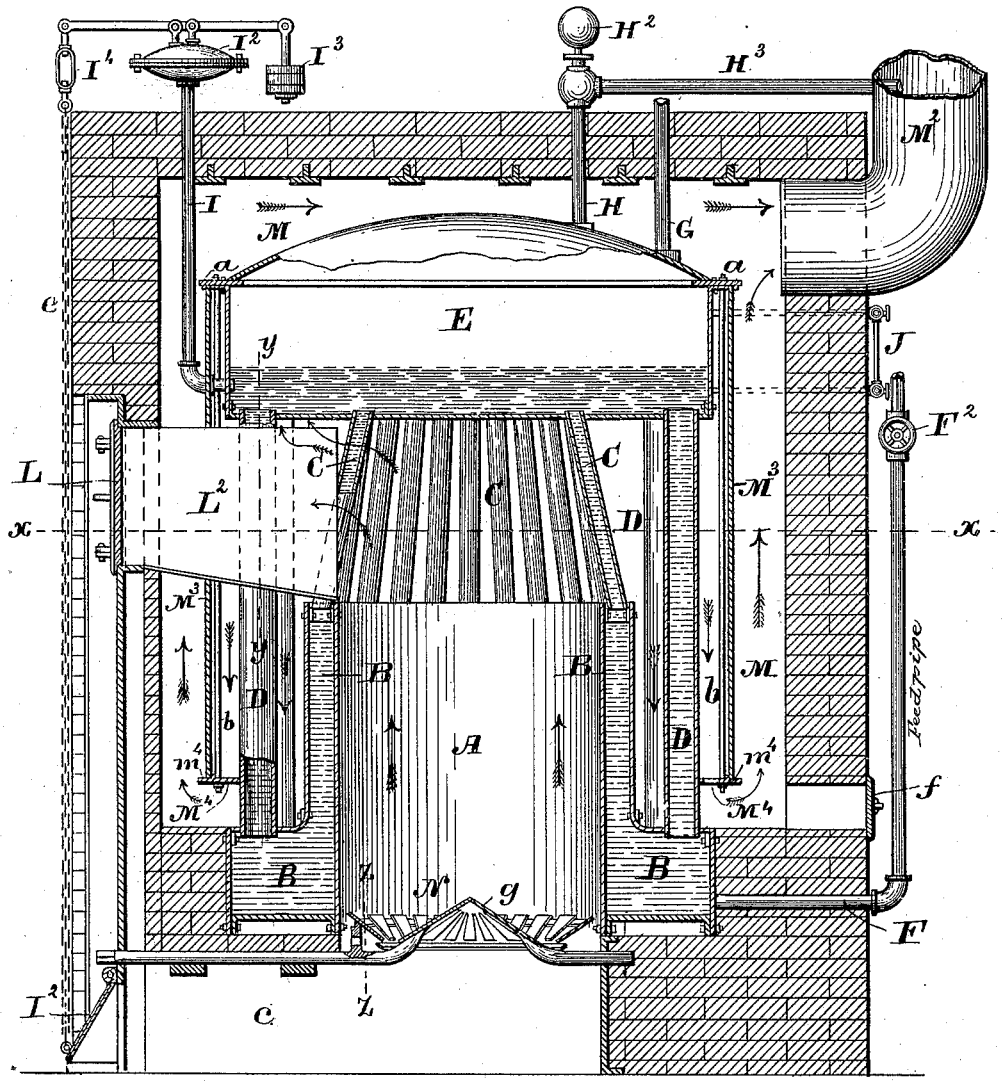
(No Model.) 2 Sheets—Sheet 1.

R. S. WATSON.

BOILER FOR HOUSE WARMING APPARATUS.

No. 344,699. Patented June 29, 1886.

FIG. I.



ATTEST-
J. Henry Kaiser
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INVENTOR-
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(No Model.) 2 Sheets—Sheet 2.

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FIG. 2.

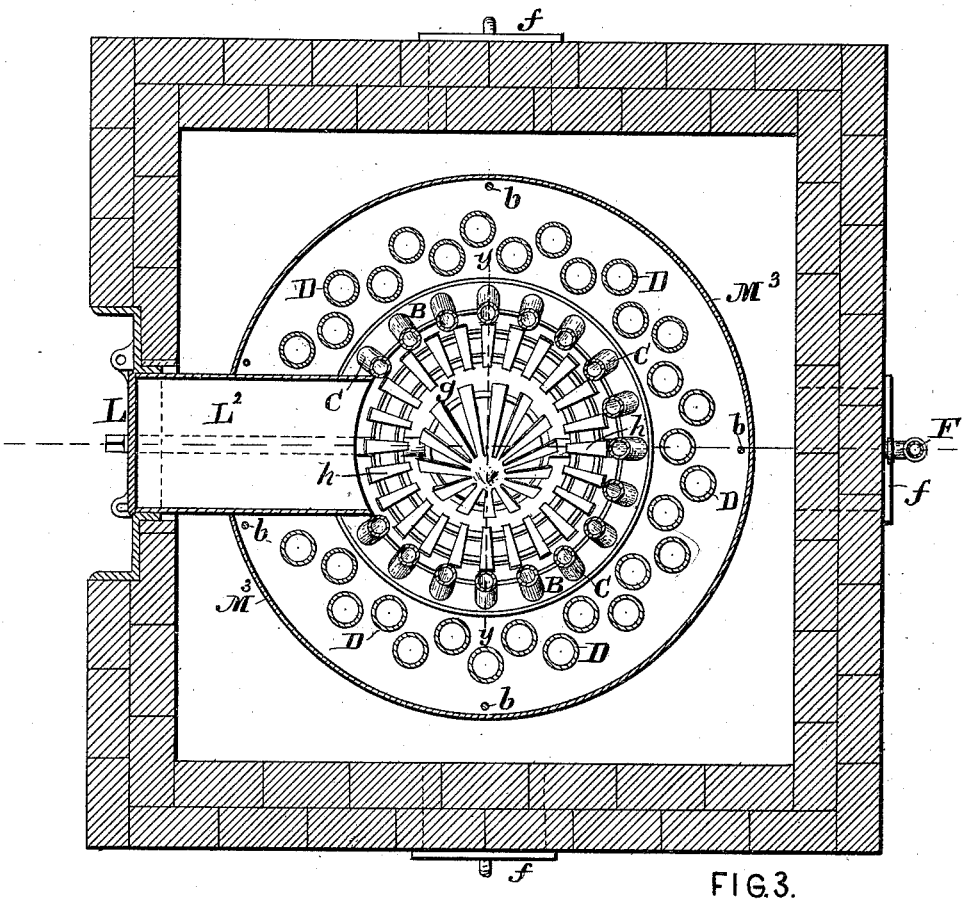
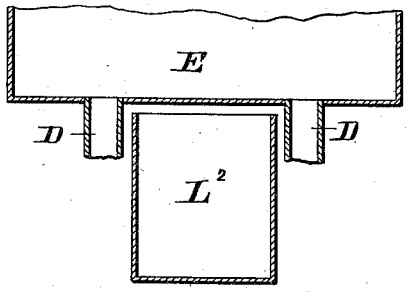


FIG. 3.



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UNITED STATES PATENT OFFICE.

ROBERT S. WATSON, OF BAY CITY, MICHIGAN, ASSIGNOR OF TWO-THIRDS TO BENJAMIN J. WATSON AND MICHAEL GARLAND, BOTH OF SAME PLACE.

BOILER FOR HOUSE-WARMING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 344,699, dated June 29, 1886.

Application filed August 22, 1885. Serial No. 175,053. (No model.)

To all whom it may concern:

Be it known that I, ROBERT S. WATSON, of Bay City, in the county of Bay and State of Michigan, have invented certain new and useful Improvements in Boilers for House-Warming Apparatus; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, making part of this application.

My invention relates to that class of steam-boilers which is designed to be used preferably with steam at a low pressure, and for the purpose of heating (by steam supplied to radiators located in the apartments) the interiors of dwellings and other buildings, and has for its main objects to provide for use a steam-boiler or steam-generating apparatus of this type, which shall be exceedingly simple and durable in its construction, easily managed, efficient in its operations, and at the same time capable of producing a maximum amount of steam-generation with a minimum consumption of fuel.

To these main ends and objects my invention consists in the novel features of construction which will be hereinafter fully described, and which will be most particularly defined and pointed out in the claims of this specification.

To enable those skilled in the art to which my invention relates to fully understand and practice the same, I will now proceed to fully describe the construction and operation of a steam-generator for house-warming purposes embracing my invention, referring by letters to the accompanying drawings, which form part of this specification, and in which I have shown my invention carried out in that form in which I have so far successfully practiced it, and which is the best now known to me.

In the drawings, Figure 1 is a vertical central section (in a plane running from front to rear) of a steam boiler or generator made according to my invention. Fig. 2 is a horizontal section on a plane indicated by the line *x x* of Fig. 1. Fig. 3 is a partial vertical section at the line *y y* of Fig. 1, showing the construction of the feed-chute of the furnace and its relationship to the dome of the boiler.

In the several figures the same part will be found designated by the same letter of reference.

A is the fire box or chamber of the boiler surrounded by a water jacket or space, B, of the form clearly shown, and N is the grate on which the fire is made, and which is of a peculiar construction, to be presently described.

E is the dome or uppermost portion of the boiler, in which the steam generated over the top surface of the contained water collects, and from which it passes off through the steam-pipe G, to supply the radiators, in a manner well understood by those skilled in the art. This dome E, as clearly shown, is preferably cylindrical in contour, (like the water-space B surrounding the fire-chamber,) and has about the same diameter as that of the lowermost or base portion of said water-space B, and is located some distance above the top of said portion B of the boiler.

Surrounding the thinner portion of the water space or jacket B are a double series of tubes, D, the lower ends of which communicate with the base portion of the water-space B, and the upper ends of which communicate with the dome E, all as clearly shown.

C represents another series of pipes which also communicate at their upper ends with the dome E, and at their ends with the extreme upper portion of the water space or jacket B; but which are arranged, as shown, to converge at their upper ends, so that the ascending products of combustion will impinge on the surfaces of said tubes to greater extent than if they were arranged vertically, and which also act in a measure, by reason of the obliquity shown, to deflect the ascending currents of heat and make them act more intensely on the bottom of the dome portion E of the boiler.

M^3 is a jacket, preferably of sheet-iron, cylindrical in form, and of a diameter a little greater than that of the dome portion E. Said jacket has its upper edge arranged just beneath and in contact with the flanged annular rim *a* of the dome E, and its lower edge placed

in contact with the upper surface of a flanged metallic rim or annulus, m^4, and together with said rim m^4 is held in place by the tie-rods *b*, which pass through the said annulus and the said rim *a*, and are provided with nuts, as shown.

L^2 is the feed-chute or passage-way through which the fuel is fed to the fire-chamber A, and which is provided, as usual, with a suitable hinged feed-door, L.

Beneath the grate-bars is formed, as usual, a suitable ash-pit, *c*, which extends forward and is provided with a door, I^5, that is opened and closed automatically (by means to be presently described) for the purpose of regulating the draft and thus controlling the fire.

H is a vertical pipe rising from the top of the dome E, (preferably near the back part of the boiler,) and provided at its upper end with a safety or blow-off valve, H^2, from the globular chamber of which latter extends a pipe, H^3, which serves to carry off into the smoke-flue or chimney-pipe M^2 of the boiler any steam blown off at the said safety-valve.

F is the feed-water or supply pipe of the boiler, through which the boiler may be fed from any desired source of supply, and it is provided, as shown at F^2, with a valve or stop-cock.

I prefer to use in connection with the boiler a supply-tank, which can be supplied preferably with soft or rain water, (that will not be apt to scale up the boiler,) and which should of course be placed high enough to get the requisite pressure or head to feed with.

As four or five pounds of steam will be the desirable pressure at which to run the boiler, six to eight pounds pressure or head to the feed-water supply will be sufficient.

J is a glass tube connected at its upper and lower ends with tubes running into the dome E at levels respectively below and above the water-level, the said glass J thus serving, in a well-known manner, as an indicator to always show the condition or level of the water in the boiler.

From the front wall of the dome portion E of the boiler extends outwardly and then upwardly a pipe, I, which has combined with its upper end the well-known means of a flexible diaphragm device, I^2, and a weighted lever provided at I^6 with regulation-weights, and connected at the other end by a swivel, I^4, with a descending chain, *e*, the lower end of which is fastened to the door I^5 of the ash-pit and draft-passage. As usual, any undue decrease in the steam-pressure will permit the diaphragm to partially collapse, thus letting the weighted end of the lever go down and the other end up, (so as to pull in the chain *e* and open the draft-door I^5 more or less,) and as soon as the increased generation, caused by opening the draft-door and starting to brighten up the fire, shall have sufficiently raised the steam-pressure of the boiler the expansion of the flexible diaphragm will restore the weighted lever to its original condition, thus permitting the draft-door I^5 to again close by gravity. The boiler is inclosed, as shown, within a casing or surrounding of brick-work, within which (and exteriorly of the sheet-iron jacket M^3 and the top of dome E) are formed suitable spaces and passage-ways for the unconsumed products of combustion to pass off to the exit flue or pipe M^2.

The arrows at Fig. 1 indicate the general direction of the currents of heat, smoke, and gases, and an observation of the drawings will show that the products of combustion ascending from the fire in the chamber A strike against the under surface of the dome E, and impinging against the convergent set of tubes C thoroughly heat them, and passing between said tubes go in a partially-horizontal direction toward and against the upper ends of the vertical tubes D; that the heat and gases have then to descend within the cylindrical jacket M^3 and in contact with all the tubes D, and also in contact with the exterior wall of the thinner portion of the water-space D, until the outermost portion of the mass of descending heat and other products comes into contact with and is inwardly deflected by the annulus or cast-iron rim M^4, after which the whole mass escapes outwardly beneath the rim M^4, and thence passes upwardly outside of the jacket M^3 and within the spaces or flues M formed within the brick-work. It will be seen that in a contrivance thus organized and operating no portion of the boiler-surfaces proper are exposed, so as to lose any heat capable of increasing the steam-generating capacity of the apparatus; and it will be understood that by reason of the convergent arrangement of the tubes C, and the construction and arrangement shown of the water-surrounded fire-chamber, the encircling series of tubes D and the surrounding jacket M^3, with its deflector-rim M^4 located as described, little or no waste of the heat produced by the fire can occur.

At suitable points around the furnace-inclosure of brick-work, at the level of the circular space betwween the rim-plate M^4 and the lower ends of the tubes D, I have several doors *f*, which may be opened at pleasure to afford easy access to the interior for the purpose of readily removing any collection of dust or fine ashes deposited round about the lower ends of said tubes and on top of the water-space B, which deposit might (in time) impair the proper action of these portions of the boiler.

To insure freer and fuller access of the heat to all portions of the base of the dome portion E, I make the cast-iron chute L^2 without any top, (except near its outer end,) or, in other words, form it of only a bottom and two sides, as best seen at Fig. 5, so that the products of combustion entering the inner end of said chute can strike against and operate on the bottom of the dome E.

Of course many variations in the details of

construction of my improved steam-generating apparatus may be made without materially changing its principles of construction or mode of operation, and all such variations would come within the scope of my alleged invention.

What I claim as new in the apparatus shown and described, and desire to secure by Letters Patent, is—

1. In combination with the cylindrical jacket or water-space B and the upper water and steam receptacle or dome, E, constructed without any fire-flues, the series of cylindrical tubes C, arranged convergently, as specified, and connecting the base of the receptacle E with the upper part of the jacket B, the whole arranged and operating together in the manner and for the purposes set forth.

2. In combination with the water space or jacket B, the dome E, and a series of tubes (preferably arranged obliquely) connecting the lower portion of the dome with the upper part of the jacket, a series of tubes, D, surrounding the fire-chamber and its jacket and connecting the base of the latter with the water-space of the dome, the whole arranged to operate substantially as set forth.

3. In combination with the lower water-space, B, the upper water and steam receptacle or dome, E, and the tubes D, which connect the said two portions of the boiler, as specified, a cylindrical jacket, M^3, depending from the upper portion of the dome E, and surrounding both it and the tubes, the whole constructed and operating, as specified, so that the products of combustion first ascend in contact with the tubes and around the sides of the dome E, and are thence forced to pass downwardly, then upwardly outside of the said jacket, and thence over the top of the dome to the chimney.

4. The combination, with the boiler portions B and E, the series of connecting-tubes D, and the surrounding jacket M^3, of an annular plate, M^4, arranged some distance above the base portion of the water-space B, as specified, and operating, as described, to deflect a portion of the descending currents of hot air, &c., in the manner shown and described.

5. A feed-chute or coal-slide, L^2, made open at the top, as shown and described, and combined with the fire-chamber A, dome E, and tubes D in a manner to permit the products of combustion ascending from the fire to pass freely into and up through said chute, and into contact with the bottom of the dome E.

6. In combination with a boiler having a water-space, B, an upper portion, E, a series of tubes, D, and surrounding brick-work, forming air-spaces within said brick-work and exteriorly of the tubes D, a series of passages and doors arranged, as specified, to afford access to the lower portions of the tubes D and the top plate of the base portion of B, for the purpose of thoroughly cleaning said parts, as hereinbefore explained.

In testimony whereof I have hereunto set my hand this 8th day of August, 1885.

ROBERT S. WATSON.

In presence of—
W. J. McCORMICK,
W. G. WILMOT.