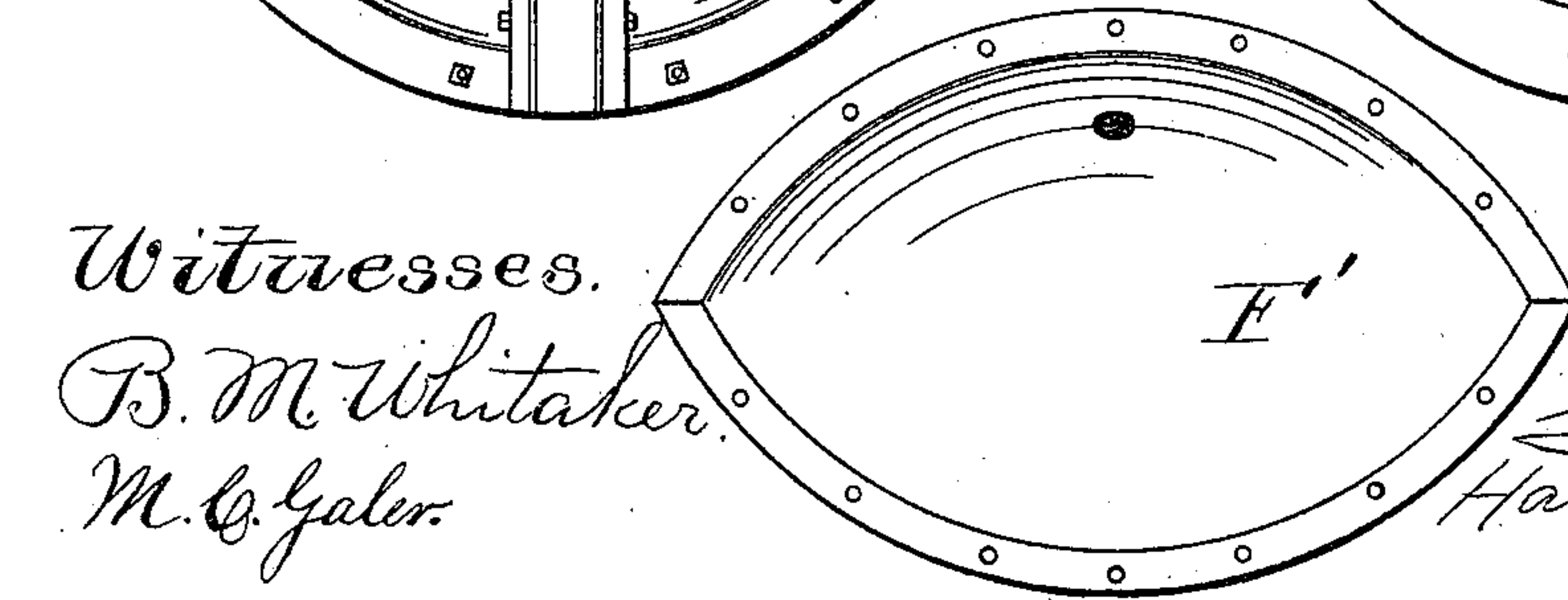
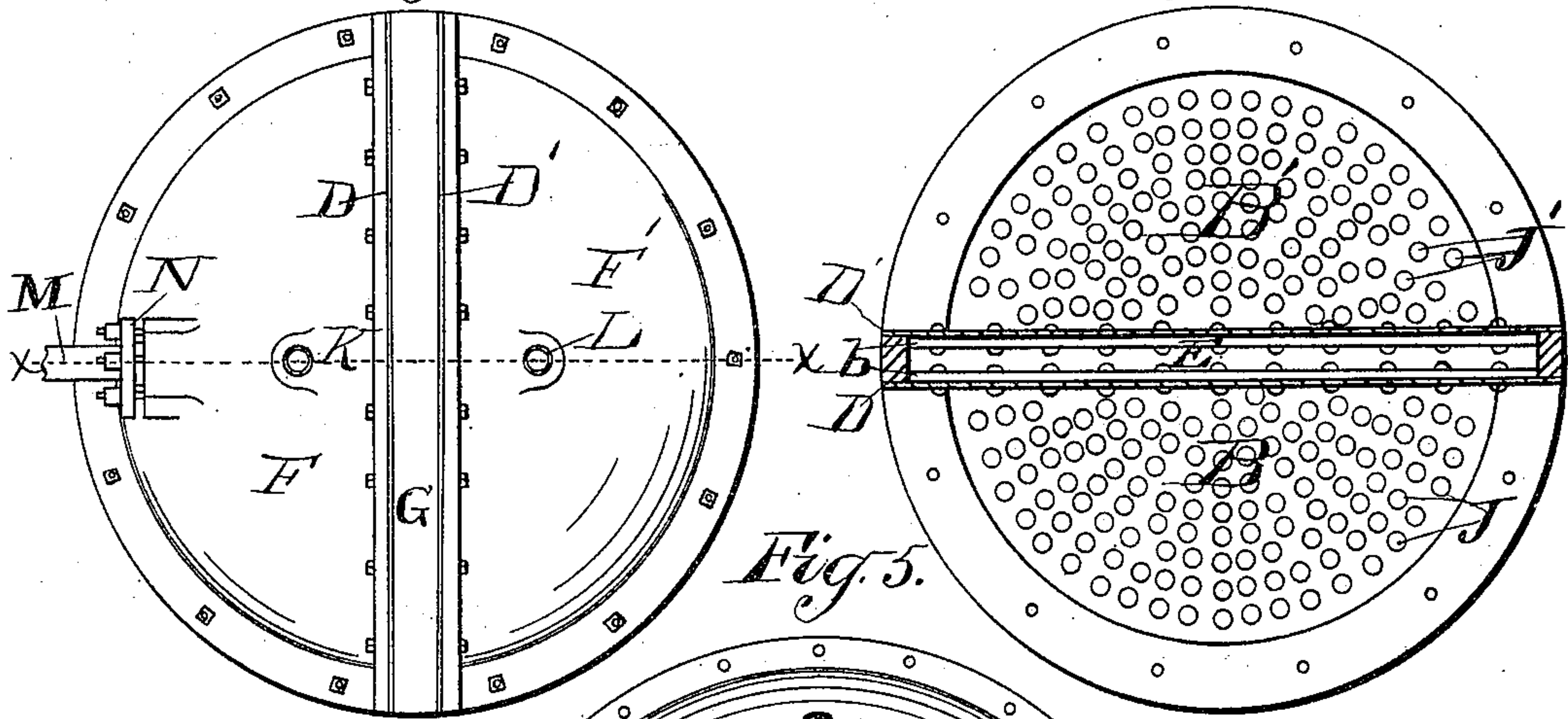
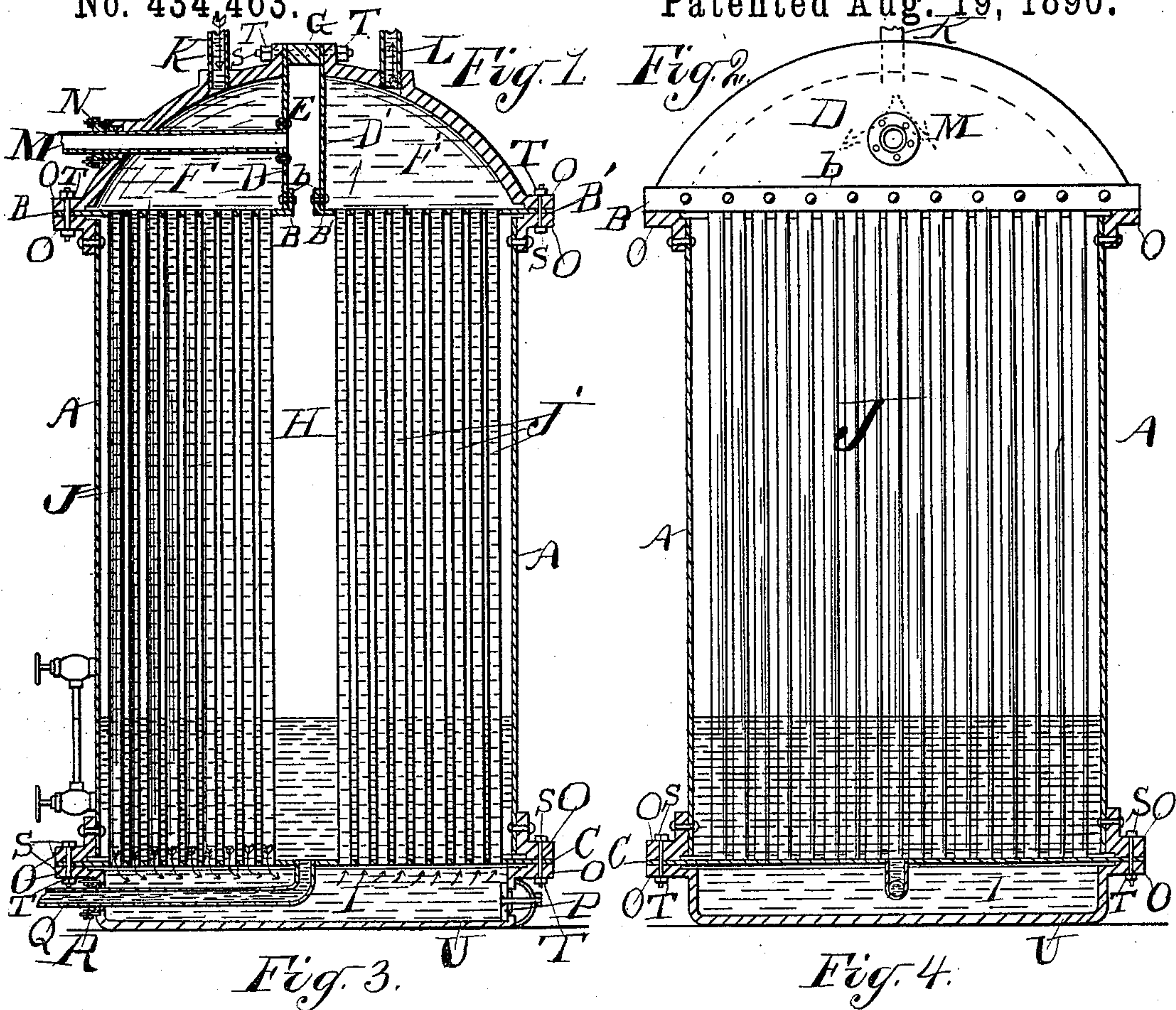


(No Model.)

F. RADEMACHER.  
STEAM CONDENSER AND WATER HEATER.

No. 434,463.

Patented Aug. 19, 1890.



Witnesses.

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# UNITED STATES PATENT OFFICE.

FRANK RADEMACHER, OF LOS ANGELES, CALIFORNIA, ASSIGNOR OF ONE-HALF TO HIRAM H. LEITHEAD, OF SAME PLACE.

## STEAM-CONDENSER AND WATER-HEATER.

SPECIFICATION forming part of Letters Patent No. 434,463, dated August 19, 1890.

Application filed February 10, 1890. Serial No. 339,918. (No model.)

*To all whom it may concern:*

Be it known that I, FRANK RADEMACHER, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Improvement in Steam-Condensers and Water-Heaters, of which the following is a specification.

One object of my invention is to so construct and arrange the parts of the condenser and heater as to reduce to a minimum the ill effects of the contraction and expansion, and to do this by simple inexpensive means.

A further object is to insure great efficiency in the heater, so that the water will be rapidly heated and the steam condensed with corresponding rapidity.

A further object is to secure convenience of access for repair.

The general construction and arrangement of parts are briefly described as follows: My improved heater and condenser comprises the combination of a water-ingress compartment, a water-egress compartment, a steam-receiving compartment located between such ingress and egress compartments, a base or settling compartment located beneath such ingress and egress compartments, a steam-condensing chamber communicating with the steam-receiving compartment and located between the base-compartment and the ingress and egress compartments, surface tubes passing through such steam-condensing chamber and connecting the ingress-compartment with the base-compartment, surface tubes passing through such condensing-chamber and connecting the base-compartment with the egress-compartment, an ingress water-pipe opening into the ingress-compartment, an egress water-pipe opening from the egress-compartment, a steam-pipe opening into the steam-receiving compartment, and a condense-water pipe leading from the condensing-chamber. This construction and various details are illustrated in the accompanying drawings, in which—

Figure 1 is a vertical mid-section along line  $x x$ , Fig. 3. Fig. 2 is a vertical mid-section at right angles to that of Fig. 1. Fig. 3 is a top view. Fig. 4 is a plan view, partly in section

and with the top removed. Fig. 5 is a view of the inner side of one of the top shells.

The body of the heater and condenser is formed of the barrel or drum A, having two semicircular sheets B B' at the top and a circular tube-sheet C at the bottom. The straight edge  $b$  of each of the top tube-sheets B B' is bent upward and is secured, respectively, to partition-sheets D D', which form the side walls of the ingress steam-compartment E, which extends across the dome of the heater. The dome of the heater and condenser is formed of the two concave top shells F F' and the cap-piece G. The cap-piece G forms the top of the ingress steam-compartment, and the shells F F' form, respectively, the tops of the water-ingress and water-egress compartments. The floors of the ingress and egress water-compartments are formed, respectively, of the top tube-sheets B and B'.

The bottom tube-sheet C forms the bottom of steam-condensing chamber H and the top of settling or base compartment I. The surface tubes J pass through and are secured to the top sheet B and bottom sheet C and connect the ingress-compartment with the base-compartment. The surface tubes J' pass through and are secured to the top sheet B' and bottom sheet C and connect the base-compartment with the egress water-compartment.

K is the cold-water-ingress pipe.

L is the hot-water discharge or egress pipe.

M is the steam-pipe, which passes through a stuffing-box N in the top shell or wall F of the ingress-compartment, through the water-ingress compartment, and through the partition-sheet D, in which it is fastened, and opens into the ingress steam-compartment E.

The steam-pipe M is secured to the partition-sheet D near the center thereof, and the steam entering through it strikes upon the center of the opposite partition-sheet D' and rebounds against D, thus heating the sheets forming walls D D' more intensely at the center than elsewhere, so that the effect of the expansion is to bulge the sheets and not to strain the shell or the tube-sheets of the heater. A degree of play of the top tube-sheet is provided for, however, to compensate for the expansion and contraction of the tubes



J J'. To allow for such expansion and contraction, the top sheet is formed of the two sections B B' disconnected from each other, and further allowance for expansion and contraction is made by leaving a space around the tubes in both the top and bottom tube-sheets between the tubes and the flanges O, between which the sheets are clamped.

The cold-water-ingress pipe K is located axially over the steam-pipe M, so that the discharge of the cold water is directly against the steam-pipe, whereby the water is heated and the steam is cooled in a degree before the steam has entered the compartment E. The water from pipe K strikes upon steam-pipe M, and is thereby distributed so that it will flow more equally through the several tubes J. The cold water passing through F is heated by the steam in pipe M and that in compartment E and condense-chamber H, thereby raising the temperature of the water before it is allowed to enter the tubes J. By this means I avoid the ill effects of expansion and contraction, which result when the cold water is allowed to flow immediately into long surface tubes.

The tubes J, base-compartment I, and tubes J' form a conduit connecting the ingress and egress compartments for the passage of the water, and as the water flows on through the tubes J and J' it is further heated by the steam in H, and when it finally reaches the egress-compartment it receives the heat from the direct blast of steam against partition-sheet D', so that it receives the greatest heat just before discharging.

The base-compartment I serves as a settling-chamber, and the sediment can be removed from time to time through the hand-hole P. The condense-water is led off through pipe Q, which passes through a stuffing-box R to allow longitudinal movement of the pipe during its expansion and contraction.

To repair the heater, access is given to the interior by removing the nuts T from bolts S, thereby allowing the removal of the base U and top.

Now, having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a heater and condenser, the combination of the water-ingress compartment, the wa-

ter-egress compartment, the steam-receiving compartment located between the water ingress and egress compartments, the base-compartment located beneath such ingress and egress compartments, a steam-condensing chamber communicating with the steam-receiving compartment and located between the base-compartment and the ingress and egress compartments, surface tubes passing through such steam-condensing chamber and connecting the ingress-compartment with the base-compartment, surface tubes passing through such condensing-chamber and connecting the base-compartment with the egress-compartment, an ingress water-pipe opening into the ingress-compartment, an egress water-pipe leading from the egress-compartment, a steam-pipe opening into the steam-receiving compartment, and the condense-water pipe leading from the steam-condensing chamber.

2. In a heater and condenser, the combination of a water-ingress compartment, a water-egress compartment, a conduit connecting the ingress-compartment with the egress-compartment, a steam-receiving compartment between the ingress and egress compartments, a stuffing-box in the wall of the ingress-compartment, a steam-pipe passing through such stuffing-box and through the ingress-compartment and opening into the steam-receiving chamber, the water-ingress pipe located axially over such steam-pipe, and the discharge-pipe leading from the egress-compartment.

3. In a heater and condenser, the combination of the cold-water-ingress compartment and a water-ingress pipe opening thereinto, tubes leading therefrom, a stuffing-box in the walls of such compartment, and a steam-pipe located between such pipe and tubes in the line of discharge of such ingress-pipe and passing through the stuffing-box.

4. The combination of the barrel, the dome, the partition-walls, the two semicircular top tube-sheets, the bottom tube-sheet, the base, the surface tubes, and the ingress and egress pipes.

FRANK RADEMACHER.

Witnesses:

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