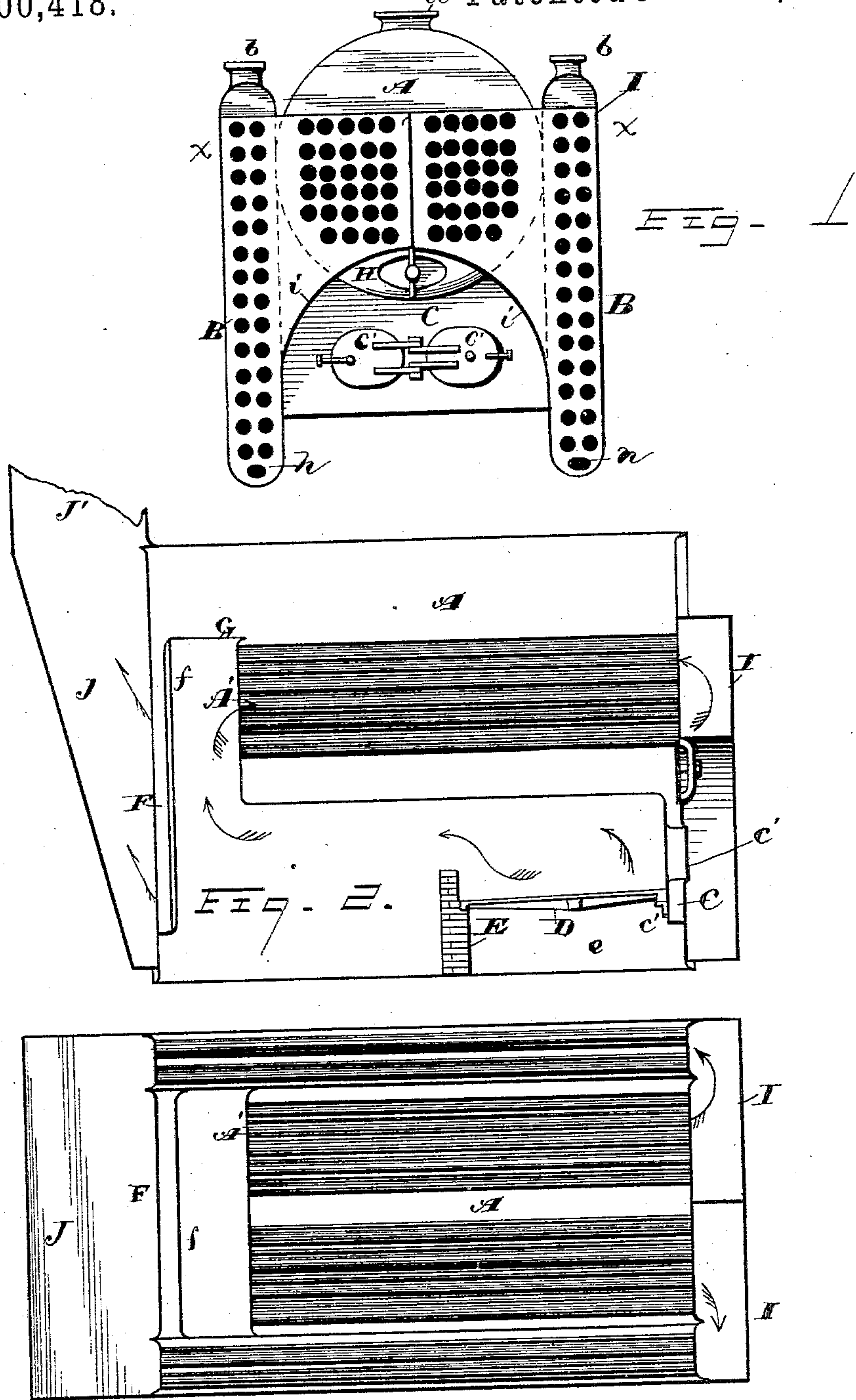


(No Model.)

E. I. WALDEN.
STEAM GENERATOR.

No. 300,418.

Patented June 17, 1884.



WITNESSES

Wm. M. Woodcock.
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UNITED STATES PATENT OFFICE.

ENGEBRIGHT I. WALDEN, OF ISHPEMING, MICHIGAN.

STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 300,418, dated June 17, 1884.

Application filed March 18, 1884. (No model.)

To all whom it may concern:

Be it known that I, ENGBRIGHT I. WALDEN, of Ishpeming, in the county of Marquette and State of Michigan, have invented certain new and useful Improvements in Steam-Generators; and I do hereby 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 pertains to make and use the same.

My invention relates to improvements in steam-generators; and it consists in certain features of construction and in combination of parts hereinafter described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a front elevation of my improved steam-generator. Fig. 2 is a longitudinal vertical section through the center of the cylindrical boiler. Fig. 3 is a horizontal longitudinal section on the line of $x x$, Fig. 1.

A represents a cylindrical horizontal tubular boiler attached to, and separated on either side by, the tubular heaters B B. The heaters are provided above with the flanged nozzles b , and the main boiler with a similar nozzle, a , set in line crosswise, to which are preferably attached a steam-drum. (Not shown.)

C is a water-front, the water-space of which is in open relation with the interior of the boiler A and the heaters B. This water-front has openings arranged in the usual manner for the doors C', and has attached on the inside the support c for the front end of the grates D. The other ends of the grates are supported in the usual manner by the bridge-wall E, and underneath the grates is the ash-pit e . At the rear end and flush with the heaters B and the top portion of the boiler A is the water-back F, the water-space of which is in open relation with the said heaters and the upper portion of the boiler A.

G is a crown-sheet connecting the back flue-sheet, A', of the boiler A with the inside sheet, f , of the water-back, and of course joined on the sides to the shell of the boiler A. An opening, closed with a door, may be had through the water-back for removing ashes; or a door may be set in mason-work below the water-back. All of the flat surfaces of the heater, water-front, water-back, crown-sheet, &c., are provided with suitable stay-braces or

stay-bolts in the usual manner. The boiler A is provided with the man-hole plate H, and the heaters with hand-hole plates h ; and both the boiler and the heaters may have such other openings as may be thought necessary for cleaning and repairs.

I is a smoke-box in front extending to the line I' above, and curved below in the central part, as shown by the curved line i . This smoke-box is snugly fitted to the boiler and heaters, and incloses all of the tubes in each. At the rear is the smoke-box J, inclosing the tube of the heaters, and connected with the smoke-pipe J'.

In operating the device, the products of combustion pass under the boiler and along the sides of the heater, and are deflected by the water-back and crown-sheet aforesaid, and turned back through the tubes of the boiler and are discharged into the smoke-box I. From thence they pass back through the tubes of the heaters to the smoke-box J, and from thence to the smoke-pipe J'. The feed-water should enter the lower portions of the heaters when the heat is sufficient to precipitate the sediment, lime, &c., to the bottom of the heater, from whence it may be blown off or cleansed out when necessary; and as the lower portion of these heaters are below the lines of the grates, any accumulation of sediment in these parts will do no special injury, as the heat is not sufficient to burn the iron.

It will be observed that the water-space in the water-front and water-back does not extend as low as the heater, and will consequently receive little or none of the sediment; and it is found that the boiler A is kept entirely free from sediment and scales.

This generator, in proportion to the floor-space occupied, presents a very large fire-surface, by reason of which it is economical in fuel, and well adapted for marine-boilers and other places where economy of space, combined with the maximum steam-generating capacity, is desirable. Also, the parts are accessible and convenient for repairing. The ends of the tubes are the parts that require the most attention. When the smoke-boxes are removed, the tubes at the front and rear of the heaters and at the front of the boiler are exposed, and the combustion-chamber at the rear of the lower portion of the boiler and

between it and the water-back is of ample size for workmen to expand or otherwise repair the tubes or other parts around this chamber.

5 What I claim is—

The combination, with the boiler, the upper portion thereof, at the rear end, projecting beyond the flue-sheet and communicating with the water-back, the water-front in open communication with the boiler, and tubes passing through the front of the boiler, of heaters

B, having tubes which pass through the front and rear end of the boiler, and the smoke-boxes I and J, all of the parts combined substantially as set forth.

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In testimony whereof I sign this specification, in the presence of two witnesses, this 7th day of March, 1884.

ENGEBRIGHT I. WALDEN.

Witnesses:

PHILLIP JONES,
W. J. RAY.