

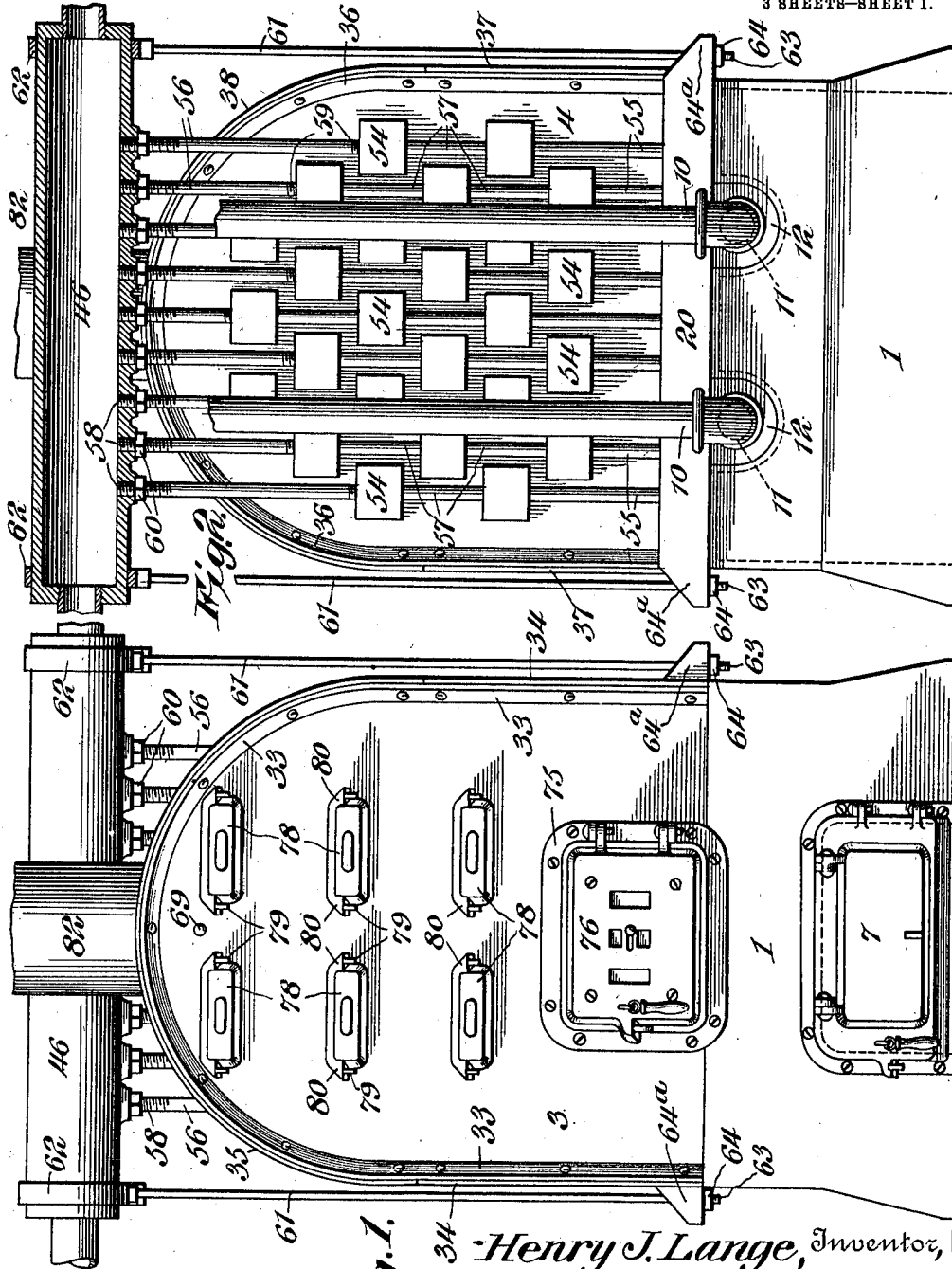
H. J. LANGE.
HEATER.

APPLICATION FILED APR. 12, 1910.

1,004,042.

Patented Sept. 26, 1911.

3 SHEETS-SHEET 1.



Witnesses

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Fig. 1.

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3 SHEETS—SHEET 2.

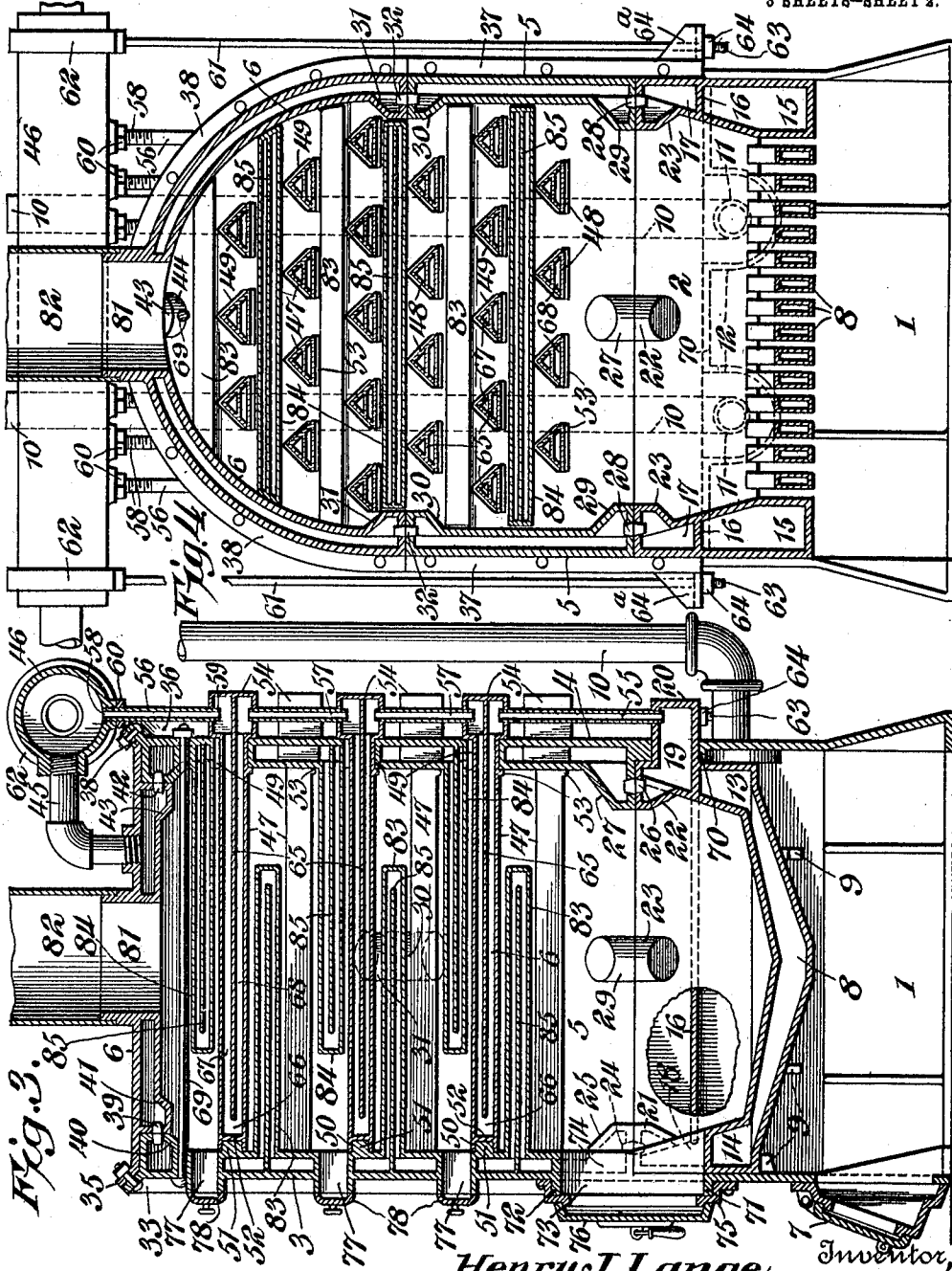


Fig. 3.

Fig. 4.

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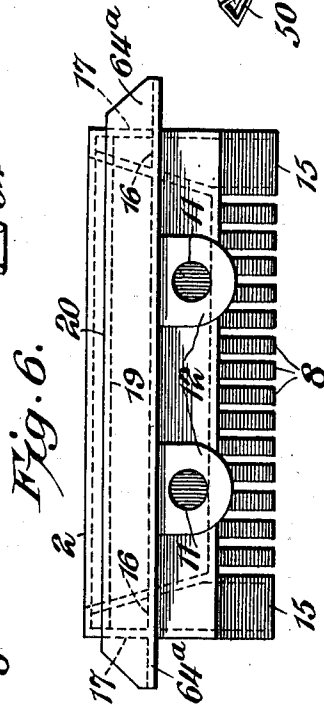
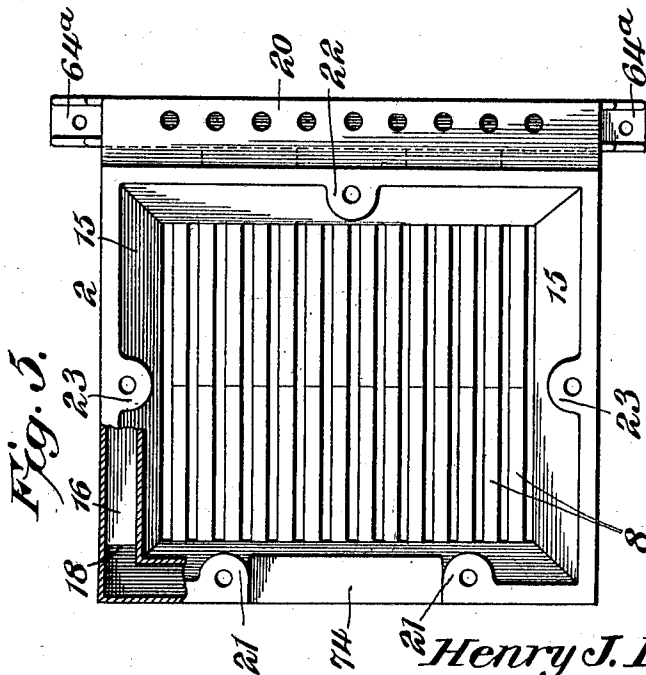
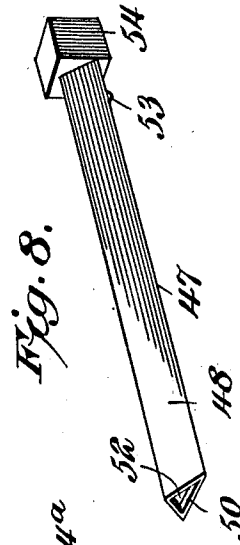
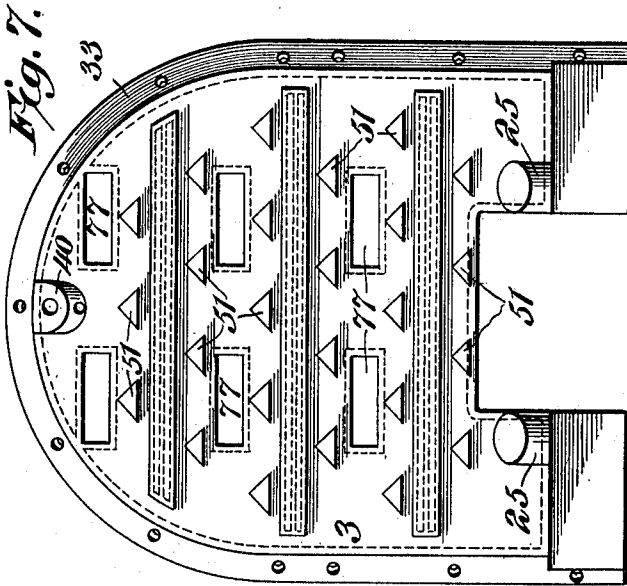
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3 SHEETS-SHEET 3.



Witnesses
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UNITED STATES PATENT OFFICE.

HENRY J. LANGE, OF LORAIN, OHIO.

HEATER.

1,004,042.

Specification of Letters Patent. Patented Sept. 26, 1911.

Application filed April 12, 1910. Serial No. 555,048.

To all whom it may concern:

Be it known that I, HENRY J. LANGE, a citizen of the United States, residing at Lorain, in the county of Lorain and State of Ohio, have invented a new and useful Heater, of which the following is a specification.

The invention relates to improvements in heaters for hot water systems.

The object of the present invention is to improve the construction of heaters for hot water systems, and to provide a simple, efficient and comparatively inexpensive one adapted to use various kinds of fuel and capable of being constructed almost wholly of cast iron and in which the joints between the sections will not be exposed to the fire.

A further object of the invention is to provide a heater of this character, equipped with a hollow grate and in which water in passing from the hollow grate to the manifold or distributing drum, will circulate through both water tubes and a water jacket, whereby two distinct circulatory systems are provided and a maximum heating of the water obtained.

Another object of the invention is to provide a heater provided with water tubes presenting upper inclined faces, adapted to shed dust in order to maintain themselves automatically in a comparatively clean condition.

With these and other objects in view, the invention consists in the construction and novel combination of parts, hereinafter fully described, illustrated in the accompanying drawings, and pointed out in the claims hereto appended; it being understood that various changes in the form, proportion, size and minor details of construction, within the scope of the claims, may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

In the drawings:—Figure 1 is a front elevation of a heater, constructed in accordance with this invention. Fig. 2 is a rear elevation, the manifold or distributing drum being in section. Fig. 3 is a central vertical sectional view, taken longitudinally of the water tubes. Fig. 4 is a central vertical sectional view, taken transversely of the water tubes. Fig. 5 is a plan view of the grate section, one corner thereof being broken away to show the horizontal partition. Fig. 6 is a rear elevation of the

grate section. Fig. 7 is an elevation of the hollow front wall of the heater. Fig. 8 is a detail perspective view of one of the water tubes.

Like numerals of reference designate corresponding parts in all the figures of the drawings.

In the embodiment of the invention illustrated in the accompanying drawings, the heater is provided with a casing comprising in its construction a base section 1, a grate section 2, hollow front and rear walls 3 and 4, hollow side walls 5 and a hollow top or dome 6. These are all constructed of cast iron and their interior spaces are connected and communicate with one another by means of pressed nipple joints, as hereinafter fully described. The base 1, which is substantially rectangular, forms an ash pit and is provided at the front with a suitable door 7 for the removal of the ashes. The grate section 2 is also approximately rectangular, as clearly shown in Fig. 5, and it is composed of a hollow marginal frame, and hollow grate sections 8, extending across the frame from front to rear. The walls of the base are provided with integral interiorly arranged lugs 9, forming supports for the grate section, which is seated upon and fitted within the base of the heater.

The hollow grate bars are composed of oppositely inclined front and rear portions, as clearly shown in Fig. 3 of the drawings, and each is connected at its front end with the front portion of the hollow frame of the grate section, and at its rear end with the rear portion of the said frame, so that the water passing through the grate bars flows forwardly into each of the same. The water is conducted to the hollow grate section by return pipes 10, having their lower ends piercing the rear wall of the base section and fitted in openings 11 of the tubular bosses 12. The hollow bosses 12 communicate with a rear transverse passage 13, located within the lower portion of the frame of the grate section and extending from one side portion of the said frame to the other. The transverse space or passage 13 is closed at the top to cause the water from the return pipes to flow through the grate bars, which communicate with the passage 13 and with a similar front transverse passage or space 14. The terminals of the rear transverse space

or passage 13 communicate with lower side passages or spaces 15, through which the water passes in circulating through the grate section from the back to the front thereof. The circulation of water through the lower portion of the grate maintains the grate bars and the adjacent portions of the frame sufficiently cool to prevent the formation of clinkers, and in practice any suitable form of shaking device, or other means may be employed for raking the heater. The side portions of the grate section are provided with horizontal partitions 16, extending forwardly from the rear portion of the grate section and dividing the side portions of the same into the said lower spaces or passages 15 and upper spaces or passages 17. The horizontal partitions 16, which are arranged in the same plane as the top wall of the lower rear passage 13, are located slightly above the plane of the top wall of the front passage 14 and terminate short of the front of the grate section to provide openings 18 to permit the water to circulate upwardly from the lower passages of the grate section through the upper side passages 17 to an upper rear space or passage 19. The passage 19 is formed in a hollow enlargement 20, extending across the back of the grate section and projecting horizontally therefrom, as clearly illustrated in Figs. 3 and 6 of the drawings.

The grate section is provided at the top with front, rear and side hollow bosses 21, 22 and 23. The front hollow bosses are provided with perforations and receive oppositely tapered nipples 24, which fit in corresponding perforations of upper hollow bosses 25 of the hollow front section 3. The rear boss 22 is provided with a perforation for the reception of a rear nipple 26, which fits in a corresponding perforation of a hollow boss 27 of the hollow rear wall 4. The hollow side bosses 23 are connected by oppositely tapered nipples 28 with hollow bosses 29 of the side sections 5.

The side sections 5 are seated upon the grate section and support the hollow top or dome section 6, the parts being equipped at their meeting edges with hollow bosses 30 and 31, which are connected by nipples 32.

The hollow front wall 3 of the heater is seated upon the base section 1 and is provided with a marginal attaching flange 33, which is bolted or otherwise secured to front marginal attaching flanges 34 and 35 of the hollow side walls 5 and the hollow top or dome 6. The hollow rear wall 4 is also equipped with a marginal attaching flange 36, which is bolted to rear attaching flanges 37 and 38 of the hollow side walls and the hollow top or dome. The hollow front wall is connected at the top with the interior of the hollow top or dome by means of a nipple

39, fitted in tapered openings of hollow bosses 40 and 41. The hollow rear wall is similarly connected with the hollow top or dome by a nipple 42, mounted in openings of hollow bosses 43 and 44. The hollow walls and the hollow top or dome provide a water jacket, which communicates with the hollow grate section, and the hot water from the grate section circulates upwardly through the water jacket to the hollow top or dome of the heater.

The hollow top or dome is connected by a short pipe 45 with a manifold or distributing drum 46, located at the top of the heater directly above the hollow rear wall thereof. The heater is also equipped with a plurality of horizontal water tubes 47, arranged in horizontal rows and in vertical series and providing for a circulation of water from the grate section to the manifold or distributing drum independently of the circulation through the water jacket. By subjecting the water in this manner to the action of the heat, a maximum heating of the water is obtained.

Each of the water tubes is triangular in cross section and presents oppositely disposed inclined side faces 48, which meet at the top and form an apex and which are adapted to shed dirt, whereby the water tubes are automatically maintained in a comparatively clean condition. The water tubes extend through openings 49 in the rear wall of the heater, and are provided at their front ends with sockets 50, which fit over integral triangular lugs 51 of the front wall. The lugs 51 extend horizontally from the inner face of the front wall, and when the water tubes are secured in position by the means hereinafter described, their front ends are interlocked with the front wall 3 by means of the lugs 51 and are firmly supported in the horizontal position. The front end wall 52 of the water tube is inwardly off-set from the front end thereof to provide the socket 50, and the bottom of the tube 48 is provided adjacent to its rear end with a transverse rib or flange 53, forming a shoulder to engage the inner face of the rear wall of the heater, whereby the water tube is held against outward movement and maintained in engagement with the front horizontal lug or projection 51. The openings 49 are of sufficient size to permit the water tube and the flange or rib 53 to pass through them, and when the water tubes are seated upon the rear wall at the bottom of the openings 49, there is sufficient space above the tubes to permit them to be lifted to disengage the rib or flange 53 from the rear wall.

The water tubes are provided at their rear ends with heads 54, preferably in the form of a cube as shown and arranged exteriorly of the hollow rear wall. The heads 54 of the water tubes are provided with upper and

lower openings for the reception of the coupling pipes. In order to equip the heater with a comparatively large number of water tubes, the tubes of each horizontal row are arranged opposite the intervals of the tubes of the adjacent horizontal rows. The heads of the lower tubes of the vertical series are connected by bottom coupling pipes 55 with the hollow extension 20 of the grate section. The heads of the upper tubes of the vertical series are connected with the manifold or distributing drum 46 by upper coupling pipes 56, and the heads of the water tubes are connected with each other by intermediate pipes 57. The ends of the lower and intermediate coupling pipes 55 and 57 are tapered and the openings for their reception are correspondingly tapered, the parts being detachably fitted together similar to a pressed nipple joint. The upper coupling pipes 56 have threaded upper and lower ends 58 and 59, and correspondingly threaded openings are formed in the bottom of the manifold or distributing drum 46 and in the tops of the heads of the upper water tubes of the vertical series. The upper ends of the top coupling pipes 56 are also equipped with lock nuts 60, which engage the manifold or distributing drum 46 at the bottom thereof, the said manifold or distributing drum being preferably provided at the bottom openings with bosses or enlargements to be engaged by the said nuts 60. The tapered ends of the coupling pipes are maintained firmly in engagement with their respective openings by means of vertical rods 61, provided at their upper ends with suitable collars or bands 62 to fit on the manifold or distributing drum and having their lower ends adjustably connected with the grate section. The collars or bands 62 embrace the manifold or distributing drum at the ends thereof, and the lower terminals 63 of the rods 61 are threaded for the reception of nuts 64 by means of which the coupling pipes are maintained sufficiently tight to form water tight joints. The grate section is provided at the ends of the extension 20 with horizontal ears or flanges 64^a, which are pierced by the lower ends of the rod 61. The coupling pipes, which are arranged in vertical lines or series, support the manifold or distributing drum, and any one of the water tubes of the vertical series may be removed by disconnecting the top coupling pipe, which may be screwed upwardly into the manifold or distributing drum a sufficient distance to enable the other water tubes and coupling pipes of such vertical lines or series to be disengaged from one another.

Each water tube is provided with a horizontal partition 65, extending forwardly from the outer end of the head of the water tube to within a short distance of the front

end wall or partition 52 to provide an opening 66. The horizontally disposed longitudinal partition 65 divides the space within each water tube into upper and lower passages 67 and 68, and the water in circulating through the tubes passes forwardly through the lower passage 68, around the end of the partition 65 and then rearwardly through the upper passage 67. The water from both the water jacket and the water tubes flows into the manifold or distributing drum from whence it passes to the radiators of the heating system, preferably through openings in the ends of the manifold or distributing drum, which, however, may be tapped at any point for this purpose.

The front and rear walls are connected near their upper edges by a centrally arranged tie rod 69, provided with a head at one end and equipped at the other end with a nut, as clearly illustrated in Fig. 3 of the drawings. The rear wall of the base section is provided with an inwardly extending horizontal flange 70, which forms a seat for the grate section. The front wall of the base section is provided with an outwardly extending horizontal flange 71, and the hollow front wall is provided with outwardly extending top and side flanges 72 and 73. These flanges, which form projecting edges around a door opening 74, fit within a rectangular door frame 75, secured to the exterior of the hollow front wall and the base section, as clearly shown in Fig. 1 of the drawings. A suitable door 76 is hinged to the frame 75. Fuel of any desired character may be introduced through the door opening 74 into the fire box formed by the grate section. If desired a burner or burners for gas or liquid hydrocarbon may be arranged within the heater.

The hollow front wall is provided with horizontal oblong openings 77, flanged exteriorly and normally closed by suitable doors 78. The doors 78, which are substantially oblong, are hung between the lugs 79 by projecting end portions 80, preferably provided with knife edges and arranged to cause the doors to fit tightly against the flanges of the openings 77 by gravity. The doors 78 are lifted off the lugs when it is desired to remove any accumulation from the water tubes.

The hollow top or dome is provided with a central flanged opening 81, adapted to receive a smoke pipe 82 for the escape of the products of combustion. The short pipe 45, which connects the jacket with the manifold or distributing drum, is located in rear of the smoke pipe and is approximately L-shaped, as shown.

In order to increase the heating capacity of the heater, it is equipped with hollow horizontally disposed baffle plates 83 and 84, preferably formed integral with the hollow

front and rear walls of the heater and communicating with the spaces within the said walls. The hollow baffle plates are located above each of the horizontal rows of the water tubes, and their inner portions are arranged in overlapping relation for causing the products of combustion to take a circuitous course in passing from the combustion chamber to the smoke pipe 82. The horizontal baffle plates extend entirely across the heater from one side wall to the other, and they alternately project from the hollow front and rear walls, and are of a length to extend approximately about three quarters of the distance between the said front and rear walls. The baffle plates, which are closed at their inner ends, are connected at their outer ends with and lead from the inner sides or shells of the hollow front and rear walls. Each of the hollow baffle plates is provided with an interiorly arranged horizontally disposed partition 85, connected with and leading from the outer portions or shells of the front and rear walls and extending from the outer ends of the baffle plates to within a short distance of the inner ends of the same for causing the water in traveling upward through the hollow front and rear walls to pass beneath the partition 85 and upward around the inner ends thereof and over the said partitions to the outer ends of the baffle plates. It will thus be seen that the baffle plates not only interrupt the products of combustion, but are highly heated by the said products impinging against them, and the water within the hollow baffle plates is distributed over a comparatively large surface, and the heating surface of the heater is greatly increased and the products of combustion are caused to act with greater effect on the rows of water tubes and the capacity of the heater is greatly increased.

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

1. The combination of a hollow grate section, hollow front and rear walls supported upon the grate section and communicating therewith at their lower ends, hollow side walls arranged between and secured to the front and rear walls and forming a rectangular casing, said side walls being also supported upon the grate section and communicating therewith at their lower ends, and a hollow top or dome supported upon the side walls between the front and rear walls and communicating at the bottom with the side walls and at the top with the front and rear walls.

2. A heater of the class described including a hollow grate section, hollow side, front and rear walls communicating with the grate section, a hollow top connected to and communicating with the said walls and

coöperating therewith to form a complete water jacket, a manifold or distributing drum arranged exteriorly of and above the top and connected to and communicating with the water jacket, a plurality of horizontally disposed water tubes arranged within the water jacket and having one end projecting beyond one of the walls, and means for connecting the projecting ends of the water tubes with the grate section and also with the manifold or distributing drum, whereby two distinct circulatory systems are present in the heater.

3. A heater of the class described having hollow walls constituting a water jacket for the heater and including a hollow grate section connected to and communicating with the water jacket at the bottom, a manifold or distributing drum arranged at the top of the heater and connected to and communicating with the top of the water jacket, a plurality of water tubes communicating with the hollow grate section and with the manifold or distributing drum, and a return pipe connected with the hollow grate section.

4. A heater of the class described including a base, a hollow grate section supported by the base and provided with hollow bosses located within the said base, hollow side walls mounted upon the grate section, hollow front and rear walls, a hollow top or dome arranged upon the side walls and communicating with the same and with the front and rear walls, a manifold or distributing drum connected with the top or dome, a plurality of tubes communicating with the manifold or distributing drum and with the hollow grate section, and return pipes piercing the base and connected with the hollow bosses of the grate section.

5. A heater of the class described including a casing, horizontal water tubes extending into the casing and having exteriorly arranged heads, a manifold or distributing drum located above the water tubes, coupling pipes connecting the heads of the tubes and communicating with the same, and other coupling pipes connecting the manifold or distributing drum with the heads of the adjacent water tubes and provided with adjusting means for maintaining all of the coupling pipes in locked relation.

6. A heater of the class described including a casing provided with openings, a manifold or distributing drum, horizontal water tubes extending through the openings of the casing and provided with means arranged interiorly of the casing for engaging the same to hold the tubes against outward movement, and exterior vertical coupling pipes connecting the outer ends of the tubes with each other and with the manifold or distributing drum and maintaining the tubes in engagement with the casing.

7. A heater of the class described including a casing provided with openings, a manifold or distributing drum located at the top of the casing, horizontal water tubes extending through the openings and provided at the bottom with shoulders arranged interiorly of the casing for engaging the same to hold the tubes against outward movement, and vertical coupling pipes connecting the tubes with one another and with the manifold or distributing drum and maintaining the shoulders in engagement with the casing.

8. A heater of the class described including a casing provided at one of its walls with an opening and having an interior lug or projection located at the inner side of the opposite wall, and a water tube extending through the said opening and provided at its inner end with a socket receiving the lug or projection, which forms a support for the tube, said tube being provided at its outer portion with a shoulder located at the bottom of the device and arranged interiorly of the casing and detachably engaging the inner side of the same to hold the tube against outward movement.

9. A heater of the class described including a casing provided at one of its walls with openings and having interior lugs or projections located at the inner side of the opposite wall, water tubes extending through the openings and provided at their inner ends with sockets receiving the lugs or projections, which support the tubes, said tubes being provided at their outer portions with shoulders arranged interiorly of the casing and engaging the inner side of the same to hold the tubes against outward movement, and exterior vertical tubes connecting the outer ends of the water tubes and holding the shoulders thereof in engagement with the casing.

10. A heater of the class described including a casing provided in one of its walls with openings and having triangular lugs projecting from the inner face of its opposite wall, and a plurality of water tubes extending through the openings, said water tubes being triangular in cross section and having sockets at their inner ends conforming to the configuration of and receiving the said lugs, and means for connecting the tubes and for holding the same against outward movement.

11. A heater of the class described including water tubes arranged in approximately horizontal rows and extending from the front to the back of the heater, and hollow baffle plates extending entirely across the heater and projecting alternately from the front and rear walls of the same and having their inner portions arranged in overlapping relation, said baffle plates being provided with interior partitions extending

entirely across the baffle plates from the outer ends thereof and terminating short of the inner ends of the same to form upper and lower water passages.

12. The combination of a hollow grate section, hollow front and rear walls supported upon the grate section and communicating with the same at the bottom, side walls also supported upon the grate section, hollow baffles extending entirely across the space between the side walls and having no direct connection therewith, said baffles projecting alternately from the front and rear walls and arranged in overlapping relation to provide a circuitous passage for the products of combustion, said baffles leading from the inner shells of the said front and rear walls and communicating at their outer ends with the space defined by the inner and outer shells of the front and rear walls, the inner ends of the baffles being closed and each baffle being provided with a horizontally disposed partition leading from the outer shell of the front and rear walls and extending into the baffles close to the inner closed end thereof, substantially as described.

13. A heater of the class described including a hollow grate section, hollow front, rear and side walls supported by the grate section, a hollow top or dome, all of said hollow parts communicating and forming a complete water jacket around the heater, hollow baffles extending alternately from the front and rear walls and arranged in overlapping relation to provide a circuitous passage for the products of combustion, some of the baffles communicating with the hollow rear wall and others with the hollow front wall, water tubes extending through openings in one of the walls of the heater into the space between the baffles and having heads at their outer ends, a manifold or distributing drum located above the water tubes, and coupling pipes connecting the water tubes with one another and with the manifold or distributing drum.

14. A heater of the class described including a grate section, hollow front, rear and side walls supported by the grate section, a hollow top or dome, all of the said hollow parts communicating and forming a complete water jacket around the heater, hollow baffles extending entirely across the space between the side walls and having no direct connection therewith, said baffles projecting alternately from the front and rear walls and arranged in overlapping relation to provide a circuitous passage for the products of combustion, said baffles leading from the inner shell of the hollow front and rear walls and communicating at their outer ends with the spaces defined by the inner and outer shells of the said front and rear walls, the inner ends of the baffles being closed and

each baffle being provided with a horizontally disposed partition leading from the outer shell of the front and rear walls and extending into the baffles close to the inner
5 closed ends thereof, and means for supplying water to the hollow walls at the bottom thereof.

In testimony, that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

HENRY J. LANGE.

Witnesses:

W. B. THOMPSON,
C. E. VAN DEUSEN.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."
