

No. 830,833.

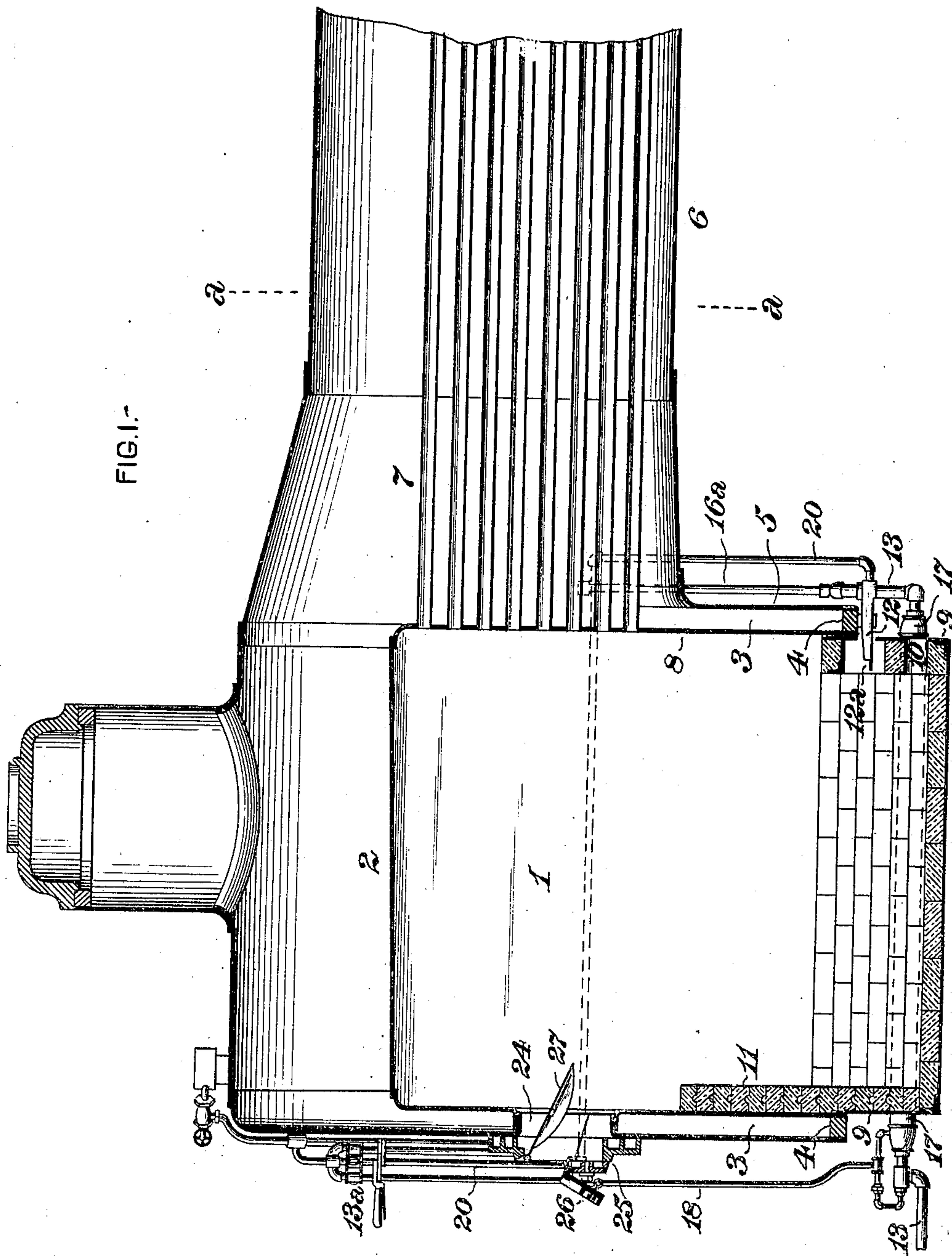
PATENTED SEPT. 11, 1906.

T. W. HEINTZELMAN & J. G. CAMP.

OIL BURNING STEAM BOILER.

APPLICATION FILED NOV. 14, 1905.

2 SHEETS—SHEET 1.



WITNESSES

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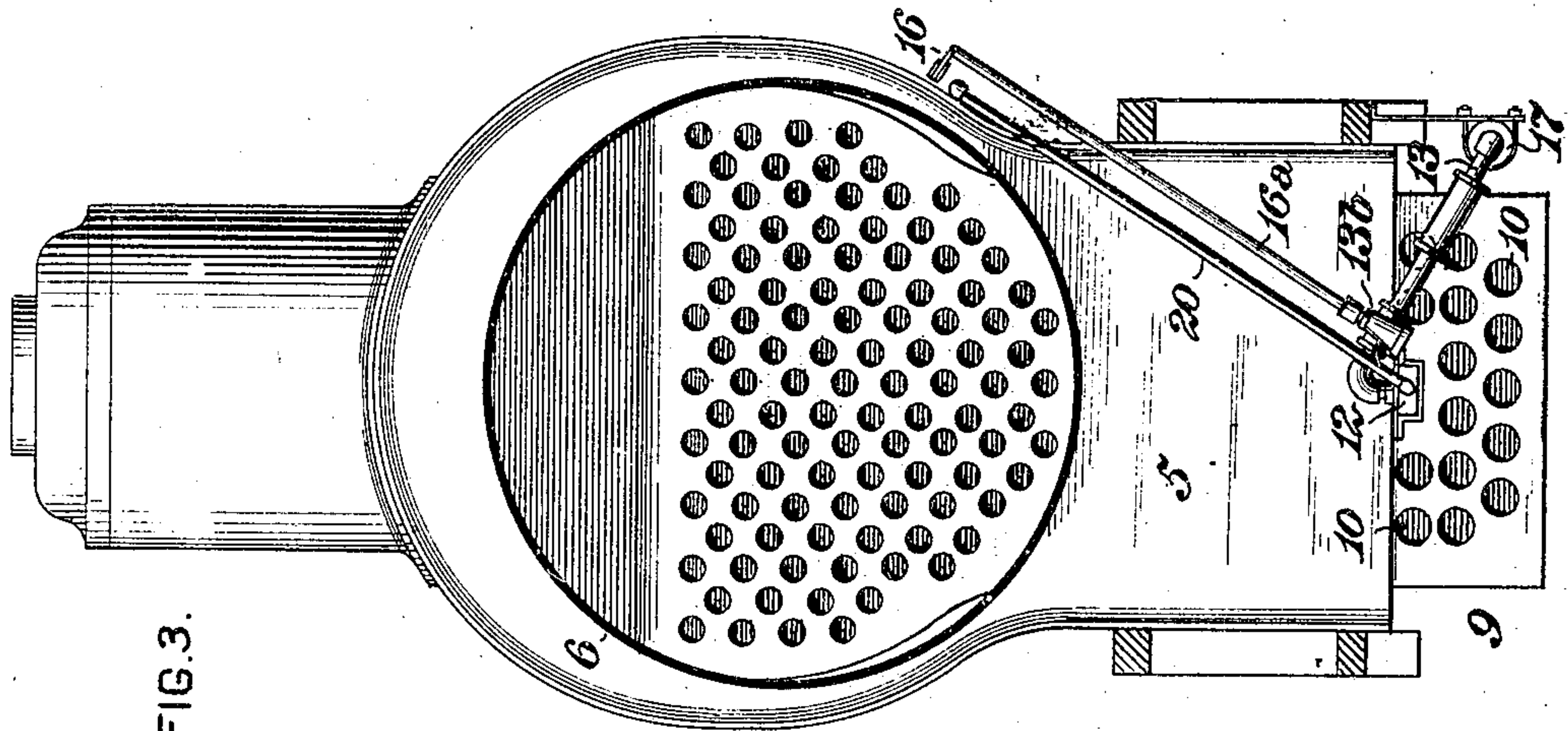


FIG. 3.

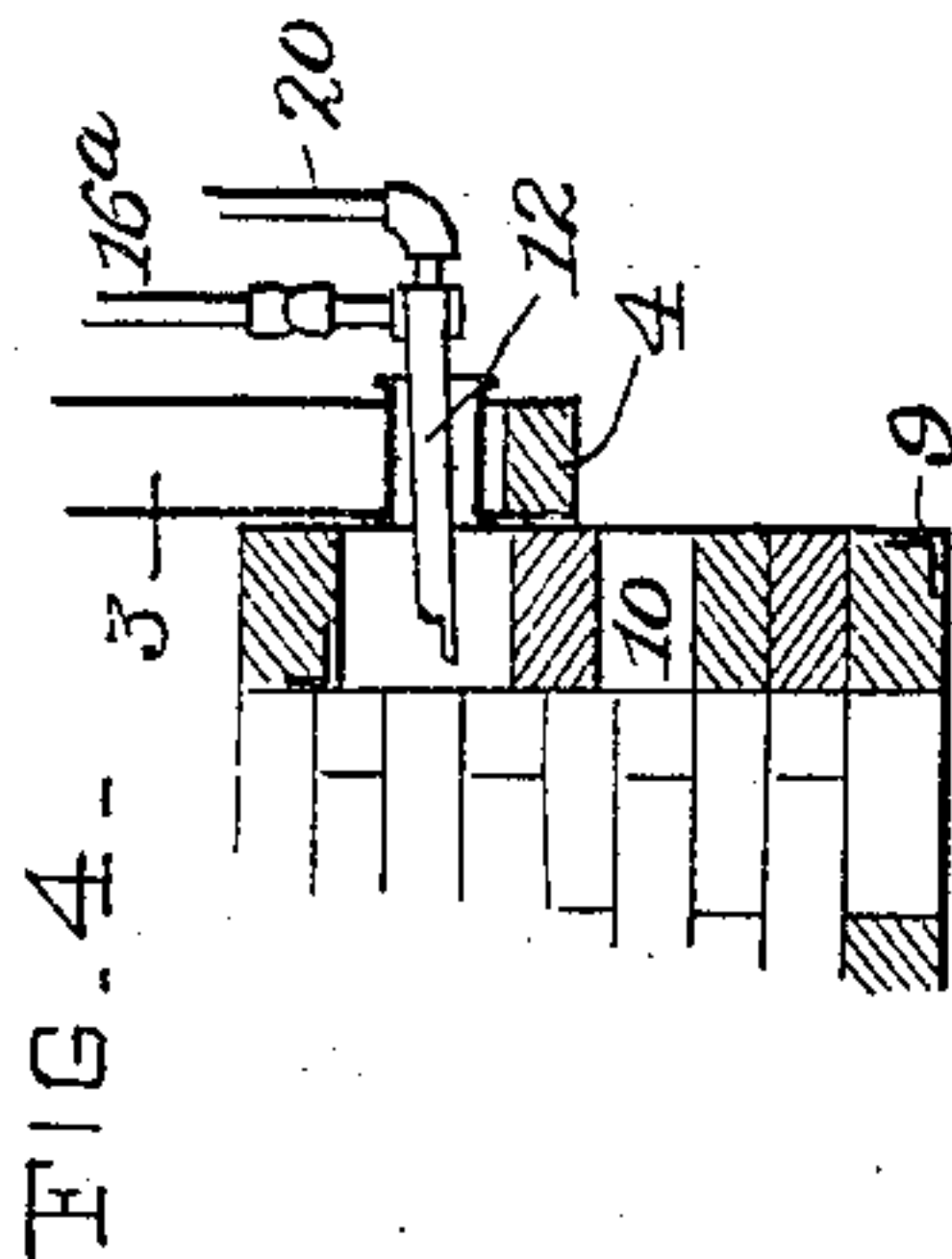


FIG. 4.

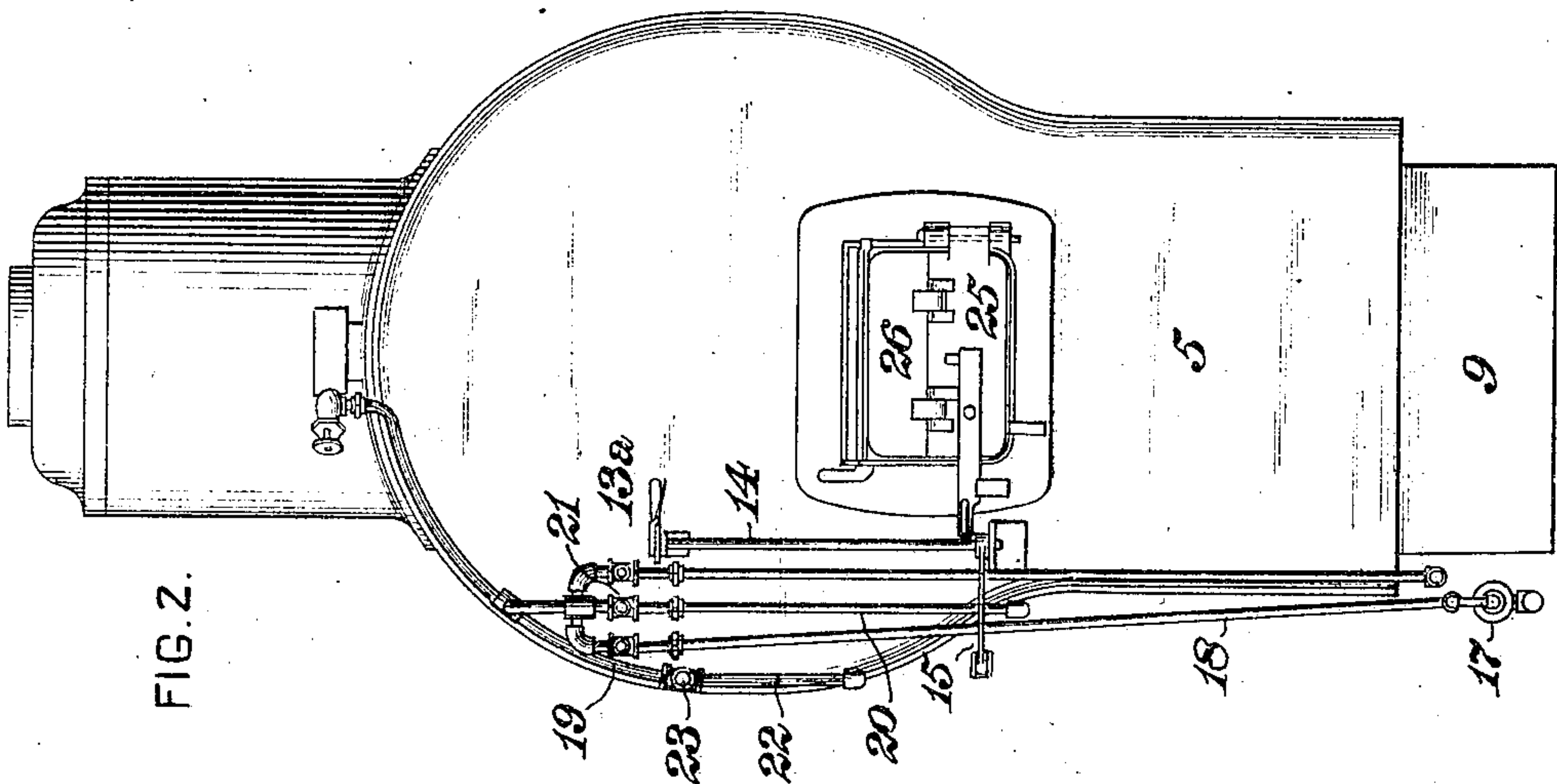


FIG. 2.

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UNITED STATES PATENT OFFICE.

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CALIFORNIA.

OIL-BURNING STEAM-BOILER.

No. 830,833.

Specification of Letters Patent.

Patented Sept. 11, 1906.

Application filed November 14, 1905. Serial No. 287,231.

To all whom it may concern:

Be it known that we, TAYLOR W. HEINTZELMAN and JAMES G. CAMP, of Sacramento, in the county of Sacramento and State of California, have jointly invented a certain new and useful Improvement in Oil-Burning Steam-Boilers, of which improvement the following is a specification.

The object of our invention is to provide means for effectively and economically generating steam in boilers of the locomotive, marine, stationary, and other types by the combustion of liquid hydrocarbons, such means being designed to attain complete combustion of the fuel within the fire-box and the application of the evolved heat to the entire heating-surface of the fire-box without injury to the fire-box sheets or inducing leaky flues and without unduly heating the front end or smoke-arch, thereby avoiding the objections heretofore encountered of leaky steam-pipes and tubes in front end.

A further and special object of our invention is to enable brick arches and walls of the various forms ordinarily heretofore employed to be dispensed with, thereby materially reducing the quantity of brick required.

The improvement claimed is hereinafter fully set forth.

In the accompanying drawings, Figure 1 is a vertical longitudinal central section through the fire-box and adjoining portion of the waist of a steam-boiler, illustrating an application of our invention; Fig. 2, a rear view in elevation of the same; Fig. 3, a vertical transverse section on the line *a a* of Fig. 1; and Fig. 4, a vertical section through the lower portion of the front wall of the fire-box, illustrating a modification of structural detail.

Our invention is herein exemplified as embodied in a locomotive-boiler of the ordinary narrow and deep fire-box type; but, as will appear upon a consideration of its essential structural and operative features, it is not limited in application to this or any other special type or form of steam-boiler, being adapted to use in any of the various constructions which are provided with a fire-box or furnace and tubes or flues leading therefrom. In the instance herein shown the inside fire-box 1 is of the usual form and is closed at its top by a crown-sheet 2 and sur-

rounded by vertical water-spaces 3, the bottoms of which are closed by a mud-ring 4, as in ordinary locomotive-boiler practice. The outside fire-box 5 is connected to the waist 6, through which the tubes 7 pass from the tube-sheet 8 to a smoke-box of the usual form (not shown) at the front end of the boiler.

In the practice of our invention the inside fire-box 1 is closed at bottom by a sheet or plate metal box or casing 9, which corresponds substantially in general form and location with the ordinary ash-pan of boilers in which solid fuel is used and will be herein descriptively referred to as the "bottom" pan. The bottom pan 9 is closed at all points except as to a plurality of draft-openings 10, located in its front wall, and is provided on its bottom, sides, front, and rear with a fire-brick lining 11, which extends upwardly for a short distance at its sides and for a greater distance at its rear into the inside fire-box 1.

In all oil-burning appliances of the type in which a jet of atomized hydrocarbon is introduced into the fire-box at or near its rear end or that farther from the tube-sheet, so that the flame from the burner is projected in the same direction as the traverse of the draft—that is to say, forwardly toward the tube-sheet—it has been the practice in order to protect the tube-sheet and tubes from the direct action of the high heat of the flame, as well as to direct the heat, as far and as uniformly as may be over the surfaces of the side, back, and crown-sheets of the fire-box, to locate one or more transverse brick walls or arches in the fire-box, one of them adjoining or being located a short distance in the rear of the tube-sheet and below the tubes. It will be obvious that brick walls or arches as above, involve a material increase of cost, weight, and time required for installation and renewals or repairs, and, moreover, the deflection or change of direction of the flame which they effect has not been found to accomplish as fully as is desirable the application of its heat with substantial uniformity to the surfaces of the inside fire-box.

The leading and characteristic feature of our invention, which has been developed with the object of not only dispensing with the ordinary brick walls and arches, but also of obtaining a more uniform and effective application of the heat from the burner to the

heating-surfaces of the fire-box than has usually been attainable when the arch is used, consists in combining with a fire-box and a floor or bottom pan a burner which delivers its flame rearwardly or in opposite direction to the draft above said floor without obstruction from arches, bridge-walls, or other analogous members, means for supplying air to the fire-box adjacent to the burner, and a draft-opening in the rear wall of the fire-box above the level of the burner, through which a current of air is directed upon the flame, which is thereafter caused to travel forwardly below the crown-sheet to the tubes by the draft through the same. Under this construction the hydrocarbon fuel is consumed in the fire-box, imparting substantially uniform heat to all the heating-surface thereof without direct action of the flame from the burner upon the tube-sheet and tubes and without highly heating the smoke-box and contained steam-pipes.

Under our invention we provide an oil-burner 12, which may be of any suitable and approved construction, various types being familiar to those skilled in the art, and which is located in front of the fire-box with its discharge or delivery nozzle 12^a extending rearwardly and opening thereinto. In the instance shown the delivery-nozzle passes through an opening in the front sheet of the bottom pan 9; but it will be obvious that, if preferred, it may, as shown in Fig. 4, be led through a hollow stay or sleeve in the lower portion of the front water-space 3, as has been done in a number of cases by us with equally satisfactory results in practice. Oil is supplied to the burner through an oil-supply pipe 13, leading from a suitable tank or receptacle and controlled by a firing-valve 13^b, which is actuated by a hand-lever 13^a through connections 14, 15, 16, and 16^a. The oil is, as in ordinary practice, preferably heated by means of a superheater 17, through which the oil-supply pipe 13 passes on its way to the burner and which is supplied with steam from the boiler through a pipe 18, controlled by a valve 19, and is atomized and discharged into the fire-box by a jet of steam admitted to the burner through a pipe 20, controlled by a cock 21. The detailed construction of the burner and its accessories is not, as above indicated, an essential of our invention, and the same may be varied in the discretion of the skilled constructor without departure therefrom. The burner shown is, however, one which is simple, durable, and inexpensive and is now successfully operating in regular service.

A blower-pipe 22, controlled by a valve 23, serves to maintain draft on the fire when the steam is shut off, and the exhaust-steam blast, which is operative in running, is consequently not effecting draft through the tubes.

The supply of air to the fire-box for the

combustion of the liquid hydrocarbon fuel is effected below and at the sides of the burner 12 through one or more lower draft-openings 10, formed in the front wall of the bottom pan 9. For convenience of construction, as well as for insuring proper distribution of the incoming air, a plurality of draft-openings is provided, and these are preferably formed of short tubes passing through the front wall. Air is also admitted to the fire-box through an upper air-supply passage 24 in its rear wall above the level of the burner, and the current of air entering through said passage is turned downwardly toward the flame by an inwardly-extending baffle or deflecting plate 27. In the instance shown the ordinary door-opening used with solid fuel constitutes the upper air-supply passage, which is controlled by a door 25, having a similar hinged door or trap 26, which covers a transverse opening in the door and is turned downwardly to uncover said opening, as shown in Fig. 1. The deflecting-plate 27 is connected to the inside of the door and may be adjusted to the angle desired for downwardly deflecting the incoming current of air.

The specific construction of door, trap, and deflecting-plate herein shown is not claimed in and of itself as of our invention and has been adopted by us as being one which is suitably adapted for the purpose.

It will be obvious that any other preferred form of similarly-located air admission and deflecting devices may be employed in the discretion of the constructor without departure from the spirit and operative principle of our invention.

In the operation of our invention the flame of the mixture of atomized oil and steam which is delivered rearwardly from the discharge-nozzle of the burner passes above the floor of the bottom pan of the fire-box, and the draft of the exhaust, by which air is drawn in through the draft-openings 10, being in the opposite direction tends to raise the flame in its rearward traverse, in which it meets the oppositely-moving current of air from the upper air-supply passage 24, and thereafter passes forwardly through the fire-box below the crown-sheet to the tubes. The oil is found in practice to be consumed in the inside fire-box with a very uniform application of heat to the heating-surfaces thereof, and the flame produced, which is of a lemon color, is soft and does not injure the crown-sheet or tube-sheet or cause leaky tubes, a substantial advantage having been gained in this latter particular over appliances heretofore used in the same service.

Our invention has been applied and is now in service in connection with the boilers of several locomotive-engines, the construction used being in all essential particulars substantially the same as that herein described and shown and has in regular service com-

plied with all the requirements thereof and obviated objections which had been found to exist to a substantial degree in constructions theretofore used in similar service.

5 We claim as our invention and desire to secure by Letters Patent—

1. The combination, with a steam-boiler having a fire-box closed at bottom, of means for delivering a hydrocarbon flame rear-
10 wardly into the fire-box, means for establishing a draft of air into the fire-box adjacent to the delivery of the hydrocarbon flame there-into, and means for admitting air directly into the rear of the fire-box and above the
15 level of delivery of the hydrocarbon flame.

2. The combination, with a steam-boiler having a fire-box closed at bottom, of means for delivering a hydrocarbon flame rear-
20 wardly into the fire-box, means for establishing a draft of air into the fire-box adjacent to the delivery of the hydrocarbon flame there-into, means for admitting air at the rear of the fire-box and above the level of delivery of the hydrocarbon flame, and means for
25 downwardly deflecting the air admitted at the rear of the fire-box.

3. The combination, with a steam-boiler having a fire-box closed at bottom, of a hydrocarbon-burner discharging rearwardly
30 into the fire-box at the front end thereof, the front of the fire-box being provided with lower draft-openings for the admission of air to the fire-box below and on opposite sides of the burner, and the rear wall of the fire-box
35 having an upper air-supply passage located within it above the level of the burner.

4. The combination, with a steam-boiler having a fire-box closed at bottom, of a hydrocarbon-burner discharging rearwardly
40 into the fire-box at the front end thereof, the front of the fire-box being provided with lower draft-openings for the admission of air to the fire-box below and on opposite sides of the burner, and the rear wall of the fire-box
45 having an upper air-supply passage located within it above the level of the burner, and a

door controlling said upper air-supply passage.

5. The combination, with a steam-boiler having a fire-box closed at bottom, of a hydrocarbon-burner discharging rearwardly
50 into the fire-box at the front end thereof, the front of the fire-box being provided with lower draft-openings for the admission of air to the fire-box below and on opposite sides of the burner, and the rear wall of the fire-box
55 having an upper air-supply passage located within it above the level of the burner, and a deflecting-plate projecting into the fire-box above the level of the upper air-supply pas-
60 sage.

6. The combination, with a steam-boiler fire-box, of a bottom pan which closes the lower end of the fire-box, a hydrocarbon-burner discharging rearwardly into the fire-
65 box, the front wall of the bottom pan being provided with lower draft-openings, and the rear wall of the fire-box having an upper air-supply passage above the level of the burner, a door controlling said upper air-supply pas-
70 sage, and a deflecting-plate projecting into the fire-box above the level of said passage.

7. The combination, with a steam-boiler fire-box, of a bottom pan which closes the lower end of the fire-box, a refractory lining
75 on the bottoms and sides of said pan, said lining extending partly into the fire-box, a hydrocarbon-burner located adjacent to the front of the fire-box, in position to discharge its flame thereinto above the bottom of said
80 pan, the front wall of said pan being provided with a plurality of lower draft-openings, and the rear wall of the fire-box having an upper air-supply passage above the level of the burner, and a deflecting-plate project-
85 ing into the fire-box above the level of said passage.

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