water-leg extends down across the rear end of the combustion-chamber, and the front and rear walls are preferably tied together by means of suitable braces I. The upper portions of the water-legs are preferably tapered toward the top, as shown in Fig. 1, and centrally thereof. Slightly below the top, connected to the inner walls, is the drum J, which acts as a steam-drum. It is evident, however, that in addition to the steam-space in the steam-drum the upper part of the water-legs, both front and rear, not only above the steam-drum, but upon both sides thereof, will form additional steam-space, which I find to be especially desirable. It will be noticed that the steam-drum connects only to the inner wall of the water-legs, and that therefore its whole area has free access with the water and steam in the water-legs. The steam-drum is preferably made in sections, connected together by means of the inturned flange *d'*, rounded, as shown, which, being riveted together, gives sufficient elasticity to prevent any danger of buckling because of the expansion and contraction thereof.

Connecting into the water-legs below and upon both sides of the steam-drum are a zigzag series of tubes L. These tubes are connected only to the inner wall of the water-legs at opposite ends, and thus they have full and free discharge thereinto, so that there is no danger of a jet effect into the water-leg due to any back pressure by restricted openings. I find that this construction prevents any danger of foaming of the boiler, besides being an economical and desirable construction to manufacture. The arrangement of these zigzag series of tubes is such that there is formed between each series a zigzag smoke-passage M. This I accomplish by arranging the tubes so closely together vertically as to make nearly a continuous wall thereof, as plainly shown in Fig. 1, and to space them sufficiently far apart horizontally as to form well-defined zigzag passages for the smoke be-

tween these zigzag series of tubes. The effect of this arrangement of the tubes is to give me a free upward movement of the products of combustion without materially impeding the flow thereof and at the same time form narrow passages through which they must flow at all times in contact with one wall or the other, and thus directly impinge upon the water-tubes. This arrangement also gives me a large number of the tubes exposed to the direct radiation of the furnace-fire, and I find that it assists very materially in making a quick-steaming and economically-operating boiler.

The rear water-leg A, I extend downward, as shown at O, below the line of the tubes, so as to form a mud-leg or mud-drum in the lower portion thereof, from which the collected sediment may be blown off through a suitable blow-off connection, which is shown at P.

It has been found very difficult in water-tube boilers to form suitable connections opposite the tubes which will give ready access thereto for cleaning purposes and at the same time will make a sufficiently strong and tight joint. A construction by which I accomplish this and which has proved to be quite satisfactory is shown in Fig. 3. In the outer wall *a* of the front water-leg I form opposite each water-tube a screw-threaded aperture. In this screw-threaded aperture I engage the screw-nipple Q, which has tapering threads and is sufficiently long to be screwed through the wall *a*, and the inner end thereof is then flanged over, as shown at *e*, Fig. 3. The tapering of the nipple prevents its being screwed in any farther and the flange *e* prevents its being loosened or withdrawn. The outer end of this nipple projects through the outer wall thereof and also through a suitable heat-insulating covering R of such material, for instance, as asbestos, which I arrange across the face of the wall *e* a sufficient distance to allow the engagement therewith of the hollow screw-cap S. These screw-caps have a suitable wrenchhold. Between the screw-cap and the nipple I place a suitable packing *h*, thereby protecting the threads from the water and preventing corrosion. The inner edge of the screw-cap bears against the covering R and holds it in place. If any of the tubes are to be cleaned, all that is necessary to be done is to take off the cap S and insert the necessary cleaning instrument there-through.

I preferably inclose the front of the water-leg by means of a plate T, having the edge flange T' and fastened by suitable bolts U or otherwise to the front. This cover I preferably line, as shown at V, with a sheet of asbestos or other non-conducting material. This gives the boiler a symmetrical front and at the same time acts as a sheath or cover to prevent the radiation of the heat therefrom.

The outer casing of the sides and top of the boiler I preferably make of sheet metal, which I secure to the angle-iron frame W, which passes around the outer edges of the front and rear water-legs, as shown in Figs. 1 and 2, conforming to the exterior shape thereof and extending down the sides thereof. Suitable asbestos-lined metal plates are secured to these angle-irons, the top being shown in Fig. 1 at *x*. The inclined portions of the top Y, I form of hinged sections, the hinges being shown at Y'. These hinged sections or lids may be readily opened at any time for the purpose of cleaning the exterior of the tubes.

What I claim as my invention is—

1. In a water-tube boiler, the combination of the tube-section comprising inclined front and rear water-legs, and tubes connecting the same, of a front for the grate and ash-pit section, a shelf at the top thereof, and a roller on the shelf and upon which the lower edges of the front water-leg rests, said roller forming a roller-support for the tube-section and the joint between the lower front section and the tube-section.

2. In a water-tube boiler, the combination of front and rear water-legs of substantially equal height tubes connected to the inner walls of each leg, stays between the walls of the legs, a steam-drum likewise connected to inner walls of the legs below the top, in such relation thereto as to form steam-space in the upper part of the water-legs above and beside the drum, and a downward extension of the rear water-leg to form a mud-chamber and a blow-off connection in the same.

3. In a water-tube boiler, the combination of the front and rear water-legs, an inclined steam-drum connected to the inner walls of the legs below the top, of the water-tubes connecting the inner walls of said legs and arranged in zigzag vertical series, the series being separated sufficiently to form well-defined zigzag smoke-flues between, and each tube partly overlapping the one beneath but being sufficiently close to prevent any vertical passage, and to deflect the products of combustion mostly up the zigzag flues.

4. In a water-tube boiler, the combination with the front and rear water-legs, the inclined water-tubes extending between the same and connecting to the inner walls, the outer walls having apertures in line with the tubes, nipples screwed and expanded therein, having their inner ends flared or flanged over and projecting beyond the outer walls thereof, and a cap screwed upon the projecting portion thereof, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

HENRY M. FERRY.

Witnesses:

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H. C. SMITH.