

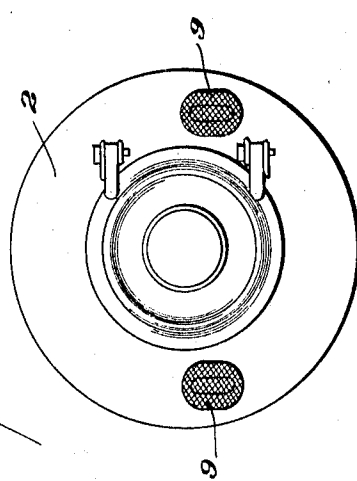
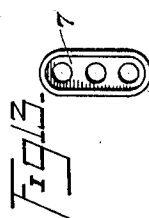
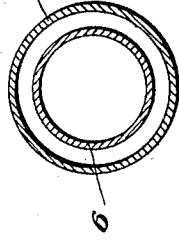
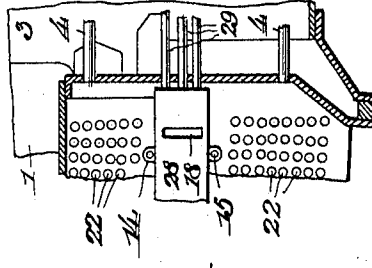
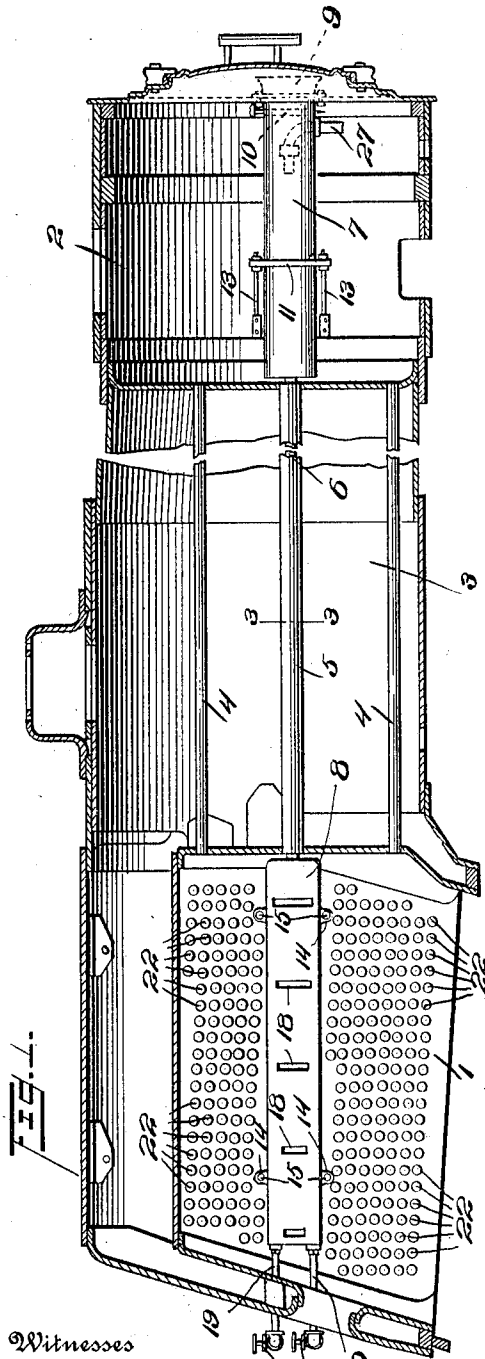
T. CRAWFORD.
SMOKE CONSUMER.

APPLICATION FILED AUG. 11, 1911.

1,048,297.

Patented Dec. 24, 1912.

3 SHEETS-SHEET 1.



Witnesses
A. Strauss
R. H. Krenkel.

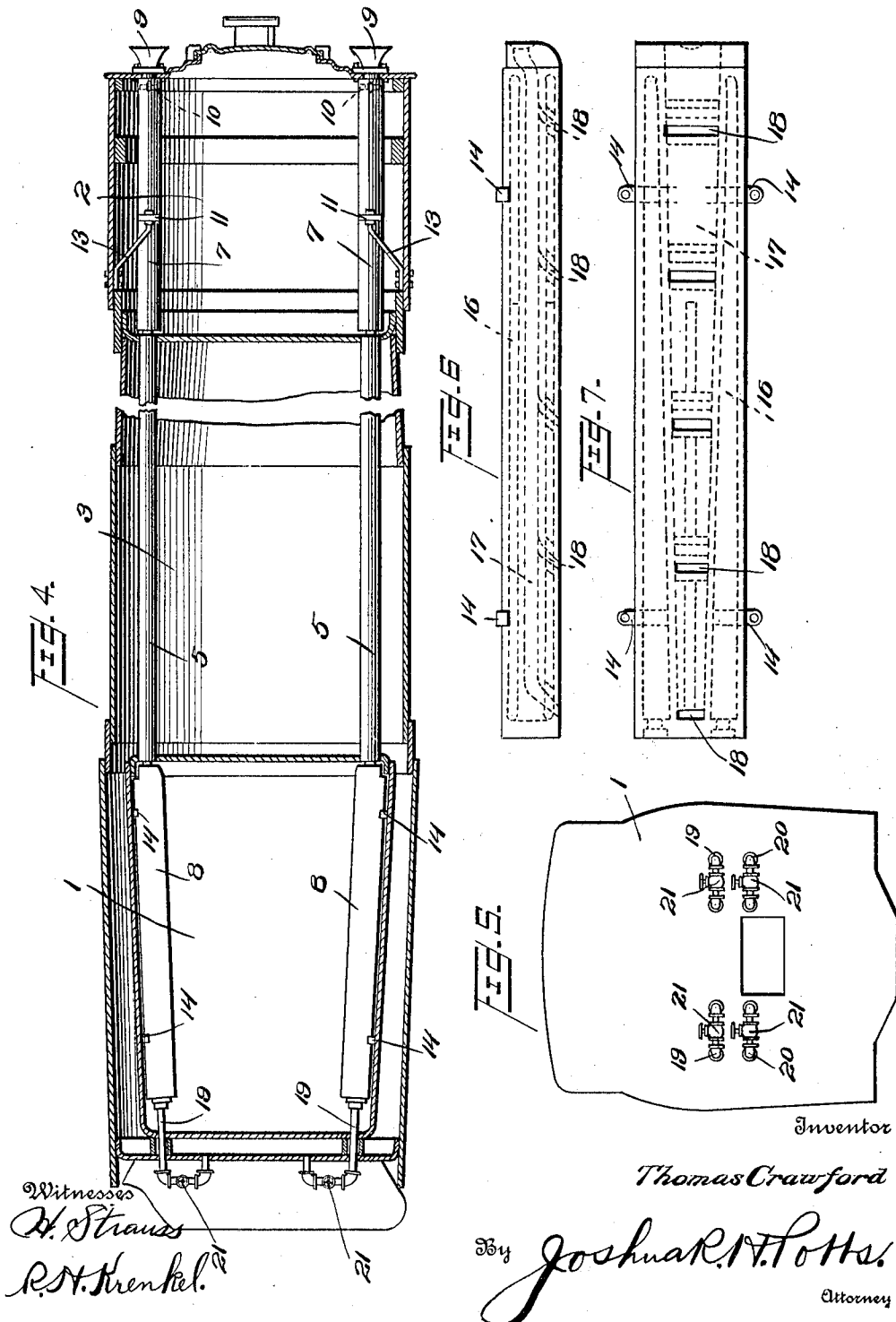
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3 SHEETS-SHEET 2.

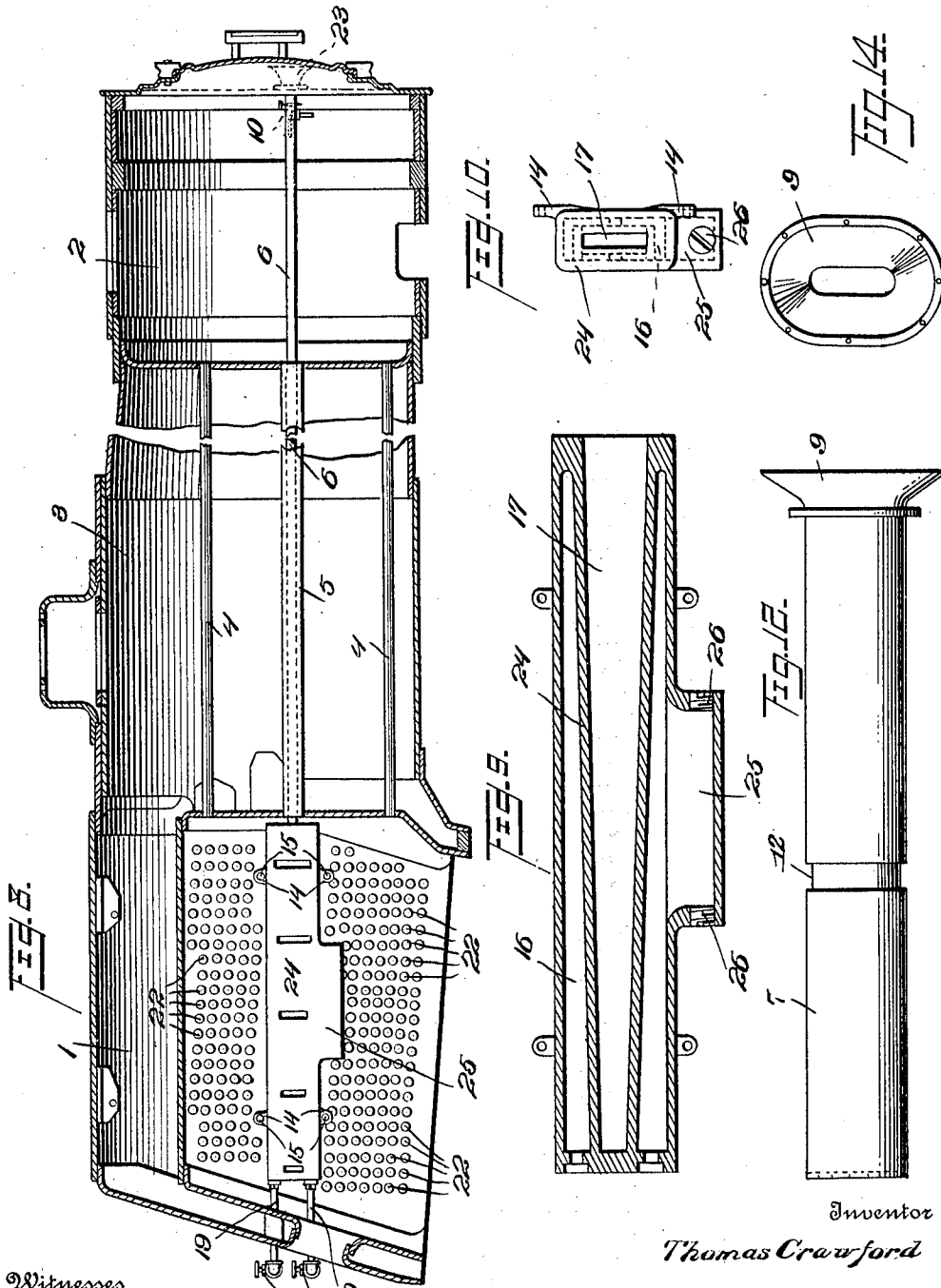


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3 SHEETS-SHEET 3.



Witnesses

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Inventor

Thomas Crawford

By

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UNITED STATES PATENT OFFICE.

THOMAS CRAWFORD, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR OF TWENTY-FIVE ONE-HUNDREDTHS TO JOHN M. JAMES AND TWENTY-FOUR ONE-HUNDREDTHS TO HENRY M. MEASON, OF PHILADELPHIA, PENNSYLVANIA.

SMOKE-CONSUMER.

1,048,297.

Specification of Letters Patent.

Patented Dec. 24, 1912.

Application filed August 11, 1911. Serial No. 643,514.

To all whom it may concern:

Be it known that I, THOMAS CRAWFORD, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Smoke-Consumers, of which the following is a specification.

My invention relates to improvements in smoke consumers, and more particularly to smoke consumers designed for use in connection with locomotive and other steam boiler furnaces, the object of the invention being to provide improved means whereby a supply of highly heated air is furnished to the fire box above the burning fuel, so as to render combustible the otherwise waste smoke and gases, and utilize to a maximum degree, the heat units in the fuel.

A further object is to provide in a steam boiler furnace, preferably of the locomotive type, an air heating compartment or compartments located in the smoke box, and communicating with the outside air, said air chambers connected through flues of the boiler with air distributors in the fire box, whereby the air is highly heated in its chambers in the smoke box, and in its passage through the boiler and distributor before it passes into the smoke and gases, hence facilitating combustion.

A further object is to provide improved means for water jacketing the air distributors in the fire box, and which means permit the disconnection of said water jackets with the water of the boiler to enable testing of the stay bolts without exerting excessive pressure in the water jackets.

With these and other objects in view, the invention consists in certain novel features of construction and combinations and arrangements of parts as will be more fully hereinafter described and pointed out in the claims.

In the accompanying drawings: Figure 1, is a broken view in longitudinal vertical section through a locomotive boiler illustrating my improvements. Fig. 2, is an end view of Fig. 1. Fig. 3, is an enlarged view in section on the line 3—3 of Fig. 1. Fig. 4, is a view in longitudinal section on the line 4—4 of Fig. 1. Fig. 5, is a rear end view of Fig. 4. Fig. 6, is an enlarged top view, and Fig. 7 is an enlarged face view of one of the air distributors shown in the figures above

referred to. Fig. 8, is a view similar to Fig. 1 illustrating a modification. Fig. 9, is an enlarged view in longitudinal section of the air distributor shown in Fig. 8. Fig. 10, is an end elevation of the air distributor shown in Fig. 9. Fig. 11, is a fragmentary longitudinal vertical section illustrating another modification. Fig. 12, is an enlarged view in side elevation illustrating one of the air heating chambers located in the smoke box, and Figs. 13 and 14, are views in elevation of opposite ends of the device shown in Fig. 12.

1, represents the fire box of an ordinary locomotive boiler, 2 the smoke box and 3 the water chamber between them through which the ordinary flues 4 project, said flues being adapted to convey the smoke and gases from the fire box to the smoke box as is customary with an apparatus of this kind.

In the construction shown in Figs. 1, 4, and 8, appreciably larger flues 5 are provided at opposite sides of the boiler, and through which pipes 6 project, said pipes being of appreciably smaller diameter than the internal diameter of the flues 5, so that a free passage for smoke and gases is permitted between the two pipes from the fire box to the smoke box.

The inner pipes 6 constitute passages for air, and at their front ends are connected to air heating chambers 7 located in the smoke box, and at their rear ends to air distributors 8 located in the fire box.

The air heating chambers 7 communicate at their forward ends with screened bell mouths 9 outside of the smoke box, and through which a current of air is induced by means of the forward movement of the locomotive.

To induce a passage through the chamber when the locomotive is standing still, a short pipe 27 projects into the chamber and discharges rearwardly as shown in Fig. 1. A suitable valve 10 may be provided in the forward end of the chamber which may be closed if desired, and this pipe 27 may supply steam, compressed air, or other fluid desirable for the purpose, and may be utilized to induce a flow of air when the valve 10 is open, or may be used solely as a draft and gas consuming agent when said valve is closed.

While of course the particular manner of securing the air chambers is not material,

a simple form is illustrated in which bars 11 are located in grooves 12 in the chambers and connected by bolts 13 with the wall of the smoke box.

5 The air distributors 8 above referred to are positioned longitudinally of the fire box 1 at both sides thereof, and are preferably provided with perforated ears 14 for the reception of bolts 15 to secure said chambers in place. These chambers each comprise 10 castings which are cored forming a water jacket 16 which allows a circulation of water about a longitudinal flue 17 in each chamber. This longitudinal flue which communicates 15 at its forward end with the pipe 6, preferably reduces in area from its forward to its rear end, and at intervals outlet ducts 18 communicate with this flue. These ducts 18 may be variously positioned, but preferably 20 discharge toward the rear, so as to oppose the escape of the smoke and gases, and serve to more effectually commingle therewith.

The ducts 18 are preferably of greatest width at the forward ends, and least width 25 at the rear ends of the distributor, to best distribute the air to aid combustion in the fire box. The water jacket of each distributor 8 is connected by two pipes 19 and 20 with the water space around the fire box, 30 and these pipes permit a circulation of water from the boiler to the water jackets to protect the distributor from the heat of the furnace, and also to assist in heating the air in the distributor. It will be noted that these 35 pipes 19 and 20 project through the end of the furnace, and then communicate with the water space, and in said pipes at the rear of the furnace, valves 21 are provided which permit said pipes to be closed. This is a 40 very desirable feature, because the stay bolts 22 of the boiler must be regularly tested in the boiler and the valves 21 permit communication with the water jackets 16 to be cut off, so that said distributors may be 45 removed and access permitted to all of the stay bolts. In operation, therefore, the air chambers 7 receive the air, and it will be noted that these chambers are greatly in excess in internal area of the pipe 6, hence a 50 supply of air is always in the chambers 7, greatly in excess of that which can pass through the pipes 6, therefore this air in the chambers 7 becomes highly heated in the smoke box, and is further heated in its passage through the pipes 6, and through the 55 distributor 8, so that it passes into the smoke and gases in a highly heated condition, and is readily combustible with the smoke and gases.

60 In the modification shown in Fig. 8, the chambers 7 are dispensed with, and pipes 6 are extended through the fire box and communicate with the bell mouths 23 at the forward end of the locomotive. This is a simple expedient for heating the air, but it is

thought the chambers 7 are an improvement, because they allow an excess of air which is being heated at all times. The distributor 24 illustrated in this modification and in longitudinal section in Fig. 9, is provided 70 in its lower edge with a mud pocket 25, the ends of which are provided with plugs 26 normally closing openings tapped therein. This mud pocket not only serves as a chamber for accumulating the sediment, but it 75 also enables a suitable instrument to be inserted through one of the tapped openings, so as to clean out the water jacket.

In the structure shown in Fig. 11, I dispense with the special flues 5, and connect 80 the air distributor 28 with a plurality of the ordinary flues 29, which latter are of course utilized for the passage of air, and not smoke and gases.

While my improvements are illustrated 85 and described in connection with a locomotive boiler, it is to be understood that they may be utilized in connection with a stationary boiler, and that various other slight changes might be made in the general form 90 and arrangement of parts described without departing from my invention, and hence I do not limit myself to the precise details set forth, but consider myself at liberty to make such changes and alterations as fairly 95 fall within the spirit and scope of the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is: 100

1. In a steam boiler, the combination with a fire box, a smoke box, a water chamber between them, and flues connecting said fire box and smoke box, of air heating chambers 105 in the smoke box, pipes connected to said air heating chambers and extending through the boiler, air distributors secured to the sides of the fire box, each distributor comprising a casting having a longitudinal flue larger at its forward end than at its rear end 110 and communicating at its forward larger end with the said pipes, and closed at its smaller rear end, the inner faces of said castings having discharge openings of varying lengths communicating with the flues, 115 said openings substantially vertical with the largest openings adjacent the forward ends of the distributors, and said openings decreasing in size from the forward to the rear ends of the distributors, substantially as 120 described.

2. In a steam boiler, the combination with a fire box, a smoke box, a water chamber between them, and flues connecting said fire box and smoke box, of air heating chambers 125 in the smoke box, pipes connected to said air heating chambers and extending through the boiler, air distributors secured to the sides of the fire box, each distributor comprising a casting having a longitudinal flue 130

larger at its forward end than at its rear end and communicating at its forward larger end with the said pipes, and closed at its smaller rear end, the inner faces of
 5 said castings having discharge openings of varying lengths communicating with the flues, said openings substantially vertical with the largest openings adjacent the forward ends of the distributors, and said openings decreasing in size from the forward to
 10 the rear ends of the distributors, and said casting made hollow forming water jackets around said flues and outlets, substantially as described.

15 3. In a steam boiler, the combination with a fire box, a smoke box, a water chamber between them, and flues connecting said fire box and smoke box, of air heating chambers in the smoke box, pipes connected to said
 20 air heating chambers and extending through the boiler, air distributors secured to the sides of the fire box, each distributor comprising a casting having a longitudinal flue larger at its forward end than at its rear
 25 end and communicating at its forward larger end with the said pipes, and closed at its smaller rear end, the inner faces of said castings having discharge openings of varying lengths communicating with the
 30 flues, said openings substantially vertical with the largest openings adjacent the forward ends of the distributors, and said openings decreasing in size from the forward to the rear ends of the distributors, said castings extending downward below the normal
 35 plane of the distributor forming mud pockets having tapped openings in their ends and screw plugs in said tapped openings, substantially as described.

40 4. In a steam boiler, the combination with a fire box, a smoke box, a water chamber between them, and flues connecting said fire box and smoke box, of air heating chambers in the smoke box, pipes connected to
 45 said air heating chambers and extending through the boiler, air distributors secured to the sides of the fire box, each distributor comprising a casting having a longitudinal flue larger at its forward end than at its rear
 50 end and communicating at its forward larger end with the said pipes, and closed at its smaller rear end, the inner faces of said castings having discharge openings of varying lengths communicating with the
 55 flues, said openings substantially vertical with the largest openings adjacent the forward ends of the distributors, and said openings decreasing in size from the forward to the rear ends of the distributors, and said
 60 casting made hollow forming water jackets around said flues and outlets, said castings extending downward below the normal plane of the distributor forming mud pockets

having tapped openings in their ends, and screw plugs in said tapped openings, substantially as described. 65

5. In a steam boiler, the combination with a fire box, a smoke box, a water chamber between them, and flues connecting said fire box and smoke box, of air heating chambers
 70 in the smoke box, pipes connected to said air heating chambers and extending through the boiler, air distributors secured to the sides of the fire box, each distributor comprising a casting having a longitudinal flue
 75 larger at its forward end than at its rear end and communicating at its forward larger end with the said pipes, and closed at its smaller rear end, the inner faces of said castings having discharge openings of varying
 80 lengths communicating with the flues, said openings substantially vertical with the largest openings adjacent the forward ends of the distributors, and said openings decreasing in size from the forward to the rear
 85 ends of the distributors, pipes connecting the water jackets of the distributor with the boiler, and extending outside of the boiler intermediate the ends of said pipes, and valves in said pipes outside of the boilers, 90
 substantially as described.

6. In a steam boiler, the combination with a fire box, a smoke box, a water chamber between them, and flues connecting said fire box and smoke box, of air heating chambers
 95 in the smoke box, pipes connected to said air heating chambers and extending through the boiler, air distributors secured to the sides of the fire box, each distributor comprising a casting having a longitudinal flue
 100 larger at its forward end than at its rear end and communicating at its forward larger end with the said pipes, and closed at its smaller rear end, the inner faces of said castings having discharge openings of varying
 105 lengths communicating with the flues, said openings substantially vertical with the largest openings adjacent the forward ends of the distributors, and said openings decreasing in size from the forward to the rear
 110 ends of the distributors, and said casting made hollow forming water jackets around said flues and outlets, pipes connecting the water jackets of the distributor with the boiler and extending outside of the boiler
 115 intermediate the ends of said pipes, and valves in said pipes outside of the boilers, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of
 120 two subscribing witnesses.

THOMAS CRAWFORD.

Witnesses:

HENRY M. MEASON,
 S. W. FOSTER.