No. 615,242. Patented Dec. 6, 1898.

J. J. BLACKMORE.

WATER TUBE SAFETY BOILER.

(Application filed Feb. 4, 1898.)

(No Model.) 3 Sheets—Sheet 1.

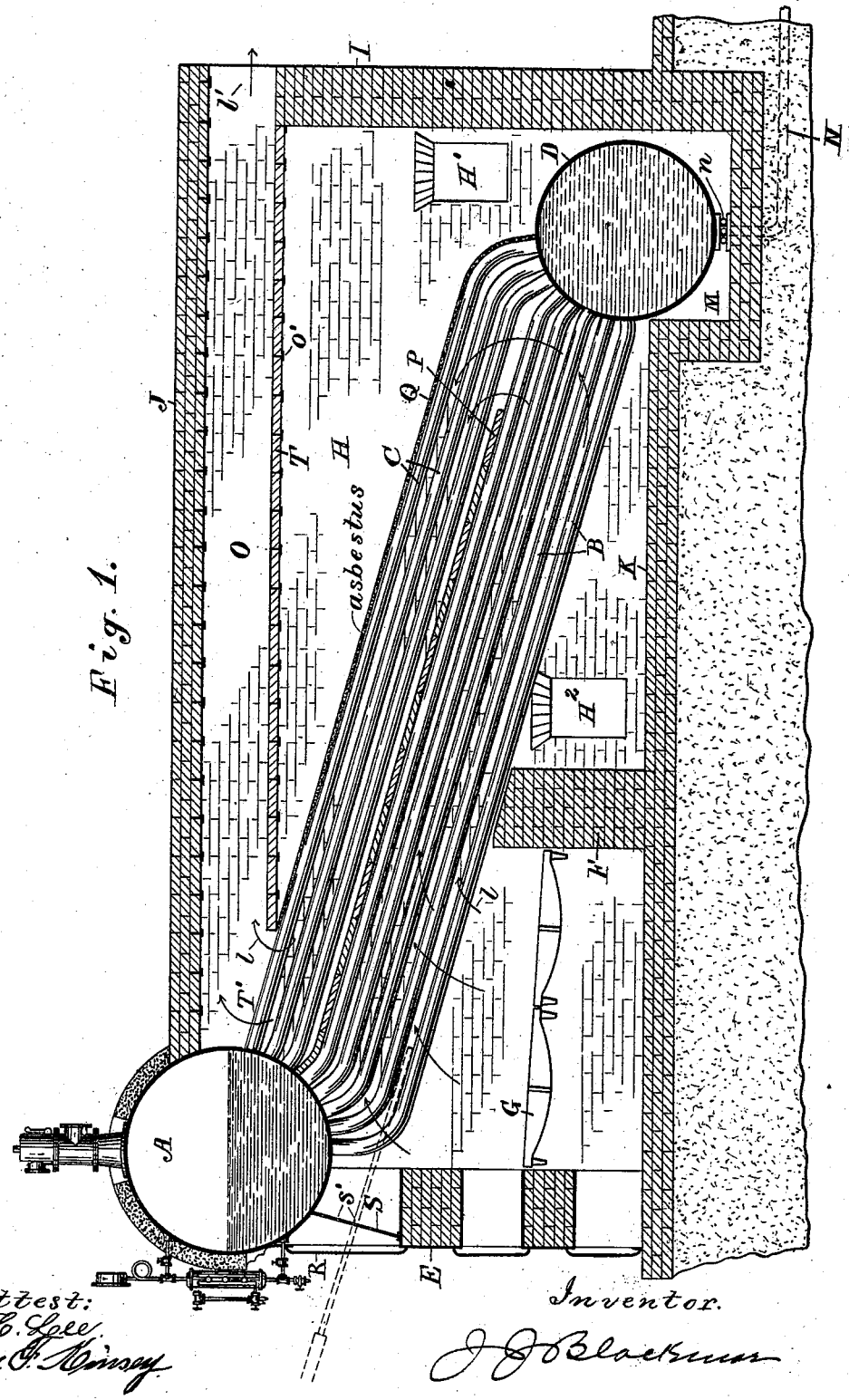

Fig. 1.

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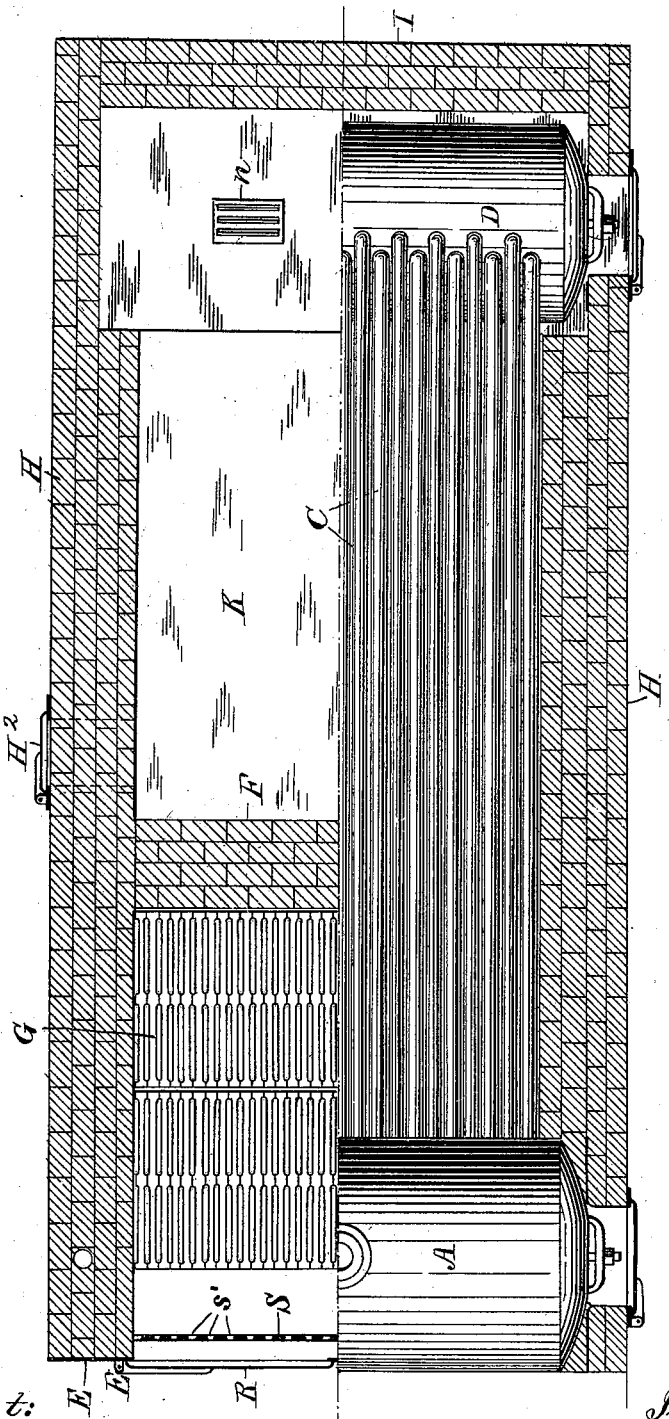
Fig. 2.



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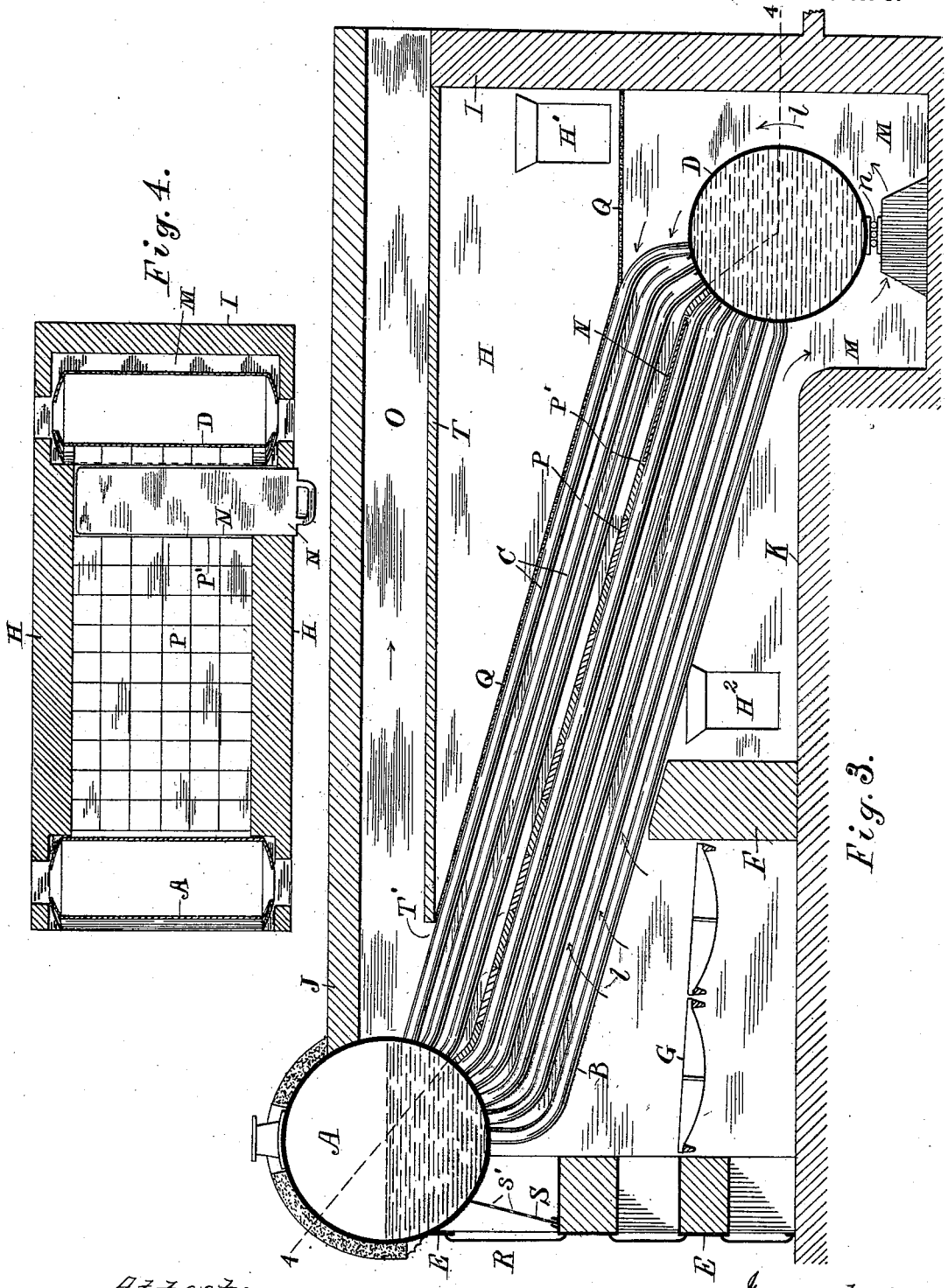

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UNITED STATES PATENT OFFICE.

JOSEPH J. BLACKMORE, OF JERSEY CITY, NEW JERSEY.

WATER-TUBE SAFETY-BOILER.

SPECIFICATION forming part of Letters Patent No. 615,242, dated December 6, 1898.

Application filed February 4, 1898. Serial No. 669,034. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH J. BLACKMORE, a citizen of the United States, residing at Jersey City, county of Hudson, State of New Jersey, have invented certain new and useful Improvements in Water-Tube Safety-Boilers, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

The present invention relates to a boiler adapted especially for use in the basements of buildings where the head room is commonly very limited; and the object of the invention is to provide a cheap and efficient construction for a water-tube boiler of greater length than height to use for heating by hot-water radiators or to generate steam for power. To effect these results, I connect two drums by water-tubes, which are expanded at their ends into such drums, one of the drums being set above the grate parallel with the boiler-front and the other drum being arranged at the extreme rear end of the boiler-setting upon the floor or in a pit below the level of the floor. A bridge-wall is extended transversely to the tubes in the rear of the boiler-front, at the back end of the grate, and the tubes are thus inclined downwardly and backwardly past the bridge-wall. The ends of the tubes are inserted in the drums in longitudinal rows and arranged in upper and lower groups, with a smoke-partition extended from the lower rear quadrant of the steam-drum backwardly between the two groups to direct the gases downward in the rear of the bridge-wall. The gases may be directed upwardly at the front side of the distributing-drum and led forward among the upper tubes by a covering over the same, or they may be conducted around the bottom and rear side of the distributing-drum to enter the upper group of tubes. In the latter case a smoke-passage is formed through the pit below the distributing-drum, and a damper is arranged to close the opening in the smoke-partition in the rear of the bridge-wall.

The construction will be understood by reference to the annexed drawings, in which—

Figure 1 is a longitudinal section of the boiler. Fig. 2 is a plan showing the boiler-setting in the upper half of the figure and in the lower half the drums and tubes with their covering removed. Fig. 3 is a longitudinal section, like Fig. 1, with certain of the details omitted, showing an alternative construction for the smoke-passage; and Fig. 4 is a plan in section on line 4 4 in Fig. 2.

A designates the steam-drum, and B and C the lower and upper groups of tubes inclined downwardly and backwardly from the steam-drum to the distributing-drum D. E designates the boiler-front set parallel with the steam-drum A at the front side of the same. F is the bridge-wall in the rear of the front, below the tubes B, and G is a grate. This arrangement exposes the rear lower quadrant of the steam-drum to the heat of the furnace, as well as the tubes which are connected with such portion of the drum.

The boiler-setting consists of side walls H, rear wall I, and roof J, beneath which the smoke-flue O is shown extended backwardly from the rear side of the steam-drum. A smoke-partition P is shown extended from the steam-drum backwardly nearly to the distributing-drum, between the groups of tubes B and C, and a covering Q is shown extended over the upper group of tubes to the forward end of the smoke-flue O, which is open upon the lower side adjacent to the steam-drum.

The space between the partition P and covering Q forms a return-flue, in which the gases heat the upper group of tubes after they have passed among the lower tubes B, the movement of the gases from the furnace being indicated by the arrows *l*.

The distributing-drum D is shown with its lower side set in a pit M below the level of the floor K, and the tubes B and C are connected with its upper front quadrant. With this arrangement a considerable length of tubes, with the necessary inclination to promote circulation, may be obtained in a limited head room, as six or seven feet, and the space within the boiler-setting be provided with a return-flue to utilize the heat of the gases before they escape to the smoke-flue.

In Fig. 1 the boiler-setting is shown fitted close to the front side of the distributing-drum, so that the gases are deflected entirely upward through the opening P′ at the rear end of the partition P.

In Fig. 3 the covering Q is extended backwardly over the drum D to the wall I, and

the pit M is made wider and deeper than the distributing-drum to form a passage around the bottom and rear side of the same to lead the gases from the lower to the upper group of tubes. A damper N is inserted in the opening P′ to furnish when requisite a more direct draft than is afforded by the passage through the pit M. With this construction the opening of the damper furnishes a direct connection to the return-flue; but when the damper is closed the gases are directed downwardly and are carried around the bottom and rear side of the steam-drum before they enter the return-flue among the tubes C. The latter construction is especially adapted for a heating-boiler from which water is circulated through heating-radiators, as it utilizes the heat of the gases to the greatest degree by carrying them completely around the distributing-drum; but such construction is not so desirable in a boiler for generating steam where the gases are not effective in vaporizing the water after they are cooled below a certain point. The lower side of the smoke-flue O is shown formed of tiles or bricks T, supported upon transverse iron bars or beams o', and the covering Q over the return-flue is shown formed of asbestos fabric, which is commonly used for such purpose.

The partition P is shown formed of tiles supported upon the tubes; but such details of construction may be varied without affecting the invention, which consists, essentially, in the permanent connection of the drums A and D by the inclined tubes B and C, expanded into the adjacent sides of such drums, with the boiler-front set parallel to the steam-drum and the partition P, covering Q, grate G, and bridge-wall arranged as shown herein. The covering prevents the gases from escaping into the space Q′ below the flue O in the rear end of the boiler-setting; but such dead-space is provided with a cleaning-out door H′ to facilitate the inspection and repair of the boiler. A door H^2 is also shown extended through the walls into the space behind the bridge-wall to clean out such space.

The boiler-front is shown furnished directly beneath the steam-drum with an opening having a door R and a guard-plate S, in which holes s' are provided to introduce a steam-jet for cleaning the soot from the doors B.

The space containing the guard-plate is at the top of the furnace, and the guard-plate prevents the smoke and gases from pouring out when the door R is opened to clean the tubes. A small steam-pipe t (shown in dotted lines) may be inserted between the tubes through the holes s' in the guard-plate, and a sufficient number of the holes is provided to thus clean all the tubes.

It is common to connect steam and distributing drums by means of water-tubes; but the present construction differs from those heretofore used in having the steam-drum set parallel with the boiler-front and a bridge-wall inserted below the tubes in the rear of the front, with the partition P and covering Q arranged to form a return-flue in which the upper group of tubes is located.

It will be observed that the water-tubes in my construction are parallel with one another and straight throughout their length except at the extreme ends, where they are bent toward the center of the drum to enter the shell of the same at right angles, and that they are inclined to the horizontal at only a slight angle, so as to occupy as little head room as possible. The tubes are also of much greater length than the furnace, so that only the front ends of the tubes adjacent to the steam-drum are affected by the radiant heat of the fire. The gases thus have a considerable "run" in the rear of the bridge-wall before they strike the distributing-drum and a still longer run on their passage from such latter drum to the opening T′, which connects the outlet-flue O with the return-flue. When the damper N is closed, the gases are driven through the passage in the pit M around the bottom and rear side of the distributing-drum, as indicated by arrows l, and their run is correspondingly increased and the heat is abstracted from them more perfectly.

The nearly horizontal disposition of the tubes and their straight form produce a very considerable horizontal movement of the drum D when the tubes are expanded by heat, and the drum is thus set to clear the adjacent brickwork and mounted upon antifriction-rolls n to permit its free movement.

The connection of the tubes with one of the upper quadrants of the distributing-drum leaves the water in the bottom of such drum quite out of the general circulation, and thus greatly favors the deposit of mud or sediment and the removal of the same when required.

A blow-off pipe n' is shown connected with the bottom of the drum in Fig. 1 and would in practice be provided with a suitable cock.

The outlet-flue O is formed within the roof J of the boiler-setting, and thus serves to blanket the top of the chamber in which the boiler-tubes are inclosed, and thereby prevents radiation from such chamber. The boiler is thus adapted for location in apartments with a low ceiling, as its constructive features limit the radiation of heat from the top of the boiler-setting. Under such conditions the smoke is never taken from the top of the boiler-setting, but is conducted from one end of the same to a lateral opening in the chimney, and the arrow l' at the outlet of the smoke-flue O shows where such chimney connection would be made.

I am well aware that it is common to connect drums by inclined tubes arranged above a grate and bridge-wall, and have therefore claimed my specific improvements in this class of boilers.

In practice the shell of the steam or distributing drum is made to resist a greater pressure than the tubes, and in case of over-

pressure one of the tubes would therefore burst and prevent any dangerous explosion of the drums. I have therefore entitled my construction a "water-tube safety-boiler."

Having thus set forth the nature of the invention, what I claim herein is—

1. In a steam-boiler, the combination, with a suitable boiler-setting having boiler-front, grate, and transverse bridge-wall, as set forth, of the steam-drum A sustained parallel with the boiler-front and next to the same, the smoke-flue O extended from the rear side of such drum backwardly, the groups of tubes B and C extended from the lower rear quadrant of the steam-drum downwardly and backwardly below such flue, the distributing-drum connecting their rear ends, as set forth, the smoke-partition P extended from the steam-drum backwardly between the groups of tubes, and the covering Q extended over the upper tubes to the forward end of the smoke-flue, substantially as herein set forth.

2. In a steam-boiler, the combination, with a suitable boiler-setting, of the steam-drum A arranged transversely at the front end of such setting, with tubes extended downwardly and backwardly from its rear quadrant and connected at their lower ends by a distributing-drum, the boiler-front arranged parallel with such drum and provided with a tube-cleaning door at the bottom of such drum, and having the grate and transverse bridge-wall in the rear of such front, and the tube-cleaning door being provided with a guard-plate S having holes to insert the steam-jet for cleaning between the tubes, as and for the purpose set forth.

3. In a steam-boiler, the combination, with a boiler-setting having the side walls H, the front E and the bridge-wall F with grates between such front and bridge-wall, of the steam-drum arranged at the front end of such setting and having the group of tubes B and C extended downwardly and backwardly, with distributing-drum D connected to their lower ends, the tubes B being connected with the lower side of the steam-drum by bends or curves, and the boiler-front having a cleaning-out door adjacent to such bends, with guard-plate having holes to insert the steam-jet for cleaning between such tubes, and the side walls having cleaning-out doors H′ in the rear of the bridge-wall, substantially as herein set forth.

4. In a steam-boiler, the combination, with a boiler-setting having the side walls H, the front E, and the bridge-wall F with grates between such front and bridge-wall, of the steam-drum arranged at the front end of such setting with smoke-flue O extended from the rear side of such drum backwardly, groups of tubes B and C extended from the lower rear quadrant of the steam-drum downwardly and backwardly past the bridge-wall, the distributing-drum connecting their rear ends, as set forth, the smoke-partition P extended from the steam-drum between the groups of tubes, the covering Q applied to the tops of the upper tubes to confine the gases to such tubes, and forming a dead-air space in the rear of the boiler-setting, and the side wall being provided with an inlet-door to such dead-air space, to permit inspection and repairs, substantially as herein set forth.

5. In a steam-boiler, the combination, with a suitable boiler-setting having boiler-front, grate, and transverse bridge-wall, as set forth, of the steam-drum A, groups of tubes B and C extended from the steam-drum downwardly and backwardly past the bridge-wall, the distributing-drum connecting their rear ends, as set forth, the smoke-partition P extended from the steam-drum backwardly between the groups of tubes, the covering Q applied to the tops of the upper tubes to confine the gases to such tubes, the roof J for such dead-air space sustained upon the beams or bars o', as set forth, the smoke-flue extended from the rear side of the steam-drum backwardly over such roof, and the opening T′ connecting such flue with the tube-space adjacent to the steam-drum, substantially as herein set forth.

6. The combination, with the boiler-setting having side walls H, boiler-front E, grate G, and transverse bridge-wall F, as set forth, of the steam-drum A sustained parallel with the boiler-front and next to the same, the smoke-flue O extended from the rear side of such drum backwardly, the groups of tubes B and C extended from the lower rear quadrant of the steam-drum downwardly and backwardly below the level of the grates, a flue-pit at the rear end of the boiler-setting arranged below the level of the ash-pit floor, and a distributing-drum having its lower half set in such flue-pit and its upper quadrant connecting the lower ends of the water-tubes, the pit forming a passage around the lower and rear sides of the drum, as and for the purpose set forth.

7. A steam-boiler comprising a boiler-setting having boiler-front with grate and transverse bridge-wall at the rear of the grate, a steam-drum sustained parallel with the boiler-front adjacent to the same, two groups of tubes in horizontal rows extended downwardly and backwardly from the steam-drum past the bridge-wall, a distributing-drum connecting the lower ends of the tubes at the rear of the bridge-wall, a smoke-partition extended from the steam-drum backwardly to the distributing-drum between the two groups of tubes, and a smoke-passage extended from the lower group of tubes around the bottom and rear side of the distributing-drum to discharge the gases into the upper group of tubes, substantially as herein set forth.

8. A steam-boiler comprising a boiler-setting having a boiler-front with grate and transverse bridge-wall at the rear of the grate, a steam-drum sustained parallel with the boiler-front adjacent to the same, two groups of tubes in horizontal rows extended down-

wardly and backwardly from the steam-drum past the bridge-wall, a distributing-drum connecting the lower ends of the tubes at the rear of the bridge-wall, a smoke-partition extended from the steam-drum backwardly to the distributing-drum between the two groups of tubes, a smoke-passage extended from the lower group of tubes around the bottom and rear side of the distributing-drum to discharge the gases into the upper group of tubes, and an opening with damper in the smoke-partition adjacent to the distributing-drum, to furnish a direct draft for the gases when required, substantially as herein set forth.

9. In a steam-boiler, the combination, with a suitable boiler-setting having boiler-front, grate, and transverse bridge-wall, as set forth, of a steam-drum A sustained parallel with the boiler-front above the same, the smoke-flue O extended from the rear side of such drum backwardly, the group of tubes B and C extended from the steam-drum downwardly and backwardly below such flue, the distributing-drum connecting their rear ends as set forth, the smoke-partition P extended from the steam-drum to the distributing-drum between the two groups of tubes, with damper N in the opening P' adjacent to the distributing-drum, the covering Q extended from the rear wall of the boiler-setting over the upper tubes to the forward end of the smoke-flue, and a smoke-passage extended from the lower group of tubes around the bottom and rear side of the distributing-drum, substantially as herein set forth.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

JOSEPH J. BLACKMORE.

Witnesses:
L. LEE,
EDW. F. KINSEY.