

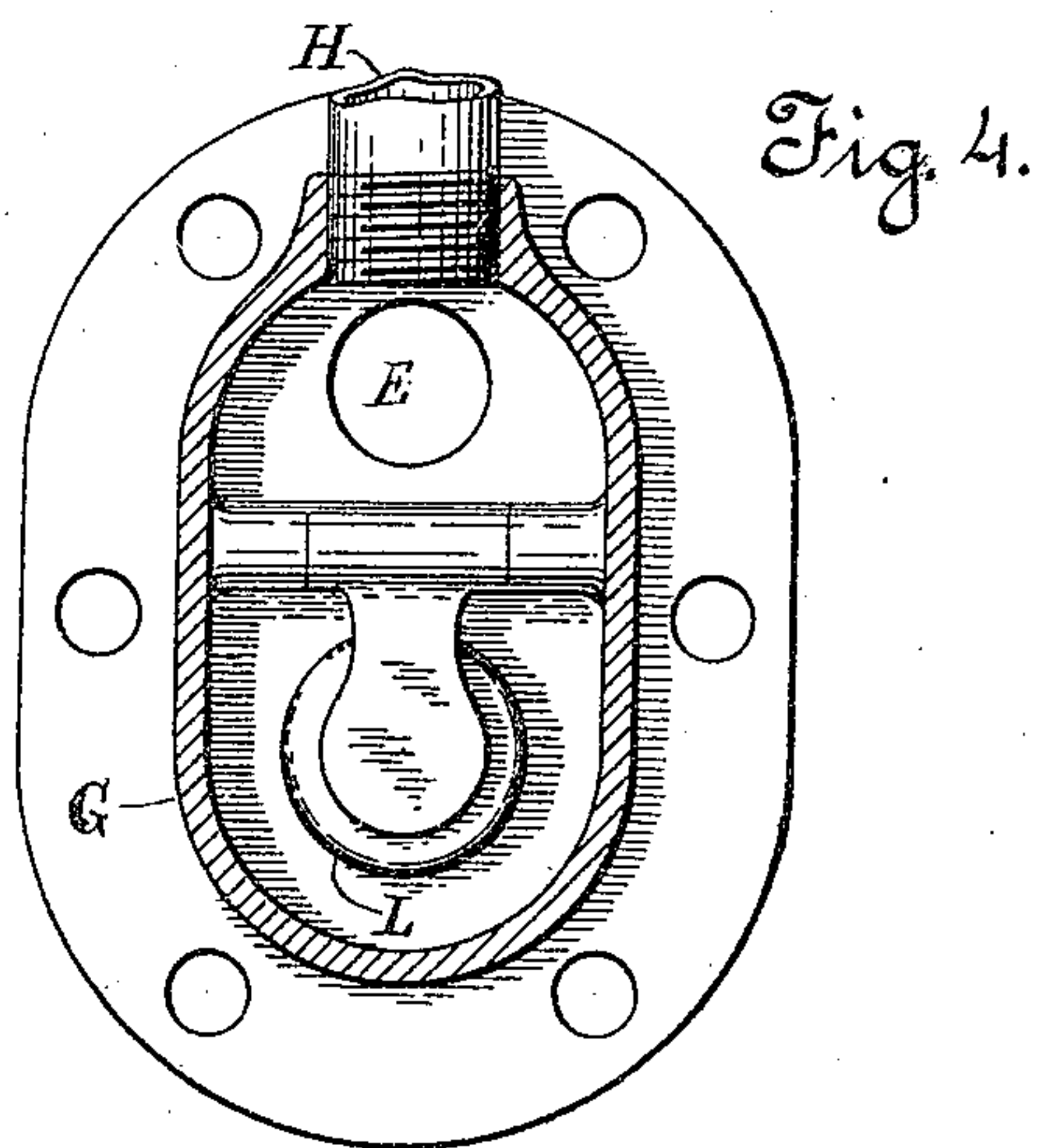
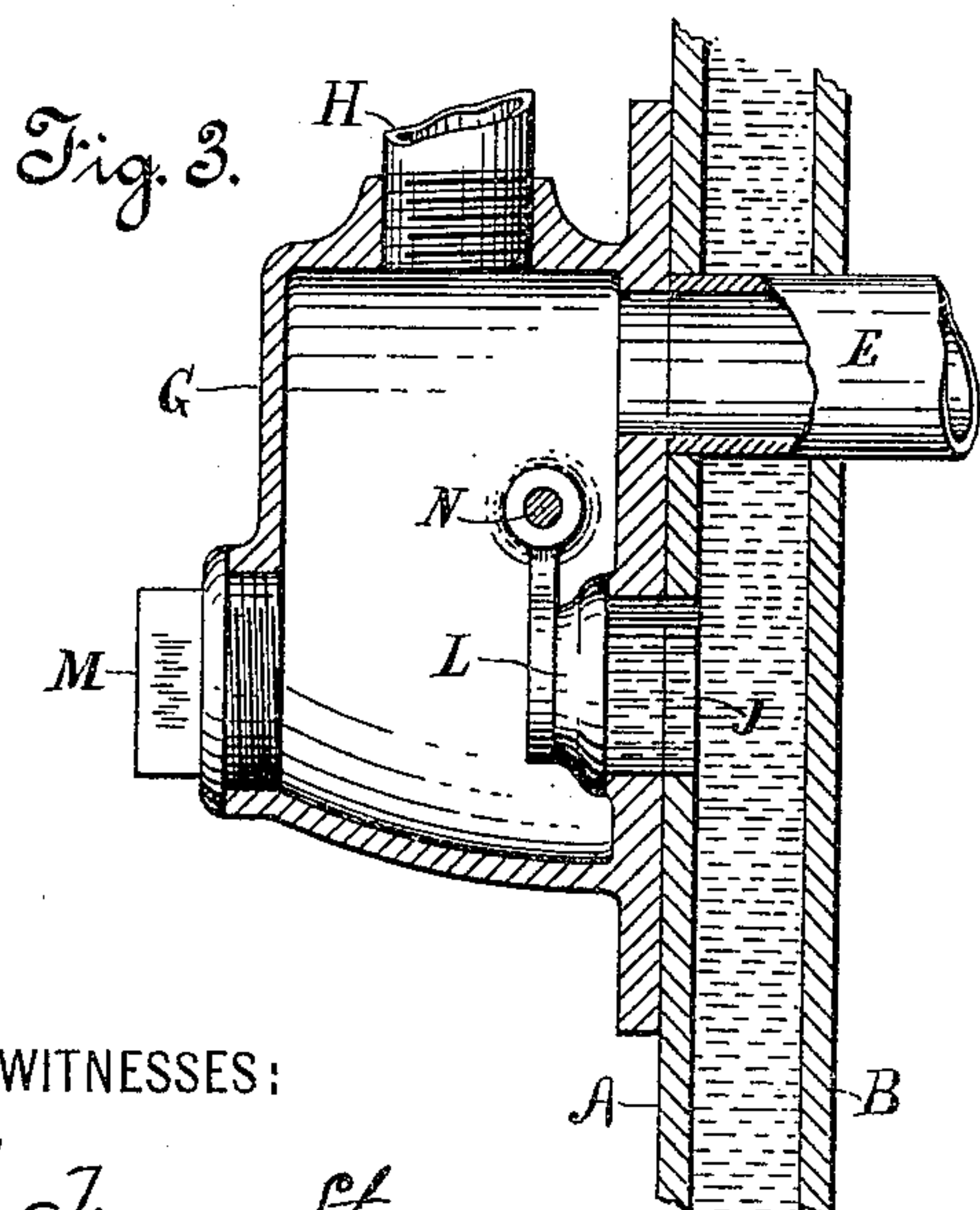
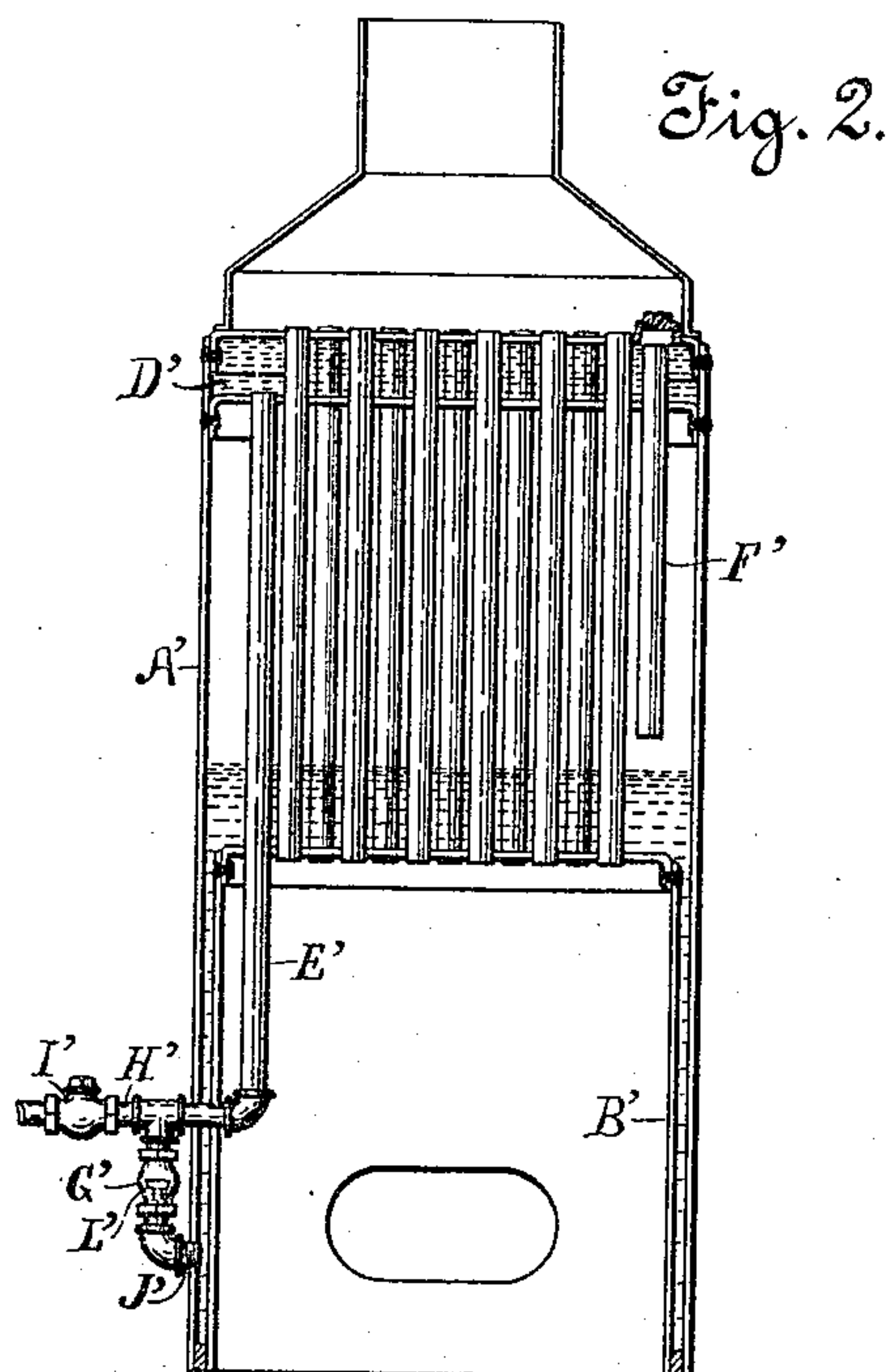
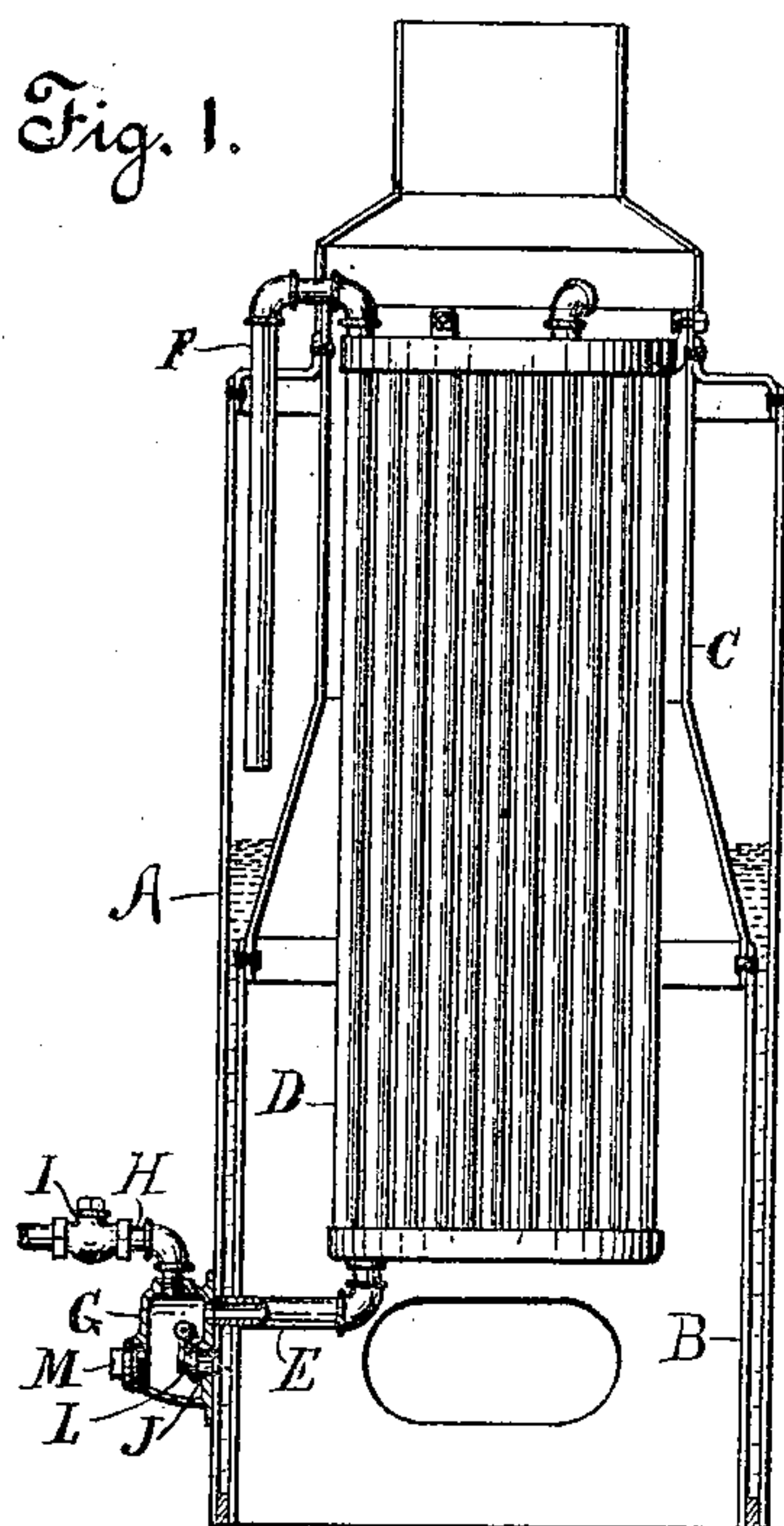
No. 620,947.

Patented Mar. 14, 1899.

C. R. MOORE.
STEAM BOILER.

(Application filed Dec. 12, 1898.)

(No Model.)



WITNESSES:

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CHARLES R. MOORE, OF ELMIRA, NEW YORK, ASSIGNOR TO THE LA FRANCE
FIRE ENGINE COMPANY, OF SAME PLACE.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 620,947, dated March 14, 1899.

Application filed December 12, 1898. Serial No. 698,981. (No model.)

To all whom it may concern:

Be it known that I, CHARLES R. MOORE, a citizen of the United States, residing at Elmira, in the county of Chemung and State of New York, have invented certain new and useful Improvements in Steam-Boilers, of which the following is a specification.

My invention relates to improvements in steam-boilers wherein the feed-water is first delivered to a water-heating chamber within the boiler, and it relates more particularly to boilers of the vertical type which are especially suitable for steam fire-engines and other apparatus requiring prompt generation of steam, and incidentally to improvements in the boiler described in Letters Patent No. 582,216, granted me on the 11th day of May, 1897; and the object of my improvements is to provide the water-chamber with a connection from the water-space of the boiler, whereby a circulation of the water from the boiler to the water-chamber will take place automatically when the feed-pump is stationary. I attain this object by the construction illustrated in the accompanying drawings, in which—

Figure 1 shows a vertical section of a tubular boiler embodying my improvements; Fig. 2, a section of a boiler of the smoke-flue type in which the connections between the boiler proper and water-chamber are somewhat modified, and Figs. 3 and 4 sectional details showing my preferred form of valved connection.

Similar letters refer to similar parts throughout the several views.

In Fig. 1, A represents the outer shell of the boiler, B the fire-box, and C a continuation of the fire-box shell, forming a large central flue from bottom to top of boiler and an annular water and steam space within the outer shell, as indicated. Within the central flue of the boiler is located a large nest of tubes D, running between top and bottom headers and extending from a short distance above the grate to the top of the boiler. The bottom header of this nest is connected by the pipe E with the valve-case G, which in turn is connected by the pipe H to the feed-pump for the boiler, a check-valve I being usually inserted close to the boiler to prevent backflow to the pump. The top header of the nest is connected by

one or more pipes F with the water and steam space of the boiler, this pipe preferably terminating a short distance above the normal water-level. The valve-chamber G is connected by a passage J with the leg of the boiler, and flow of water from the valve-chamber to the leg is intercepted by the check-valve L, which is pivoted at N, as shown in Figs. 3 and 4. A plug M is provided opposite the valve for the purpose of inspecting, adjusting, or repairing the valve.

In operation when the feed-pump is working water therefrom will pass through the check-valve I and pipe H into the chamber G, closing the check-valve L and passing through the pipe F into the boiler, the operation of the pump being continued until the water stands in the boiler at the normal water-level. If the pump is then shut off, the nest will stand full of water until evaporation takes place or until the heat imparted to the nest from the fire-box drives a portion of the water over into the boiler. Should the water-level in the nest fall below that in the boiler, the check-valve L will permit the water to flow from the leg of the boiler into the nest, thereby insuring a water-supply in the nest though the feed-pump be shut off, the level of which will never be below that in the boiler proper as indicated by the water-gage. Moreover, this central nest D being in the hottest portion of the boiler, a circulation will be produced from the leg of the boiler through the check-valve L into the nest and thence back through the pipe F into the boiler, the steam generated in the nest rising from the mouth of pipe F into the steam-space of the boiler and the water falling into the water-space. Were the connection J and check-valve L not provided it will be apparent that the heat applied to the nest D would tend to drive the water therein over into the boiler, excessively raising the water-level therein, and it would be necessary to keep the feed-pump working in order to prevent the burning of the tubes in the central nest. By providing the check-valve connection, however, there will always be water in the central nest at a level above or equal to that in the main boiler, and it will only be necessary to watch the gage of the boiler to determine when to operate the feed-

pump. By this construction of the boiler it will be seen that I feed the water into the hottest part of the boiler, separating it into a number of small vertical columns, around
 5 which the heated gases circulate, thereby providing a large heating-surface and a very rapid generation of steam. The steam generated in the central nest unites with that generated in the boiler proper, rising into the
 10 steam-space, the water carried over with the steam falling into the leg of the boiler and thence through the passage J, circulating back into the nest, the water in the nest being carried above the water-level of the boiler at all
 15 times while steam is being generated.

In Fig. 2 I have shown a smoke-flue boiler in which a water-chamber is provided and operates on the same principle as that in Fig. 1. This chamber, however, is located at the
 20 top of the boiler at D' between the two heads, as indicated, the purpose being, in addition to heating the water, to protect the top of the smoke-flues, which are otherwise apt to become leaky around their connections with the
 25 boiler-head. In this boiler I have also shown the circulating device constructed and coupled up by ordinary steam-fittings, G' being a vertical check-valve, such as can be purchased at any steam-fitter's, the valve being
 30 indicated in broken lines at L'. In this boiler the water entering through pipe H' rises through pipe E' into the water-chamber D', filling said chamber, and thence flows down through pipe F' into the water-space of the
 35 boiler. In case the feed-pump is shut off and the water is driven from the chamber D' a circulation from the leg of the boiler will be set up through connection J' and the valve G' through the pipe E', which is subject to a
 40 high heat from the fire in the fire-box. The water in this pipe E' being heated to a greater extent than that in the leg of the boiler will be driven up through the pipe into the water-chamber, thus insuring a circulation from the
 45 leg into the water-chamber and filling said chamber at all times either with water or very heavily-saturated steam, the saturated steam being as effective in protecting the smoke-flues as the water would be. Thus the feed-
 50 pump may be shut off and neglected without danger of driving the water from the chamber D' or burning out of the connection E' so long as water is shown in the water-gage.

The vacant spaces in the fire-box in Fig. 2
 55 and around the central nest in Fig. 1 may be filled with circulating nests, coils, tubes, &c., as now generally in use in this type of boiler, to promote the rapid generation of steam; but as they form no part of my present invention
 60 I have not illustrated them.

It will be noted that the valve-cases G and G' and their connections are on the outside of the boiler, where they are readily get-at-able, and that the action of the device is en-
 65 tirely automatic.

While my invention involves any arrangement of boiler and connections which will ac-

complish the object stated, I prefer the form of boiler and connections shown in Figs. 1, 3, and 4, since the boiler therein illustrated
 70 will give a greater amount of heating-surface and a more rapid generation of steam, and the valve connection as therein shown is of small compass and can be readily repaired or
 75 inspected without breaking connections. The valve-case is of one casting, the inner flange and wall being dressed off to fit the curve of the boiler and being bolted to the boiler by
 80 means of a suitable number of stud-bolts, an asbestos or other packing being inserted between the valve-case and boiler to insure a water-tight joint. Where the central system
 85 or nest of tubes is large, I may need more than the one induction connection from the source of feed-water supply. I may also promote cir-
 90 culation from the boiler-leg to the central system by disposing at suitable intervals around the boiler an additional number of the valved connections, such connections in that case
 95 having the opening for the feed-pipe plugged or otherwise closed up.

Having thus described my improvements, what I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination, with a steam-boiler,
 95 of a water-chamber within the boiler wherein the water is carried above the water-level of the boiler, an induction-pipe from the feed-water supply to said chamber, an eduction-
 100 pipe from said chamber to the boiler, a passage from the boiler to said chamber whereby water may circulate from the boiler to said chamber when the feed-water is shut off, and
 105 a check-valve in said passage to prevent backflow to the boiler.

2. The combination, with a steam-boiler,
 110 of a water-chamber within the boiler wherein the water is carried above the water-level of the boiler, an induction-pipe leading from the feed-water supply to said chamber through
 115 the fire-box, an eduction-pipe leading from the top of said chamber to the boiler, a passage from the boiler to said induction-pipe whereby water may circulate from the boiler
 120 to said chamber when the feed-water is shut off, and a check-valve in said passage to prevent backflow to the boiler.

3. In an upright boiler, the combination of inner and outer shells forming an annular
 125 water and steam space, and independent central system of tubes or nest of tubes extending from the top of the boiler down within the fire-box wherein the water is carried above
 130 the water-level of the boiler, an induction-pipe from the feed-water supply to the bottom of said system, an eduction pipe or pipes from the top of said system to said water or
 135 steam space, one or more connections between the leg of the boiler and the bottom of said system, whereby water may circulate from the
 140 leg to said system, and a check-valve in said connection or each said connections to prevent backflow to the leg.

4. In combination with a boiler and water-

chamber of the character described, a valve-chamber flanged and bolted to the boiler-shell, said valve-chamber being provided with a port communicating with a connection leading to the water-chamber, and having a second port registering with an opening in the leg of the boiler, said second port being closed by a check-valve for the purpose set forth.

5. In combination with a boiler and water-chamber of the character described, the valve-chamber G, said chamber being flanged to

bolt to the boiler-shell and having three ports, one opening to the feed-water supply, one to the water-chamber, and one to the leg of the boiler, the last-named port being provided with a check-valve for the purpose set forth. 15

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

CHARLES R. MOORE.

Witnesses:

A. S. DIVEN,

C. TRACEY STAGG.