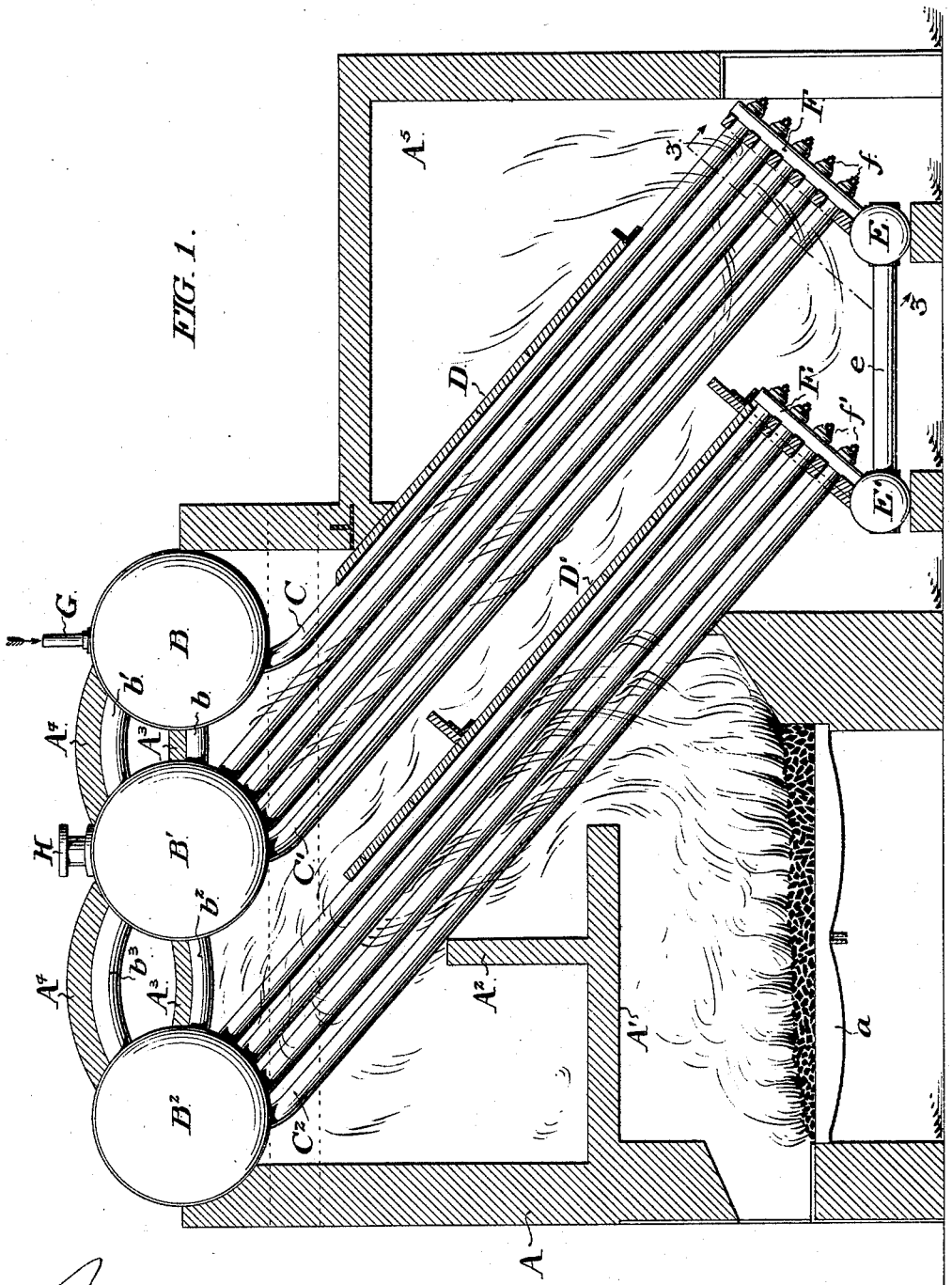
(No Model.) 2 Sheets—Sheet 1.

L. M. MOYES.

WATER TUBE BOILER.

No. 524,724. Patented Aug. 21, 1894.

FIG. 1.



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(No Model.) 2 Sheets—Sheet 2.

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WATER TUBE BOILER.

No. 524,724. Patented Aug. 21, 1894.

FIG. 2.

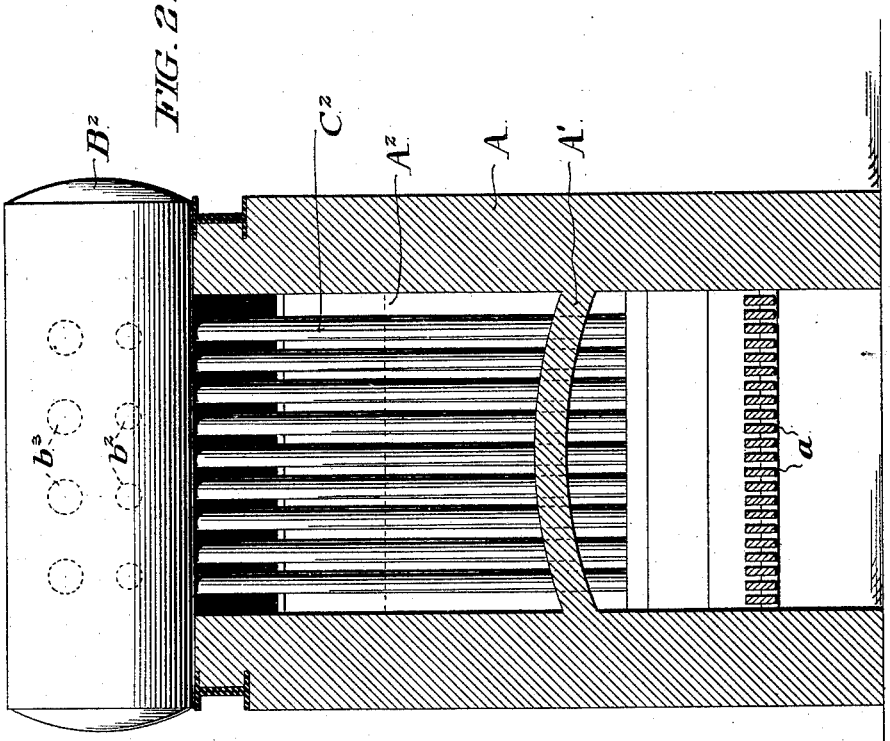
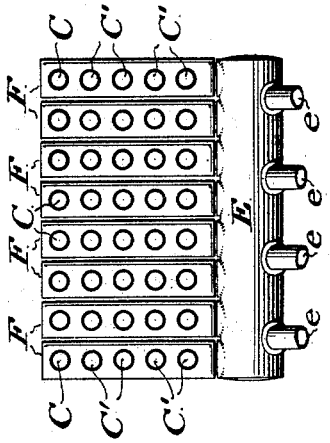


FIG. 3.



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LAURIE M. MOYES, OF PHILADELPHIA, PENNSYLVANIA.

WATER-TUBE BOILER.

SPECIFICATION forming part of Letters Patent No. 524,724, dated August 21, 1894.

Application filed March 30, 1894. Serial No. 505,671. (No model.)

To all whom it may concern:

Be it known that I, LAURIE M. MOYES, of Philadelphia, in the State of Pennsylvania, have invented certain new and useful Improvements in Water-Tube Boilers, whereof the following is a specification, reference being had to the accompanying drawings.

In said drawings Figure 1 represents a vertical longitudinal section through the furnace, showing the boiler and accessories in side elevation. Fig. 2 is a vertical transverse section through the furnace, showing the boiler in front elevation. Fig. 3 is a sectional view on the line 3 3 of Fig. I, looking in the direction of the arrows.

Referring to the drawings, A represents the wall of the furnace and, *a*, the grate-bars, A′, indicating the bridge wall over the grate, and A^2 a transverse flame wall above said bridge. The chimney flue leads from the rear portion, A^5, of the furnace. Transversely across the top of the furnace are arranged three parallel drums, B, B′, B^2, respectively, the first mentioned of which is the feed water drum. A two-fold direct communication is maintained between the adjacent drums above and below the normal water level as follows: The feed water drum, B, communicates with the drum, B′, below the normal water level by a series of transverse pipes, *b*, and above the normal water level by a series of transverse pipes, *b′*. Similarly, the drum, B′, communicates with the drum, B^2, below the normal water level by a series of transverse pipes, b^2, and above the normal water level by a series of transverse pipes, b^3. The respective sets of transverse pipes are slightly arched in opposite directions, as shown in Fig. 1, and above the lower pipes, *b* and b^2, the brick work of the furnace extends between the drums, as indicated at A^3, a protecting covering being also arranged above the upper pipes, *b′* and b^3, as shown at A^4.

From the feed water drum, B, a transverse row of downwardly depending inclined tubes, C, leads to the upper ends of a series of manifolds, F, the lower ends of said manifolds extending into the transverse cylindrical distributing chamber, E. From the drum, B′, four transverse rows of inclined tubes, C′, lead down also into the manifolds, F, as indicated in Fig. 3. From the drum, B^2, four similar transverse rows of inclined tubes, C^2, lead down to a series of manifolds, F′, similar in construction to the manifolds, F, except that they are slightly shorter, and said manifolds, F′, are supported by and communicate with the cylindrical distributing chamber, E′, which in turn communicates with the chamber, E, by the transverse tubes, *e*.

Opposite to the ends of the respective tubes, C, C′, and C^2, the manifolds, F and F′, are provided with removable plugs, *f* and *f′*, respectively, to permit access to the tubes for cleaning purposes.

Inclined deflector plates, D, and D′, respectively, are arranged in rear of the group of tubes, C, and in rear of the group of tubes, C^2. The feed water drum, B, is provided with an inlet pipe G, and the drum, B′, with a steam outlet, H.

The operation of the device is as follows: Assuming that all three drums and the system of tubes are filled with water to a level above that of the pipes, *b* and b^2, when the fire is started, the hottest flame impinges upon the group of pipes, C^2, and the products of combustion thence pass down behind the deflector plate, D′, in contact with the groups of tubes, C′ and C, finally passing away at the rear of the furnace. Upward circulation of the water is therefore induced primarily and most forcibly in the group of tubes, C^2, and secondarily, and to a less degree, in the group of tubes, C′, and overflow of water will therefore occur from the drum, B^2, to the drum, B′, through the communicating tubes, b^2, and a second overflow will occur through the tubes, *b*, from the drum, B′, into the feed water drum, B. The feed water enters the drum, B, by the inlet pipe, G, and descends in accordance with the demands of the boiler through the tube, C, into the manifolds, F. A portion of the entering water will be drawn up the tubes, C′, but the remainder will pass down into the distributing chamber, E, thence across into the secondary distributing chamber, E′, whence it will rise into the manifolds, F′, and be drawn up the tubes, C^2, into the drum, B^2. Thus there is a continuous upward circulation through both groups of tubes and an overflow of hottest water into the central drum, B′, whence a secondary overflow into the feed water drum oc-

curs. Steam communication between the drums is of course maintained through the transverse tubes, b^3 and b'.

The feature of the return circulation into the feed water drum through the tubes, b, in conjunction with the circulation effected by the remainder of the organization is of great importance for preventing irregular action, and while I am of course aware that it is not broadly speaking new to employ drums with downwardly depending groups or tubes, nor to return the water of circulation into the feed water drum, I believe that I am the first to employ this feature in an organization of the general character herein set forth.

As compared with boilers which employ only two groups of tubes, my improvements have the advantage of insuring proper circulation, since in my organization the ascending circulation induced in the primary and secondary groups, both of which are much hotter than the feed-water group, compels the descent of the feed-water by reason of the great preponderance of the upward current in the two hot groups of tubes. There is, therefore, no danger of the water being driven out of the feed-water tubes by undue heating thereof, as compared with the other groups. It is in connection with such an organization, having such a preponderance of circulation in the parts indicated, that the return of the water of circulation to the feed water drum is of special value, since the overflow of the preponderating up currents into the feed-water drum maintains an equal distribution of water in the drum, instead of unduly filling the hotter drums, as would be the case were the organization the same in other respects as mine, but lacking the return tubes, b, between the feed-water drum and the next adjacent drum of the series.

Having thus described my invention, I claim—

The combination of the furnace; the feed water drum, B; the drums, B′, B^2, said drums being arranged transversely to the direction of travel of the flame and in the described order with relation thereto; the two-fold communicating tubes between the adjacent drums, said tubes being arranged both above and below the normal water level; the downwardly depending groups of tubes connected respectively with said drums, B′ and B^2; the manifolds, F and F′, communicating respectively with said groups of tubes; the distributing chambers, E and E′, connected respectively with said manifolds and communicating with one another; and the downwardly depending group of tubes, C, leading from the feed water drum to the rear manifolds, said last mentioned group of tubes being of less area of cross-section than the other groups, whereby the preponderance of upward circulation is induced in the primary and secondary groups, the descent of the feed-water is insured and an equal distribution in the drums is maintained by the water overflow, substantially as set forth.

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Witnesses:
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