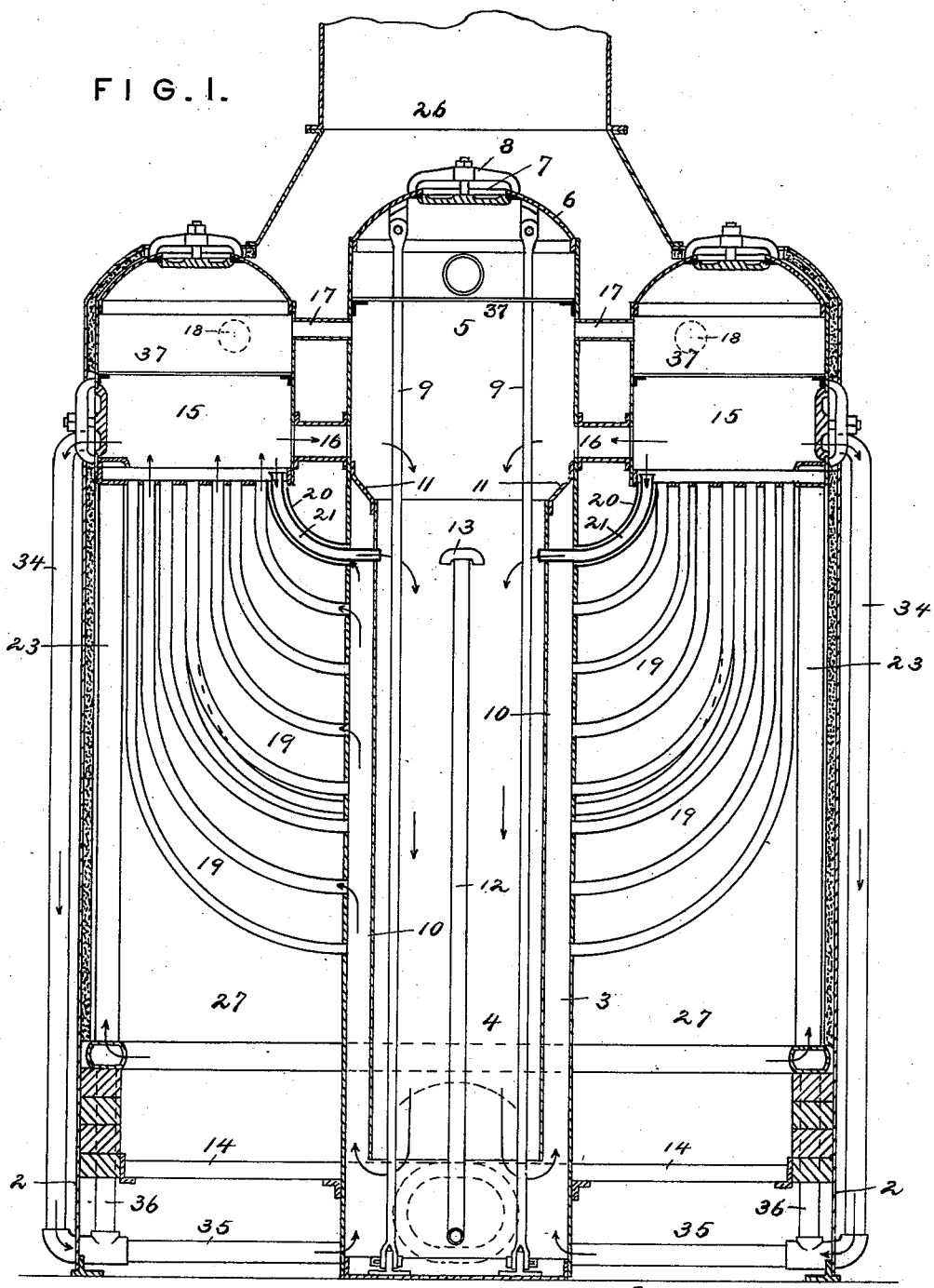
(No Model.) 2 Sheets—Sheet 1.

M. H. PLUNKETT.

STEAM BOILER.

No. 522,271. Patented July 3, 1894.

FIG. 1.



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By

(No Model.) 2 Sheets—Sheet 2.

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FIG. 3.

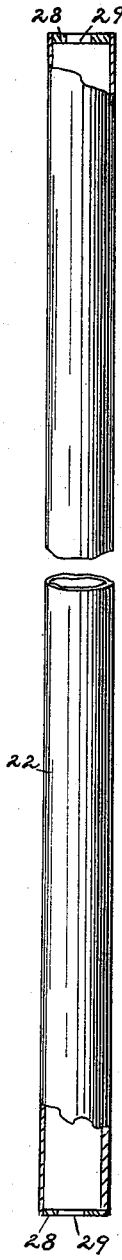


FIG. 2.

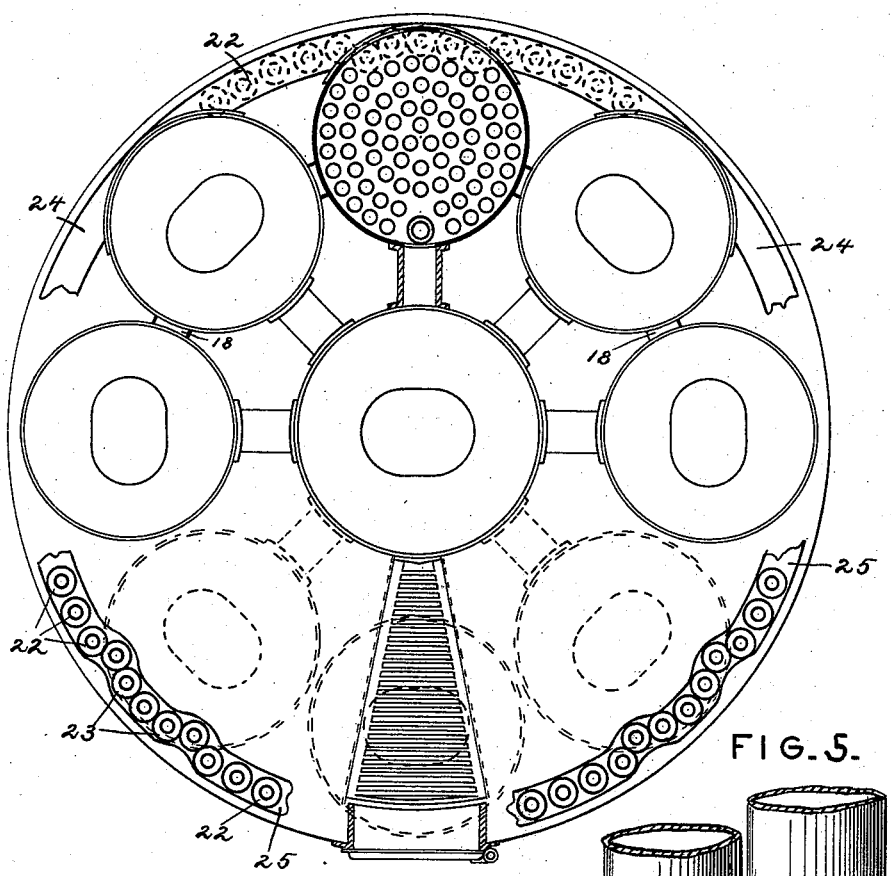


FIG. 5.

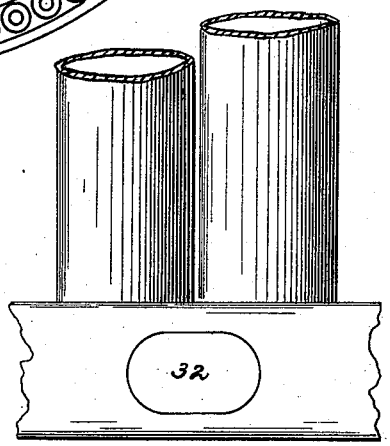
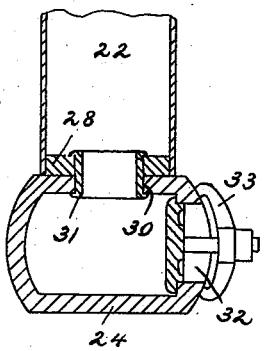


FIG. 4.



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UNITED STATES PATENT OFFICE.

MICHAEL H. PLUNKETT, OF BALTIMORE, MARYLAND.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 522,271, dated July 3, 1894.

Application filed July 20, 1893. Serial No. 481,015. (No model.)

To all whom it may concern:

Be it known that I, MICHAEL H. PLUNKETT, a citizen of the United States, residing at Baltimore city, in the State of Maryland, have invented certain new and useful Improvements in Steam-Boilers; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

My invention relates to boilers of the class known as "water tube" boilers and has for its object to furnish a boiler of this class which shall be light in weight, occupy but little floor space, rapidly generate and safely carry a very high working pressure of steam, be cheap in construction and have all its parts readily accessible for purposes of cleaning and repair, and which may be taken apart in sections and lowered down the fire room hatch without cutting the decks.

With this object in view my invention consists in the improved construction, arrangement and combination of parts hereinafter fully described, and afterward specifically pointed out in the subjoined claims.

In the accompanying drawings, Figure 1 is a central, vertical section through a boiler constructed in accordance with my invention. Fig. 2 is a view partly in plan with parts of the boiler removed and partly in section, showing in plan the central steam and water chamber and four of the surrounding cylindrical steam chambers with their man hole covers removed, and in section part of the tubular water wall and one of the cylindrical steam chambers. Fig. 3 is a view in elevation of one of the tubes of the tubular water wall. Fig. 4 is a sectional detail view showing the manner of connecting the tubes of the water wall with a horizontal, annular circulating pipe or chamber and Fig. 5 is a view in elevation of part of the annular circulating base chamber or pipe and parts of two of the tubes of the vertical water wall, the hand hole cover being removed.

Like numerals of reference mark the same parts wherever they occur in the various figures of the drawings.

Referring to the drawings by numerals 1 is the base of the boiler upon which is suitably supported a jacket 2 which may be lined or stuffed with asbestus, or otherwise constructed with a view to the prevention of radiation of heat and in land boilers may be built of brick. Upon the base 1 is supported a central cylinder 3 which surrounds a central water chamber 4 and extends the whole length of the boiler, its upper portion forming a central steam chamber 5 covered by a crown 6 having a man hole 7 with a suitable guard 8. Forked end braces 9 within the cylinder 3 connect the crown 6 with the base 1. Within the cylinder 3 is a smaller cylinder 10 open at its top and bottom and supported at the top by braces 11 secured to the inside of cylinder 3. Centrally disposed inside of these cylinders is the feed water pipe 12 which discharges near the top of the water chamber 3 and has at its upper end downward turned nozzles 13 to give direction to the currents.

The fire chamber surrounds the water cylinder and has segmentally arranged grate bars 14 suitably supported in place with any suitable door or opening for the introduction of fuel.

Surrounding the central steam chamber 5 are cylindrical steam chambers 15 connected near their bottoms to the central chamber by radially disposed pipes 16 and near their tops by smaller radially disposed pipes 17. These chambers may also be connected to each other by means of pipes 18 as shown in Figs. 1 and 2 and are connected with the central water chamber 4 by curved pipes 19 which at their lower horizontal ends pierce the cylinder 3, while at their upper vertical ends they pierce the bottom of the steam chambers 15 and are so arranged that they are brought to the bottom of the steam chambers 15 in concentric circular series. Those of these curved pipes nearest the central water chamber 4 (marked 20) have, within each of them a similarly curved pipe 21 of smaller diameter, which at its top extends a short distance into the steam chamber 15 and at its lower end passes through the inner open ended cylinder 10, into the water chamber.

At 22 and 23 are shown a series of tubes arranged side by side just inside the jacket

2, forming a tubular water wall to the fire box or combustion chamber. These tubes are connected at their lower ends to a horizontally arranged annular pipe or chamber 24 of greater diametric capacity than the tubes. At their upper ends the tubes 22 are connected to a similar horizontal pipe 25 while the tubes 23 enter the bottoms of the steam chambers 15 through the pipe 25, this pipe being bent at these points on the circle of the walls of the steam chambers 15 and entering into these chambers around their outer edges.

The boiler is surmounted by a funnel and smoke stack 26 forming an extension of the fire box or combustion chamber 27.

In constructing my boiler I expand the ends of all steam tubes into place, obviating the use of screw joints in the fire which are very objectionable. The pipes connecting the steam chamber are secured in the same way, as are all the tubes except the lower ends of the return pipes outside the boiler. Each of the tubes of the water wall is plugged at each end by a washer-like bored plate or plug 28 having a central opening 29 (this may be accomplished by reducing the diameter of the tubes at the ends). This plug is flush with the end of the tube by which construction the vertical tube can easily be put in place between the two rigid top and bottom annular chambers, and when the tube is in position it rests against the horizontal annular chamber 24 at the bottom and 25 at the top, (the manner of attaching being the same as to 24 and 25,) the opening 29 registering with an opening 30 in the pipe or chamber 24. A thimble 31 is now placed in position through the holes in the plug 28 and chamber 24, and its ends expanded by any suitable means, access to the interior of chambers 24 and 25 being had through suitable hand holes 32 closed by a guard 33. The openings 30 in the chambers 24 and 25 being somewhat smaller in diameter than the tubes 22 and 23 there is sufficient metal left between them to allow them to be arranged close against each other, without weakening the structure, thus forming a complete and continuous tubular water wall of great strength.

Return tubes 34 extend from the outer sides of the steam drums or cylinders 15, downward, outside the jacket, down to the bottom of the boiler, and at their lower ends are connected to the central water chamber by radially converging tubes 35, these radial tubes, at their joints with the return tubes, being connected with the annular chamber 22 by means of vertical tubes 36. All of the steam drums or chambers are provided with separating plates 37, to prevent the water following the steam.

It will be observed that the lower circular chamber 24 is located above the door or opening of the fire box, thus obviating the necessity of joints or arching that chamber to prevent it from interfering with the fuel opening.

The staggering of the water wall tubes, or placing them out of the true circle where they enter the steam cylinders, is necessary, as they cannot be put in in any other way, without leaving an opening between them.

The chambers and all the parts of the boiler can be taken to pieces and lowered down through the fire room hatch of a vessel, and removed in the same way without cutting or removing the deck of the vessel.

The operation of my improved boiler is as follows: Water being supplied through the feed water pipe, and the boiler being fired up the cylinder of the central water chamber, the curved tubes 19 and the tubular water wall are all quickly heated and their contained water rapidly generated into steam which passes upward, creating a rapid circulation through the tubes into the steam chambers 15. All these chambers being connected with each other, an even pressure always exists in each, and each of them being relatively so much smaller than the steam chamber would be if the whole of the upper part of the boiler were a single steam chamber they can be made of very much lighter iron or steel than would be necessary in such a structure, also giving a larger steam room, a larger separating surface and a greater amount of heating surface than any ordinary construction. The steam moving upward in the pipes 19 will naturally carry some water with it and as soon as this water reaches the top of the inside bent tube 21, a downward water current will immediately begin to flow through that tube, the water being returned to the inside of the inner cylinder 10 of the water chamber. This cylinder being removed from contact with the fire, will be cooler than cylinder 3 and as a consequence a continuous circulation, (being a downward current inside of the cylinder 10 and an upward current between it and the cylinder 3) will be kept up. Water will also be returned to the water chamber through pipes 16 and return tubes 34.

The application of the heat to the generating surfaces is direct and economical, such surfaces absorbing the greatest amount of heat and the water being divided into a large number of circulating currents steam is quickly generated in great quantity with the least possible ebullition or disturbance of the water and a greatly decreased consumption of fuel.

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

1. A steam boiler provided with a series of cylindrical steam chambers grouped about a central steam and water chamber and bent tubes connecting the sides of the central chamber with the bottom of the cylinders, substantially as set forth.

2. A steam boiler provided with a central water and steam chamber, a series of cylindrical steam chambers grouped about the central chamber, connecting tubes between the

central chamber and the sides of the group of cylindrical chambers and direct connections between the several chambers of the group, as set forth.

3. A steam boiler having a central steam and water chamber, a directly connected series of smaller chambers grouped about and directly connected to the central chamber and curved pipes connecting the series of chambers with the central chamber, as set forth.

4. In a steam boiler, a water wall consisting of vertical tubes and horizontal annular chambers, the ends of said vertical tubes resting against the surface of the horizontal chambers and being plugged with plates perforated to register with perforations in the annular chambers, and expanded thimbles in said registering perforations, as set forth.

5. The steam boiler herein described consisting of the central water chamber, the series of cylindrical steam chambers grouped about it, the curved tubes connecting them, the horizontal annular chambers, the water wall tubes connecting them and the series of steam chambers, the return tubes leading down from the series of chambers outside the boiler, the radial tubes connecting them with the central chamber, and the vertical tubes connecting them with the lower horizontal annular chamber, as set forth.

6. A steam boiler having a series of steam chambers grouped about a central water and steam chamber, an upper and a lower annular chamber, and a water wall of closely placed tubes connecting the two annular chambers, part of these water wall tubes being arranged at their upper ends in the arcs of the circumferences of the chambers of the group and opening into said chambers, as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

MICHAEL H. PLUNKETT.

Witnesses:

AUGUSTUS ALBERT,

HY. A. ALBERT.