

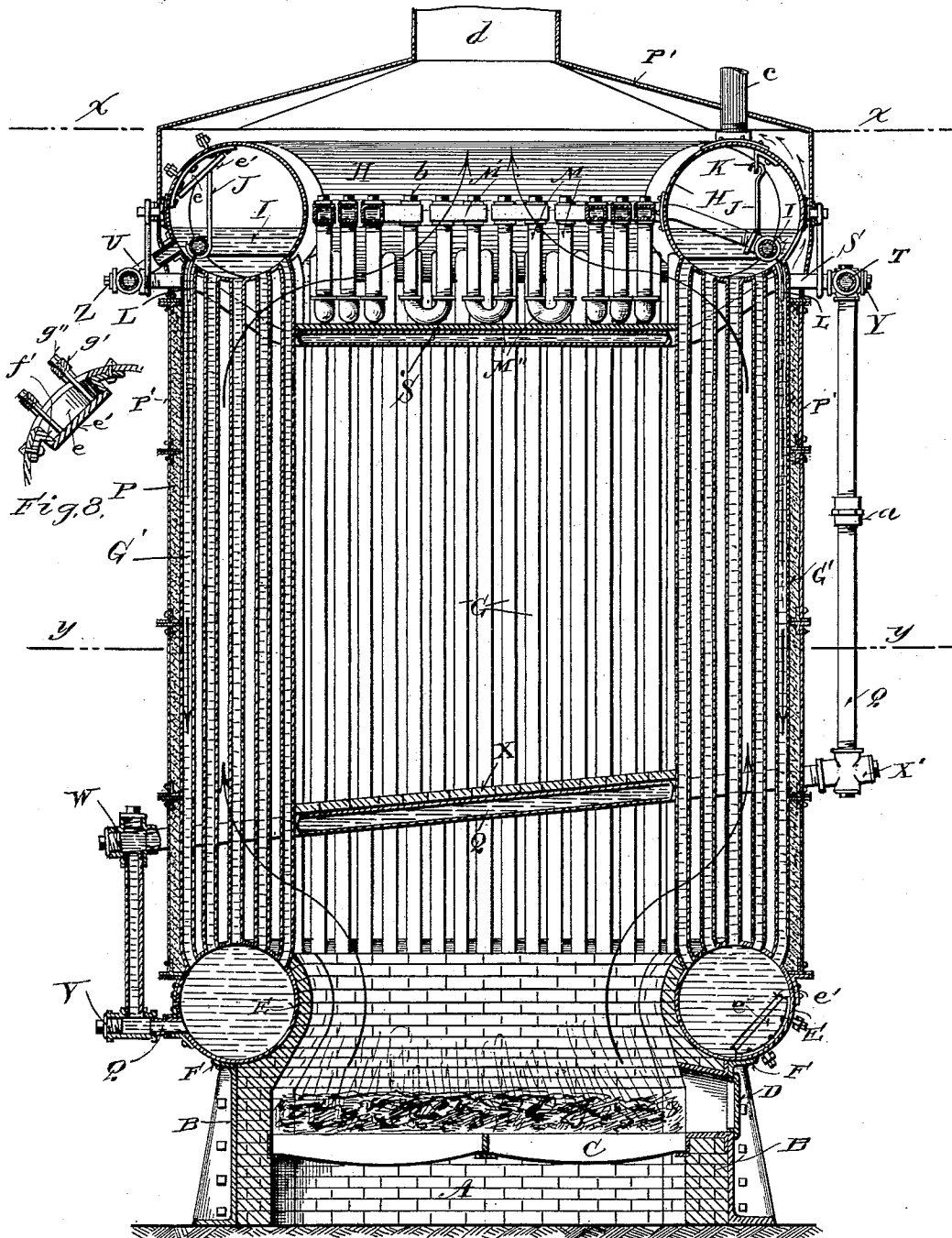
(No Model.)

3 Sheets—Sheet 1.

N. L. WARREN.
BOILER.

No. 569,477.

Patented Oct. 13, 1896.



Witnesses
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H. M. McNair.

Fig. 1.

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(No Model.)

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Fig. 2.

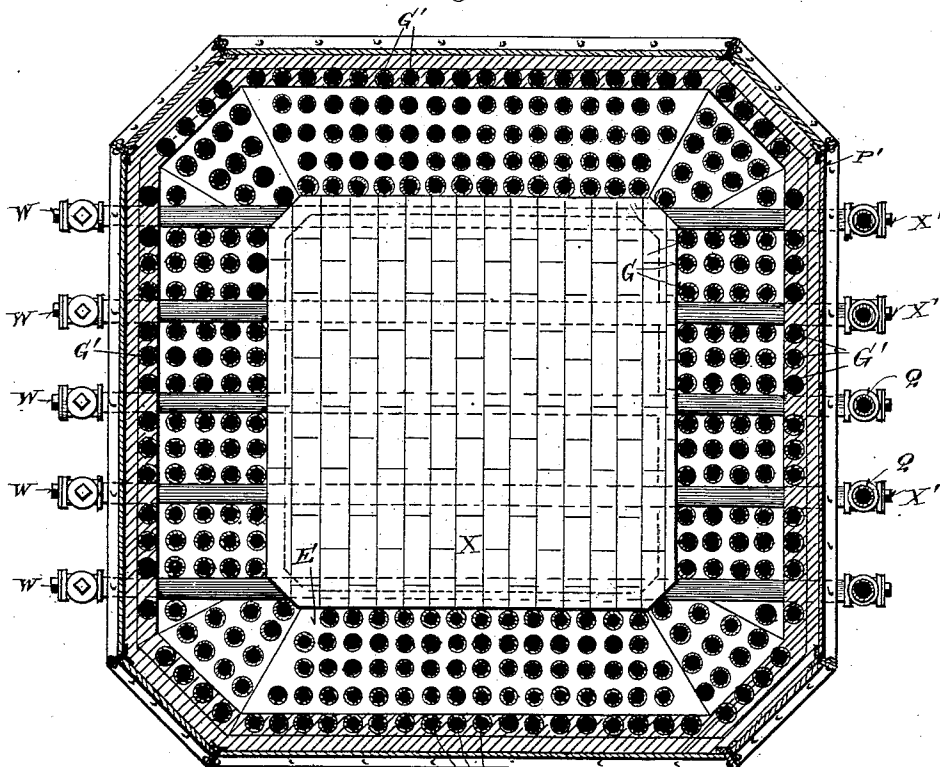


Fig. 3.

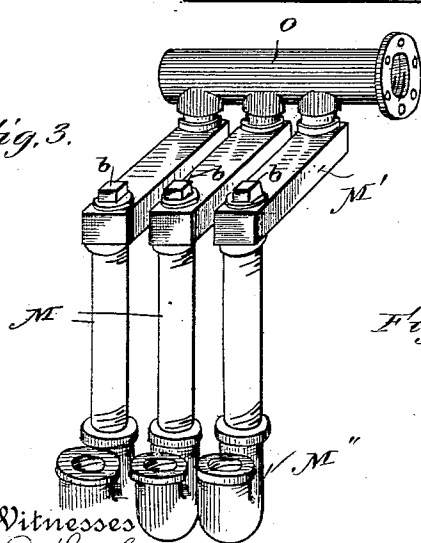
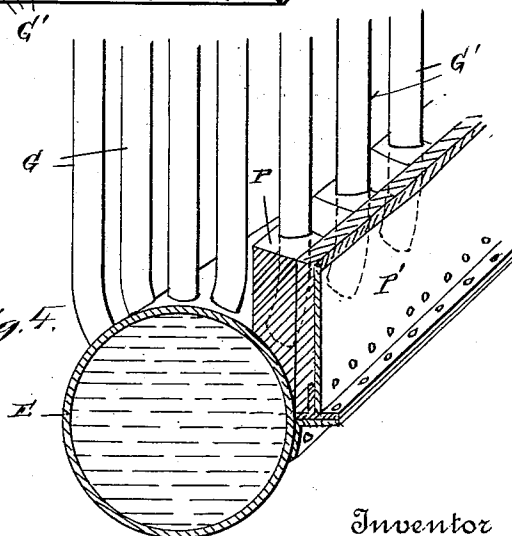


Fig. 4.



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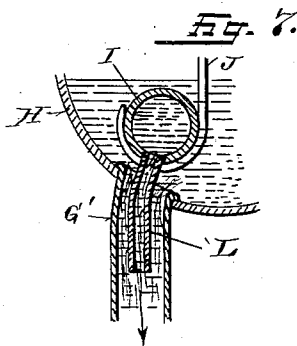
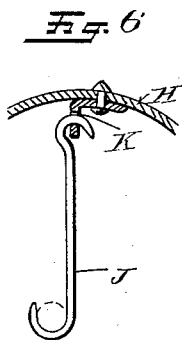
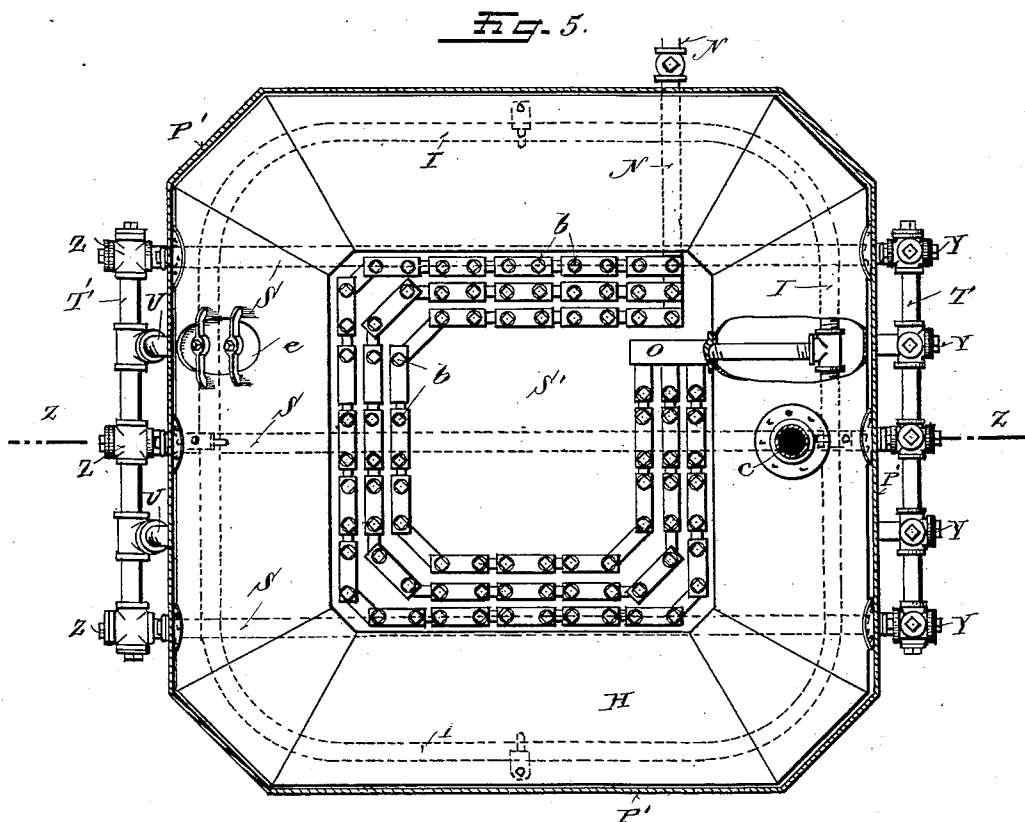
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BOILER.

No. 569,477.

Patented Oct. 13, 1896.



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UNITED STATES PATENT OFFICE.

NEWTON L. WARREN, OF SPRINGFIELD, OHIO.

BOILER.

SPECIFICATION forming part of Letters Patent No. 569,477, dated October 13, 1896.

Application filed March 12, 1896. Serial No. 582,961. (No model.)

To all whom it may concern:

Be it known that I, NEWTON L. WARREN, a citizen of the United States, residing at Springfield, in the county of Clark and State of Ohio, have invented certain new and useful Improvements in Boilers, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to certain new and useful improvements in boilers of the class known as "water-tube" boilers.

My invention has reference to an endless upper water and steam drum and an endless lower water-drum; has reference to tubular baffle-wall supports; has reference to a new organization and arrangement of the parts, whereby a compact and highly efficient boiler is produced; has reference to mechanism for producing a positive and rapid down circulation; has reference to a feed-water attachment and distributor, and has reference to details of construction hereinafter appearing, and particularly pointed out in the claims.

In the accompanying drawings, on which like reference-letters indicate corresponding parts, Figure 1 is a vertical sectional elevation taken on the line *z z* of Fig. 5; Fig. 2, a sectional plan view on the line *y y* of Fig. 1; Fig. 3, a detail perspective view of a portion of the feed-water-heater pipes; Fig. 4, a detail perspective view of a portion of the lower drum, circulating-tubes, outer casing, and lining for same; Fig. 5, a sectional plan view on the line *x x* of Fig. 1; Fig. 6, a detail view of the hanger for supporting the distributing-pipe within the upper water and steam drum; Fig. 7, a sectional view of the upper drum, one of the circulating-tubes, the distributor, and one of its nozzles; and Fig. 8, a detail sectional view of one of the manholes.

The letter A represents a furnace, preferably constructed of fire-brick and surrounded by a metal casing B. Supported within the furnace by the brick walls is a suitable iron grate C of the ordinary or any approved construction. A door D opens into this furnace on a level with the grate, as shown in Fig. 1. The fire-brick extends partly around and nearly to the top of an endless water-drum E, and also partially supports said drum. This drum is additionally supported, however, by a flange F, extending from the casing B. A

number of up-and-down circulating-tubes G extend upward from the drum E and are connected at their upper ends to what I term an "endless water and steam drum" H. The connections between these tubes and each drum are made perfectly tight in the ordinary or any approved manner.

It will be seen from Figs. 2 and 5 that the drums E and H, respectively, are made in the form of a square with their corners cut off, but they may be made in any other form so long as the drums are endless. Within the upper drum I mount what I term my "distributing-pipe" I. This pipe I is suspended in the drum H by suitable hangers J, which, at their upper ends, hook into eyes K, formed in angle-irons secured to the drum H in any convenient manner, and are of sufficient number to allow of properly supporting the distributing-pipe. From the distributing-pipe extends a series of nozzles L, one of which is shown in detail in Fig. 7. These nozzles extend a short distance into the upper end of each of the outer row of circulating-tubes G', for the purpose hereinafter appearing.

I will now refer to my feed-water-heating device. It is located, preferably, in the upper portion of my boiler, and consists of three sets of heating-coils composed of short-length pipes M, which are preferably placed in a vertical position. The first pipe of each of these three sets is connected, at its lower end with the feed-water pipe N, and at its upper end with the next vertical pipe in its series by a horizontal hollow casting M'. The lower end of the second pipe in each set is connected with the lower end of the third pipe in its series by an elbow M''. Thus the pipes in each series are alternately connected at the top and bottom and extend around to near their starting-point, where their upper ends connect with the pipe O, which in turn connects with the distributing-pipe I. Thus the cold water, as it enters the boiler, passes around through these three series of feed-water pipes before it enters the distributing-pipe. These feed-water pipes are supported by the upper baffle-wall S', as will hereinafter appear.

It will be seen that I have incased the outer row of circulating-tubes in a brick wall P, or other suitable material, about which is a sheet-metal casing P'. This prevents them

from becoming as highly heated as the inner tubes and consequently allows the water to flow downward in them. In order to more fully aid in this down circulation, I introduce
 5 nozzles L, attached to the distributing-pipe I, into the upper end of each of these outer tubes, and which conduct the cooler feed-water into the same. This causes a forced positive down-current in the outer row of
 10 tubes.

I will now refer to what I term "secondary circulating-tubes." These consist of a series of pipes Q, connected to the lower drum, as shown in Fig. 1, and extending up along the
 15 outside of the boiler a short distance, then turning and entering the boiler, passing out at the opposite side somewhat higher up than where they enter to give the desired inclination, and thence they pass up along the outer
 20 side to an upper set of cross-pipes S, which extend underneath the feed-water-heater pipes and support them, together with the baffle-wall S', the pipes of the feed-water heater being mounted directly on said baffle-
 25 wall. These upper series of pipes are connected together by means of pipes T and T', respectively. Short pipes U connect with the pipe T' and lead into the steam and water drum H, thus making a complete connection
 30 between the lower water-drum and the upper steam and water drum. Referring again to the lower set of cross-pipes or secondary circulating-pipes it will be seen in Fig. 1 that they are also adapted to support the lower
 35 baffle-wall X, which is made of fire-brick or other suitable material. These pipes, being located directly over the furnace, become intensely hot, and the water passes very rapidly upward through them and keeps them at a
 40 uniform temperature. This prevents their rapid destruction, and consequently they form a desirable support for the baffle-wall, which would quickly burn out if formed of iron girders. It will also be seen that where-
 45 ever there is a turn in the secondary circulating-tubes I have provided T's with removable caps or plugs, as shown at V W X' Y Z, &c., in Figs. 1, 2, and 5. These caps or plugs may be
 50 quickly removed when it is desired to inspect or clean the secondary circulating-tubes. I have also provided a union *a* on each pipe Q, which readily allows these tubes to be removed, should there be a necessity for doing so.

In order to properly clean the upper and lower drums and vertical circulating-tubes, I provide manholes *e* in said drums. These manholes are formed in the usual manner and consist of a plate *e'*, held against flanges
 60 *f'* by means of bolts connecting said plate with what I term "spanners" *g'*, and are held in position by nuts *g''* on the outer ends of said bolts. The flanges *f'* are riveted or otherwise secured to the endless drums and
 65 are so formed that the plate *e'* may fit tightly against them. Thus all parts of my boiler may be readily cleaned should scale or for-

eign matter collect in them, or inspected, which is of great practical importance in boiler construction. As I have constructed
 70 my boiler there will be a minimum amount of lime and other impurities in the water to collect in the drums and tubes because my feed-water pipes are designed and so located that all, or very near all, deposit will be made
 75 in them. These feed-water-heater pipes are readily cleaned and all lime scraped from them by simply removing screw-plugs *b*, opposite the upper end of each pipe.

A suitable steam-pipe *c* conducts the live
 80 steam from the steam and water drum to any desired place. The outer casing P' extends up over the top of the upper drum and is contracted to form a suitable smoke-stack, as shown at *d*.
 85

By referring again to the steam and water drum it will be seen that it is located at a short distance from the casing P'. This is for the purpose of allowing a portion of the hot gases to pass around the said drum, and
 90 which aids in superheating the steam so that it will have a greater efficiency.

In operating my boiler I fill the lower drum, the circulating-tubes, the feed-water tubes, and about one-third of the steam and water
 95 drum with water. This gives ample room for steam. The flames and hot gases are conducted up between the circulating-tubes throughout their entire length by the arrangement of my baffle-walls, and a large proportion passing between the upper drum and the upper baffle-walls envelops the feed-water pipes, which, being fed with cold water, extract a large number of units of heat and thus prevent what would otherwise be a large
 100 loss of heat up the smoke-stack. My construction is also particularly adapted for great economy of fuel, being arranged in a square and having the fire-box located in the center with the circulating-tubes all around
 110 the boiler, and the drums being endless with their whole length exposed to heat. I am also enabled to do away with the expensive and independent feed-water heaters used in connection with ordinary boilers.
 115

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a water-tube boiler, an upper and lower endless drum, tubes connecting said
 120 drums, one or more series of feed-water pipes adapted to receive and initially heat the water by being located in the heat-discharging passage, and a distributing-pipe connected to said feed-water pipes for distributing the
 125 feed-water to said endless drums and circulating-tubes.

2. In a water-tube boiler, an upper and lower endless drum, connected together with up-and-down circulating-tubes, a set of sec-
 130 ondary up-circulating tubes also connecting said drums and an upper and lower baffle-wall supported by said secondary up-circulating tubes, as shown and described.

3. In a water-tube boiler, the combination with an upper and lower endless drum and up-and-down circulating-tubes connecting them together, of a feed-water heater adapted to receive water from a supply-pipe, a distributing-pipe located within the upper drum and adapted to receive water from the feed-water heater, a series of nozzles connected to said distributing-pipe and adapted to extend a short distance into the outer series of water-circulating tubes and conduct the feed-water into such outer tubes, whereby the down-current in said outer tubes is augmented.

4. In a water-tube boiler, the combination with an upper and lower endless drum, with up-and-down circulating-tubes connecting said drums together, of a fire-box extending partly around said lower drum and nearly to its upper surface and adapted to partially support said drum, a flanged metal casing encircling said fire-box and also supporting said drum, an inner wall of brick or other suitable non-conducting material adapted to incase each of the down-circulating tubes, and a metal shell or casing adapted to encircle or incase said wall as shown and described.

5. In a water-tube boiler, the combination with an upper and lower endless drum connected together by up-and-down water-circulating tubes, a distributing-pipe suspended

in said upper drum, angle-irons with eyes in one part of them secured to the interior of said upper drum, hooks adapted to be inserted in said eyes for suspending said distributing-pipe, and nozzles connecting each down-circulating tube with said distributing-pipe, and a manhole in each of said drums to allow of the interior of the drums and circulating-pipes being cleaned, as shown and described.

6. In a water-tube boiler, the combination with a lower and upper endless drum and up-and-down tubes connecting them together, of a feed-water heater located essentially within the heat-discharging passage of the apparatus whereby it is subjected to sufficient heat, said heater at the discharge end being in communication with the interior of the boiler so that water entering said heater is conducted through it into said passage whereby it becomes heated and is then discharged into the boiler proper to supply the same with heated water, substantially in the manner and for the purpose shown and described.

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

NEWTON L. WARREN.

Witnesses:

OLIVER H. MILLER,
W. M. MCNAIR.