

(No Model.)

J. T. SMITH.
STEAM BOILER.

No. 459,724.

Patented Sept. 15, 1891.

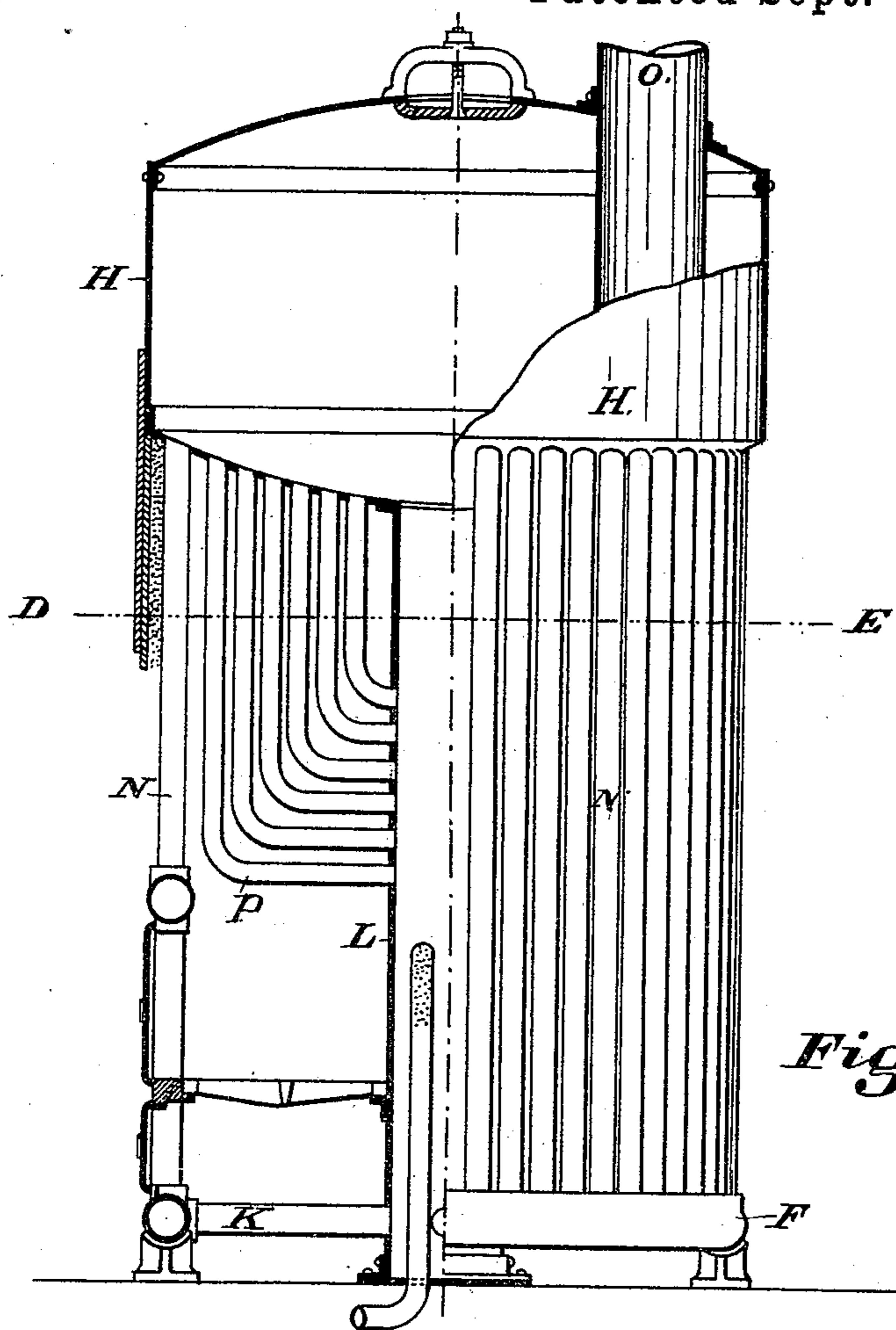


Fig. 1.

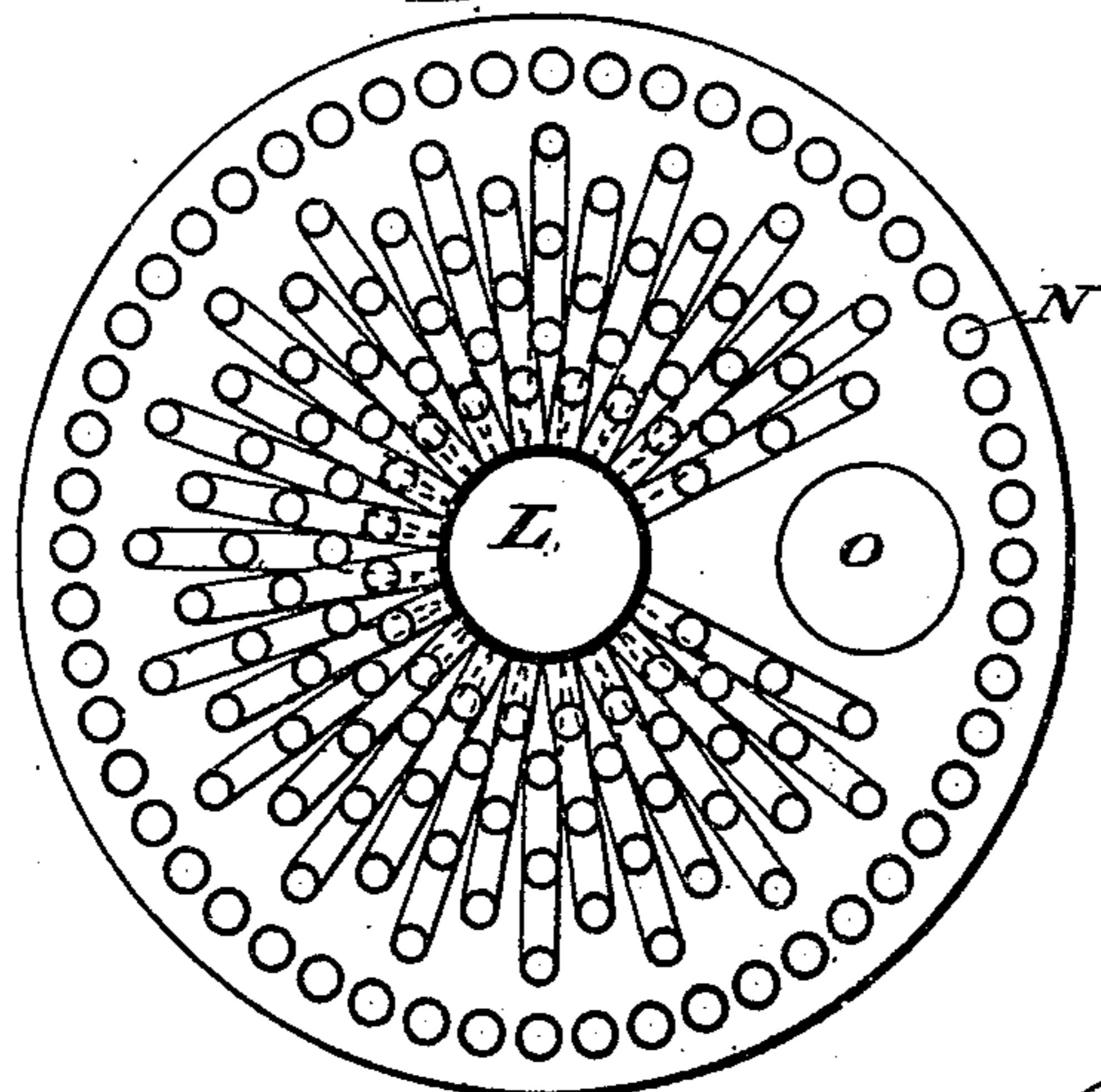


Fig. 2.

WITNESSES:

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JAMES T. SMITH, OF BALTIMORE, MARYLAND.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 459,724, dated September 15, 1891.

Application filed December 15, 1890. Serial No. 374,708. (No model.)

To all whom it may concern:

Be it known that I, JAMES T. SMITH, of the city of Baltimore and State of Maryland, have invented certain Improvements in Steam Generators or Boilers of the Type Known as Water-Tube Boilers, of which the following is a specification.

My invention relates to improvements in the combinations of tubes or pipes with water-reservoirs and evaporating-surface cylinders or drums; and the objects of my improvements are, first, to produce a boiler that will generate steam rapidly; secondly, to make such a combination that the application of heat to the generating-surfaces will be direct and economical, said surfaces absorbing the maximum amount of heat from the surrounding products of combustion; thirdly, by dividing up the water into many circulating currents and giving them all an easily-ascending direction to generate steam with as little ebullition or disturbance of the water as possible, and, fourthly, to make such a combination of parts that all may be readily accessible for repairs and examination.

Having the foregoing in view I have constructed a steam-generator of which the following is a description and by which I have successfully attained the objects to which I have referred.

Figure 1 is a vertical elevation of my generator with a part of the exterior portion removed, disclosing part of the interior. Fig. 2 is a section cut on a horizontal plane through D E on Fig. 1.

Similar letters refer to similar parts throughout the several views.

The boiler stands on a tubular base-ring F, from which rise vertical pipes N, connected at their upper ends with the cylindrical drum H. Radiating horizontally from the base-ring are tubes K, which connect with a vertical cylindrical reservoir L and circulates water from the inner cylinder to the outer circle of pipes N. The reservoir L rises to the height of the vertical tubes and is connected to the upper cylinder or drum. The lower head of the drum or crown-sheet of the furnace (for it occupies this position relative to the furnace) has a number of small tubes P suspended from it which are bent nearly at right angles and connect to the upright cyl-

inder or reservoir L at certain regular intervals above the line of the grate, largely occupying the space over the grate inclosed by the circle of vertical tubes, forming the outer wall of the furnace. The upper cylindrical drum H is constructed with convex heads, as shown, and braced head to head. Passing through the drum there is a cylindrical lining or chimney O provided to afford a passage for the smoke.

The feed-water is introduced into the boiler through a perforated pipe, led into the boiler from the top or bottom and passing into the reservoir L. The water in the bent tubes is readily formed into steam as is also that filling the outer circle of tubes, and as the steam passes upward fresh water is drawn to fill the void. Hence a complete and regular circulation is produced, and when the particles of steam reach the drum there is a large evaporating-surface, so the steam can be disengaged from the incumbent mass of water without lifting the water or causing it to be disturbed, as would be the case were not such a reservoir or drum provided.

To prevent the escape of gases between the vertical tubes forming the wall of the furnace, asbestos meal, mineral wool, or other non-conducting material is placed to fill in the interstices held in place by thick asbestos boards, around which a sheet-iron casing is placed in such a way as to completely shut in the heat and gases and prevent the radiation of heat from the vertical tubes; or it may be found desirable, especially in the case of stationary boilers—i. e., boilers used on land—to have a cylinder of fire-brick to form the wall of the furnace and placed a short distance—say four to six inches—beyond the circle of upright tubes, so as to leave a hot-air space between the said fire-brick wall and the upright tubes.

Where the fuel is introduced in the furnace a tubular manifold is provided to receive the ends of the shortened vertical tubes, and a steel or iron frame is provided to receive the doors of the furnace.

A man-hole and cover are provided at the top of the boiler, so a man can enter the boiler from this point, pass down the central reservoir, and have access to all parts of the boiler for any purpose desired. The tubes are con-

structed of steel and are readily placed and removed. They can be either expanded by any good expanding-tool or secured by screw-nuts.

5 What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination, in a steam-generator, of a cylindrical reservoir L, perforated at suitable intervals to receive bent tubes dropped
10 down from and connected with the upper drum H, through which water and steam can pass freely, establishing communication between the vertical reservoir L and drum H, the said reservoir being extended above the
15 grate, the bent tubes, and crown-sheet of drum, all being inclosed in a furnace, the walls of which consist of vertical tubes N, having free communication with the drum and the bottom water-base F, and through
20 which water is radially circulated from bottom to top of the boiler supplied through the radiating circulating-tubes K, all as before described, and for the purpose set forth.

2. In boilers or steam-generators, the combination of congeries of bent tubes suspended
25 from the underside of a water and steam cylinder or drum and connected to and giving interior communication with a vertical cylindrical reservoir containing water, and the ra-

diating circulating-tubes connecting with and giving water communication to the outer vertical tubes N, substantially as described, and for the purpose set forth. 30

3. The combination of an outer wall of vertical tubes N, fixed at the top to the water and steam cylinder or drum and at the bottom to a circular tubular base and in a way to afford free communication and circulation from the bottom to the top of the boiler, with the radiating circulating-flues, central reservoir L, and bent water-tubes P, all substantially as described, and for the purpose set forth. 35 40

4. The combination, in a water-tube generator or steam-boiler, of bent water-tubes surrounded by the heated products of combustion emanating from ignited fuel covering a grate placed around a vertical cylinder or reservoir, to which the bent tubes are radially connected and provide a medium for circulating water to the upper cylinder or drum, together with the outer wall of circulating-tubes N, in connection with the base tubular ring F, all substantially as described. 45 50

JAMES T. SMITH.

Test:

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