

No. 677,025

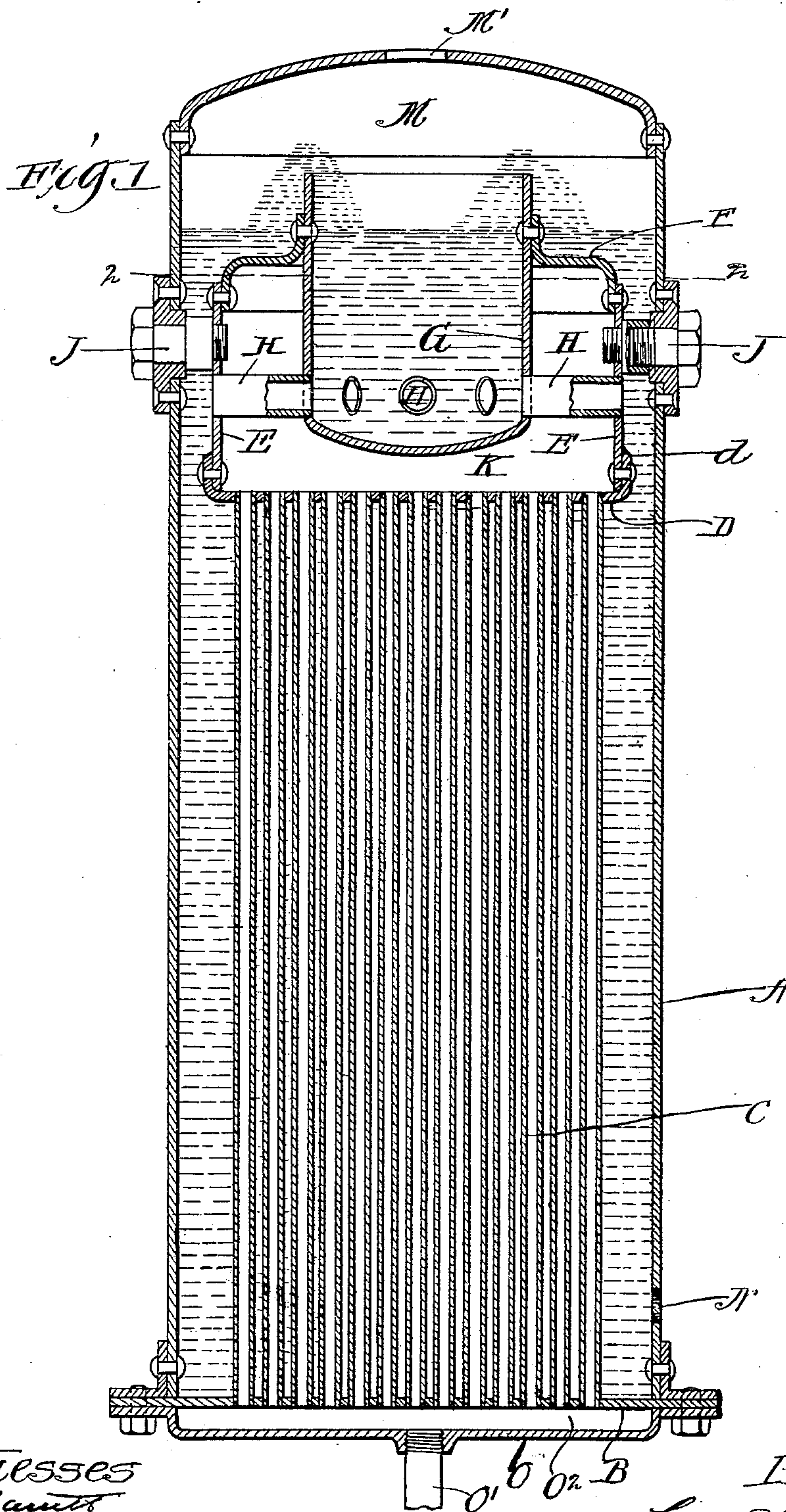
Patented June 25, 1901.

L. S. GARDNER.
BOILER.

(Application filed May 25, 1899.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses

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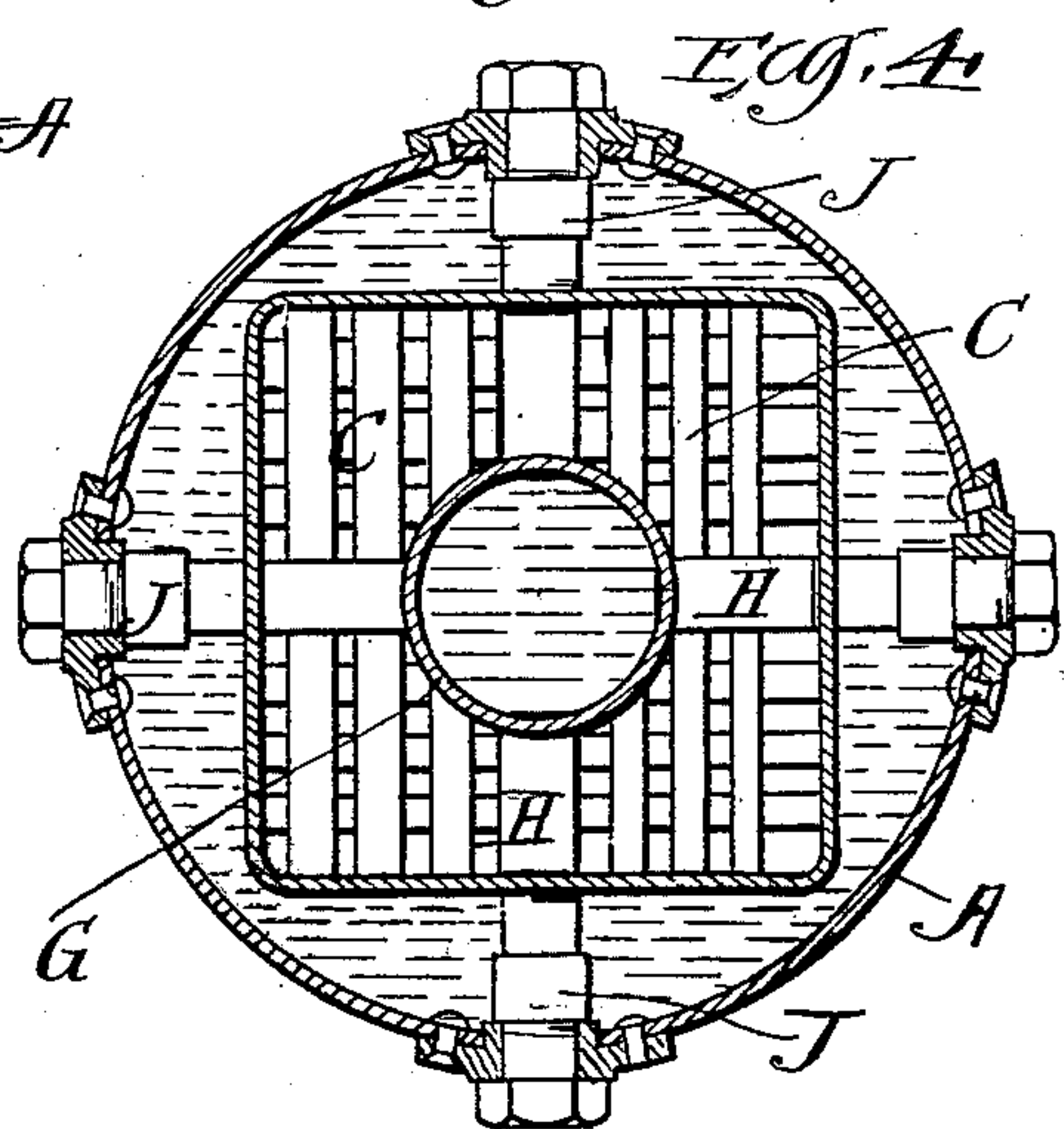
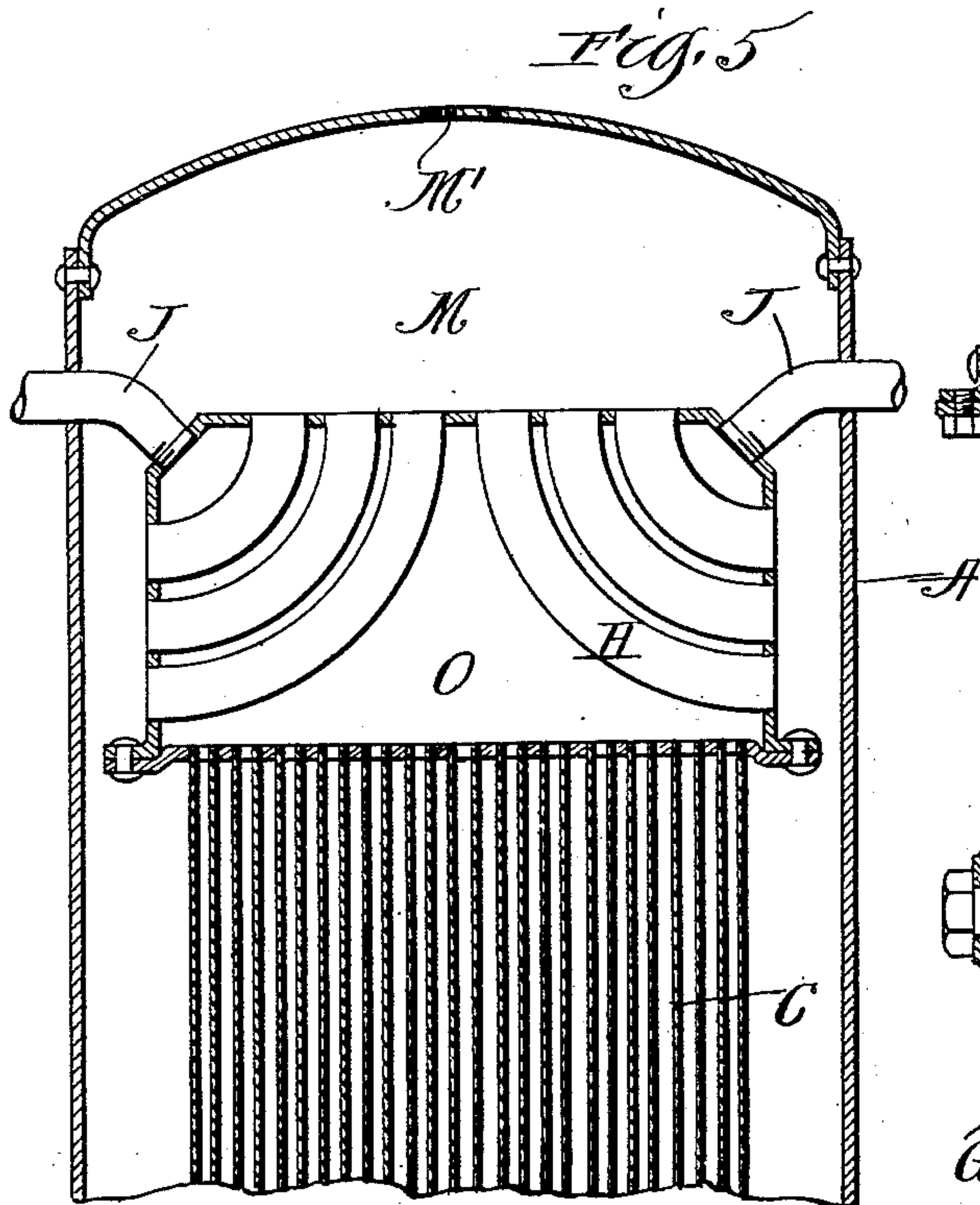
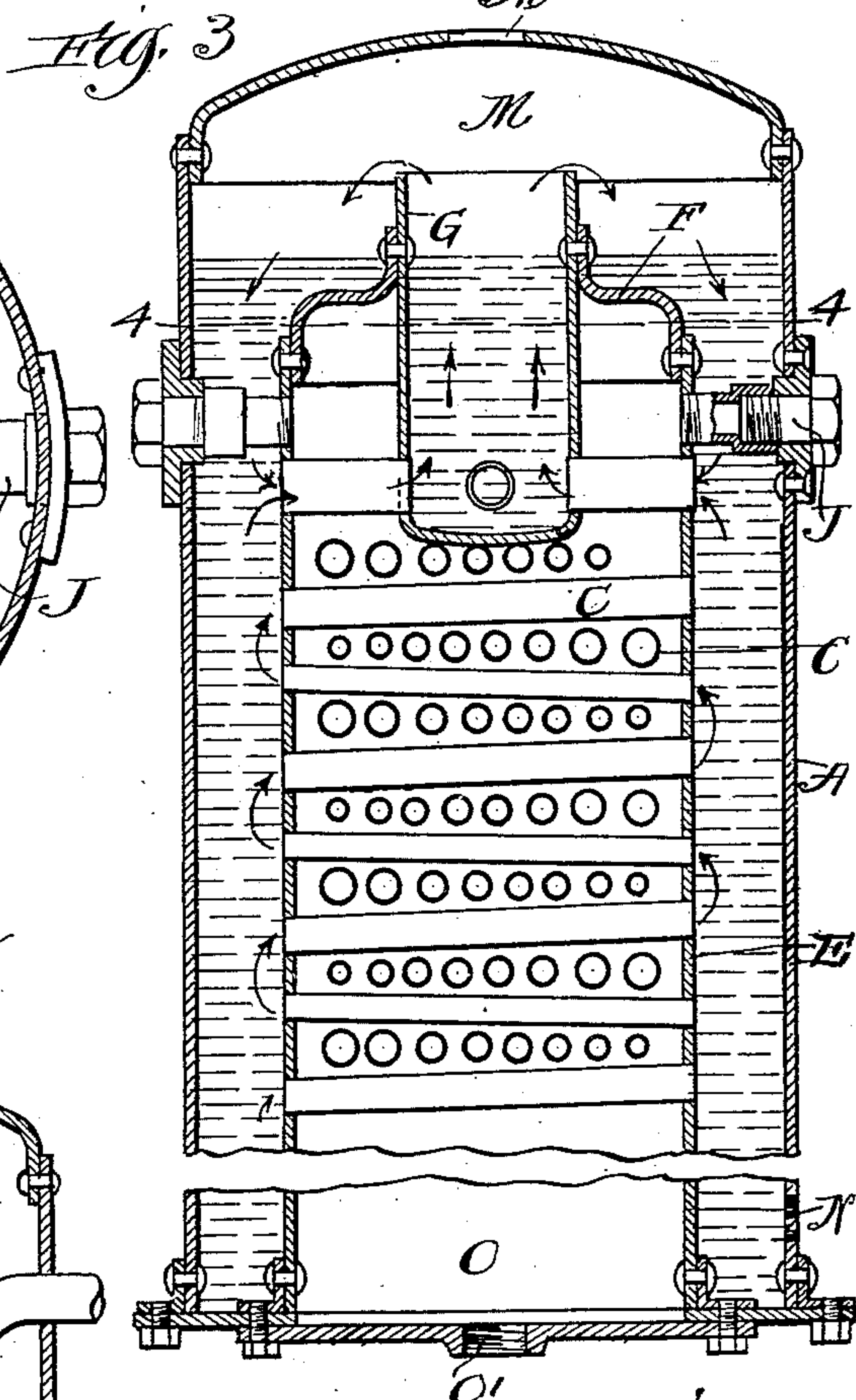
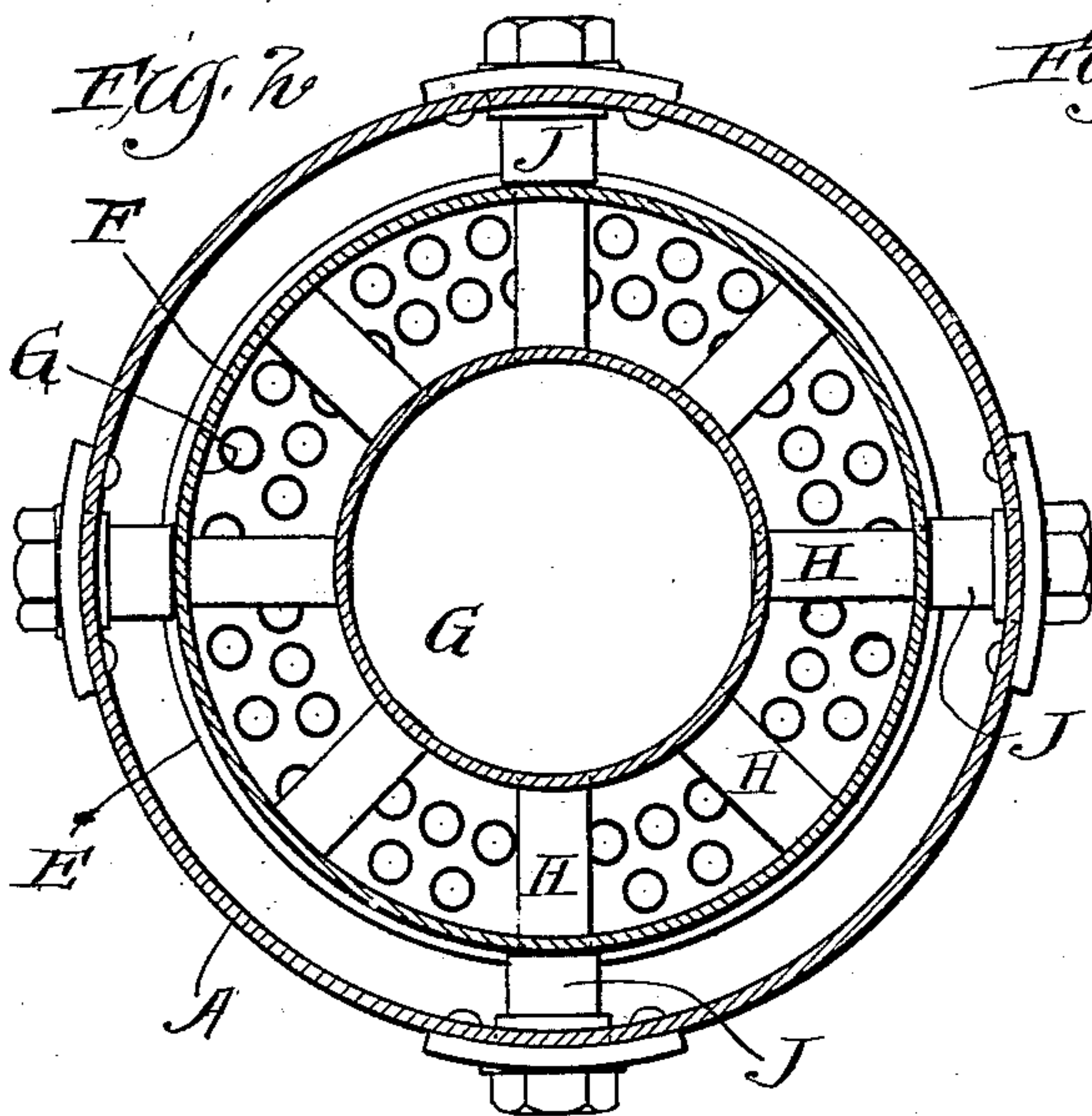
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2 Sheets—Sheet 2.



Witnesses
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UNITED STATES PATENT OFFICE.

LEVI S. GARDNER, OF NEW ORLEANS, LOUISIANA.

BOILER.

SPECIFICATION forming part of Letters Patent No. 677,025, dated June 25, 1901.

Application filed May 25, 1899. Serial No. 718,298. (No model.)

To all whom it may concern:

Be it known that I, LEVI S. GARDNER, a citizen of the United States, residing at New Orleans, parish of Orleans, State of Louisiana, have invented a certain new and useful Improvement in Boilers; and I 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, reference being had to the accompanying drawings, which form a part of this specification.

My invention has for its object the production of a steam-boiler for use more particularly in connection with a gasolene-engine, whereby the burned gases or exhaust is employed to generate steam. While designed, primarily, for this use, yet it is of such construction that without any change whatever it could be employed in connection with a petroleum or other oil burner, and with some slight modifications it could be utilized in connection with coal or wood for fuel.

The invention consists, primarily, in so constructing the boiler that the gases utilized for fuel are moved in one direction while the water is moved in the opposite direction, the result being that practically all the heat of the gases is absorbed by the water.

The invention consists in a combination of devices and appliances hereinafter described and claimed.

In the drawings, Figure 1 is a vertical section of my boiler. Fig. 2 is a cross-section on the line 2 2 of Fig. 1. Fig. 3 is a vertical section of a variation. Fig. 4 is a cross-section on the line 4 4 of Fig. 3. Fig. 5 is a vertical section of the upper portion of another variation.

In carrying out the invention, A represents a suitable casing of any suitable shape in cross-section, that which I have shown being cylindrical. Suitably engaged adjacent to the lower end of the casing A is a plate B. Extending vertically from the plate B is a series of tubes or flues C, the upper ends of said flues being engaged in and held in place by the plate D. Engaged to the upturned flange *d* of this plate is a cylinder E, which in turn supports another ring or cylinder F. Engaged to and supported by the latter is a cylinder G, having a closed bottom and an

open top. Extending from the cylinder E and tapping the lower portion of the cylinder G is a series of water-tubes H, there being eight in the present construction, although the number might be varied. Extending from the exterior of the main casing A to the interior of the cylinder E are the gas-inlet tubes J, there being four in the present construction, although the number might be varied.

K represents what might be termed the "combustion-chamber," the hot gases or whatever fuel is used being discharged into this chamber through the tubes J.

M represents the steam-chamber, the steam being carried off through the outlet M'.

N represents the water-inlet.

Of course the various water, steam, and gas inlets and outlets are suitably controlled by valves.

Engaged to the lower end of the casing is a plate or dome O, having an outlet O'. The plate O forms a chamber O², in which the gases are collected and from which they are discharged.

The operation is as follows: Gas is admitted to the combustion-chamber and strikes the sides of the cylinder G, thus heating the water therein to a high temperature and generating steam, which rises into the dome M. The water rises over the sides of the cylinder, drops down on the outside of the ring F and cylinder E, and, if not evaporated, will pass through the tubes H and back into the cylinder G. As the water is evaporated new water will move up from below and enter the cylinder G through the tubes H. Of course the gases will fill the chamber K and the flues C and will gradually move down the latter to the chamber O² and off through the outlet O'. The result is that the heat of the gases is gradually absorbed by the water as the gases descend until at the gas-discharge the heat has all been absorbed from the gas. So, also, the water entering cold at N gradually ascends and gathers up the heat until when it reaches the cylinder G it is raised to a high degree of temperature and ready to be evaporated by the gas at its maximum temperature; but by my construction another important result is obtained. The gases, as before explained, completely fill the chamber K and

tubes C, being forced in under pressure. Now by restricting the outlet O' to the necessary extent the pressure of the gases in the boiler can be raised to any height desired, depending on the pressure at which they are admitted. This pressure or, perhaps more correctly speaking, compression of the gases in the boiler develops heat, which is absorbed by the water, so that it is possible to so extract the heat units from the gas as that when released at the gas-outlet and allowed to expand the expanded gas will be at a lower temperature than the surrounding air.

In Figs. 3 and 4 I have shown a variation in the form of what might be termed the "absorbing-chamber." Instead of a series of vertical flues, as in the above-described construction, I make a casing P, corresponding to the cylinder E, and extend it to the bottom of the casing A. It may be square in cross-section. Extending through the chamber formed by the casing P is a series of water-tubes P', inclined, as shown, and crossing each other at right angles. The operation is substantially the same as in the preferred construction, the gases surrounding the water-tubes and the water gradually absorbing the heat as the water rises and the gases descend.

In Fig. 5 I have shown a variation in the form of the combustion-chamber. In this case the casing Q is rectangular in shape, with a series of curved water-tubes Q' extending from each side to the top. The gas is introduced at each upper corner and passes down through the space around the water-tubes, and thus heats the water.

It is obvious that many other variations may be made in the form or arrangement of the various parts without departing from the spirit of the invention, which consists, essentially, in the provision of means for causing the water and heat to travel in opposite directions, so that the heat at its maximum temperature will be applied to water which has absorbed the heat of the gases as they move out of the boiler.

What I claim is—

1. In a boiler, the combination of an outer water-casing, a heating-chamber in the upper

part thereof and surrounded thereby, and forming a water-space between the heating-chamber and the casing, means for causing water to circulate from said water-space up through said heating-chamber and back to said water-space, means for introducing heating fluid into the upper portion of the heating-chamber, and means for causing the heating fluid to pass down through and discharge at the lower portion of said outer casing, substantially as described.

2. In a boiler, the combination of an outer water-casing, a heating-chamber in the upper part thereof and surrounded thereby and forming an annular water-space between the heating-chamber and the casing, a water-chamber within the heating-chamber and open at the top, water-pipes passing through the heating-chamber and connecting the lower part of the water-chamber with the annular water-space, means for introducing heating fluid into the upper portion of said heating-chamber, and means for causing the heating fluid to pass down through and discharge at the lower portion of said outer casing, substantially as described.

3. In a boiler, the combination of an outer water-casing, a heating-chamber in the upper part thereof and surrounded thereby and forming an annular water-space between the heating-chamber and the casing, a water-chamber within the heating-chamber and open at the top, lateral water-pipes passing through the heating-chamber and connecting the lower part of the water-chamber with the annular water-space, one or more pipes for introducing heating fluid into the upper part of the heating-chamber, and tubes for conducting the heating fluid from the heating-chamber down through the water-casing to a discharge at the lower part thereof, substantially as described.

In testimony whereof I sign this specification in the presence of two witnesses.

LEVI S. GARDNER.

Witnesses:

LOUIS GRÜNEWALD,
J. C. WENCK.