(No Model.) 2 Sheets—Sheet 1.

R. P. BARNSTEAD.

COMBINED WATER AND GAS CONNECTION AND GAS REGULATOR.

No. 462,292. Patented Nov. 3, 1891.

Fig. 1.

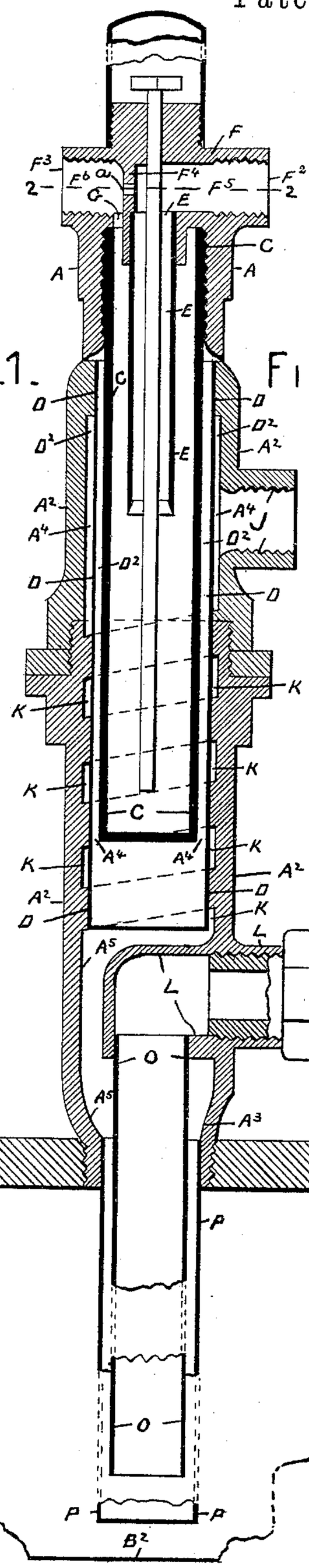


Fig. 3.

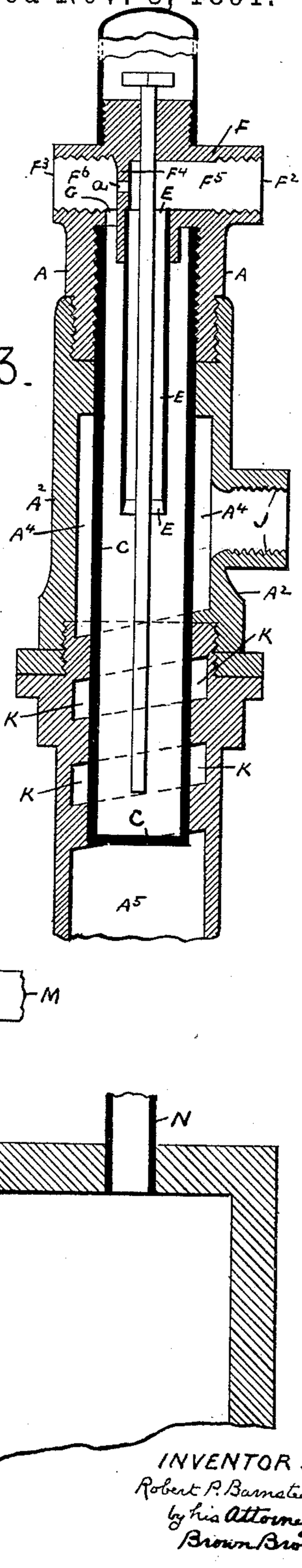
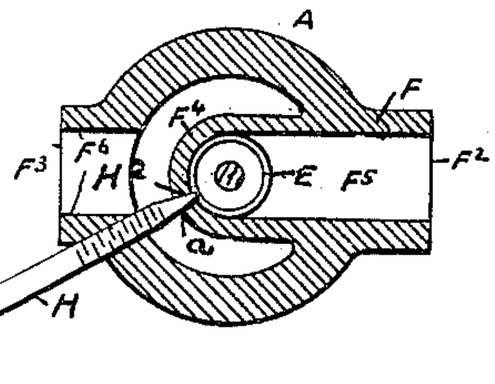


Fig. 2.



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(No Model.) 2 Sheets—Sheet 2.

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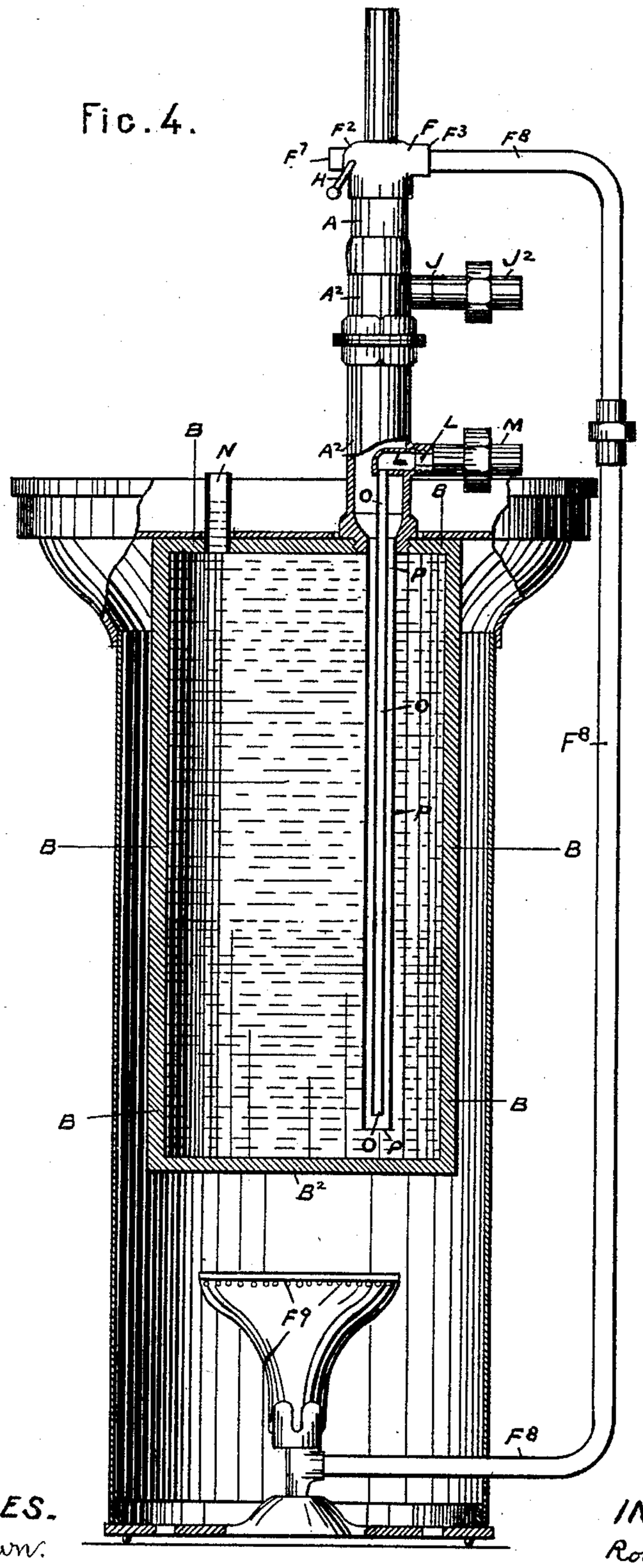
Fig. 4.



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UNITED STATES PATENT OFFICE.

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COMBINED WATER AND GAS CONNECTION AND GAS-REGULATOR.

SPECIFICATION forming part of Letters Patent No. 462,292, dated November 3, 1891.

Application filed December 23, 1890. Serial No. 375,626. (No model.)

To all whom it may concern:

Be it known that I, ROBERT P. BARNSTEAD, a citizen of the United States of America, and a resident of the city of Boston, county of Suffolk, and State of Massachusetts, have invented a certain new and useful Improved Combined Water and Gas Connection and Gas-Regulator to be Used for Hot-Water Apparatus, &c., of which the following is a full, clear, and exact description.

The improved combined water and gas connection and gas-regulator of this invention is particularly designed for hot-water apparatus, and in substance it is composed of a vertical casing or shell in upper and lower sections adapted to be connected together and its upper section at its upper end closed and its lower section at its lower and open end adapted to be connected to a boiler for water, &c.; a vertical closed reservoir for mercury or such like held in and surrounded by an open space of the shell that at its upper and lower ends, respectively, is closed and open, preferably surrounded by a fixed tube of larger diameter that is closed at both ends, and a fixed and inner tube held on and projected downward from the upper end of the mercurial reservoir and its upper and lower ends both open, and respectively one to the inside and the other to the outside of the reservoir, in combination with a horizontal passage across the upper end of the mercury-reservoir and at its opposite ends, respectively, adapted to be connected to a gas-supply and to a gas-burner and partitioned off into two horizontal sections, always in gas communication by a jet-hole of the partition, and its gas-supply and gas-burner connected sections respectively in communication with open upper end of said inner tube and with the space between it and said mercury-reservoir; two side openings of the shell, one located toward upper end portion of and the other toward and preferably below said mercury-reservoir and respectively adapted for connection with a water-supply under pressure and with a return-pipe of water-pipes arranged outside of the shell for automatic circulation through them of water supplied to them from the boiler of the apparatus, and two pipes respectively continuous with the lower end and with said lower side opening of shell and both leading into the boiler, the one to a level near the lower portion and the other to a level half-way or so of the height of the boiler; and, again, this invention in hot-water apparatus consists in the combination, with a closed vertical reservoir to contain, preferably, mercury or other material quickly sensitive to changes in temperature, and which is placed as to the boiler of the apparatus for its contents to be acted on by the temperature of the water in said boiler, and with a supply for gas, &c., to be used to heat the water or other liquid in the boiler, and suitably adapted for the gas preferably to be only partially shut off by a rise and to be fully opened by a fall of said mercury, of a spiral way or passage about and along said mercury-reservoir and at its upper and lower end portions respectively in communication with a water-supply under pressure and within the boiler, and, furthermore, in an improvement in detail, as hereinafter fully appears.

In the drawings forming part of this specification, Figure 1 is a central vertical section of the combined connection and gas-regulators of this invention in all its parts, except that its pipes leading into the boiler are broken off intermediate of their length and the boiler is shown as broken off. Fig. 2 is a horizontal section in detail, line 2 2, Fig. 1. Fig. 3 is a vertical section in detail, as will hereinafter appear. Fig. 4 is a vertical section of a hot-water boiler and also of some of the contrivances of this invention applied to the boiler, the remainder of the parts being shown in side elevations.

In the drawings, A A^2 is a vertical shell or casing in upper and lower sections, suitably adapted to be connected together—for illustration, Fig. 1 by simply resting the upper upon the lower and Fig. 3 by screwing one upon the other. The lower end A^3 of the lower section A^2 is open and is adapted to be screwed into a screw-threaded opening at the top of a water-boiler B.

C is a reservoir for mercury or other material quickly sensitive to changes in temperature. This reservoir C at its upper end portion is screwed into a screw-threaded socket at the lower end of the upper shell-section A, and extends therefrom down into and through

a greater portion of the height of the lower section A^2, wherein from end to end it is surrounded by a space A^4, which is closed at its upper end and at its lower end is continued by the full chamber A^5 of the shell located below the lower end of the reservoir.

D is a vertical tube which surrounds the mercury-reservoir and is located in the space A^4 between it and the shell A^2. This tube D at its upper open end is fixed in the upper end of the lower shell-section A^2, and at its lower end it is closed and also below the bottom of mercury-reservoir C.

D^2 is an open space between reservoir C and vertical tube D, surrounding it, as stated.

E is a vertical tube open at both ends. This tube is of smaller diameter than and is located in the upper portion of the reservoir, and its upper end is held on the lower end of the upper shell-section A, and its lower end is intermediate and preferably midway or thereabout of the height of the reservoir.

F is a horizontal gas-passage across upper portion of upper section A of shell and adapted at each end for gas-pipes F^7 F^8, Fig. 4, to be connected thereto, and at one end portion F^2 by pipe F^7 to a gas-supply, (not shown,) and at the other end portion F^3 by pipe F^8 to a burner F^9, suitably arranged for heating water in the boiler. The upper end of the inner vertical tube E of the reservoir opens into the end portion F^2 of the gas-passage F, connected with a gas-supply, and at the side of this tube toward the other end portion F^3 of the gas-passage F there is a cross vertical partition F^4, dividing the gas-passage into two distinct horizontal sections F^5 F^6, one F^5 the section connected to gas-supply and the other F^6 the section connected to gas-burner, and this section F^6 is in connection with the mercury-chamber C about its inner vertical tube E by an opening G in the lower end of the upper section A of shell and with the gas-supply section F^5 by a port or aperture *a*. To fully open or to fully close or otherwise to regulate the superficial area of this aperture, Fig. 2, a regulating-screw H is provided. This screw H screws into and through the wall of the gas-burner section F^6 of the gas-passage, and it has a conical tip H^2, adapted for the jet-hole *a*, so as to fully open or close it or otherwise regulate it, all as is obvious without further explanation.

J is an opening at one side of the lower section A^2 of shell and near upper portion of and in communication with the space D^2, directly about tube D, surrounding the mercury-reservoir. This opening J is for the connection of a supply-pipe (not shown) for water under pressure with the space D^2 of shell, said space being in fact a part of the whole space between shell and mercury-reservoir. This space D^2 below opening J has a downward-winding spiral way K, continuing to the lower end of the outer vertical tube D, where it opens to the full chamber A^5 of the shell, all so that the water entering into the space D^2 of the shell is forced to wind its way around the tube D in its passage downward through the shell A.

L is a side opening of the shell A at or near lower end portion of spiral way K, and it is for connection of the return-pipe M, making one of the two pipes M N, the other being entered into the top of the boiler, that are, as well known, together arranged for an automatic circulation of water through them from the boiler to the valve and nozzle at which the water is to be drawn off.

O is a vertical pipe connected with inner end of lower side opening L of lower section A^2 of shell A.

P is a pipe connected with the lower open end of said shell-section. The pipe O is within the pipe P, and the pipe P terminates near the bottom B^2 of the boiler B and the pipe O terminates intermediate and preferably midway of the height of the boiler.

As particularly shown, the lower section A^2 of shell is of itself divided into upper and lower sections screwed together and having the line of division just below the upper side opening J of the shell. This division is desirable, as it enables the upper portion of said section A^2 to be removed at pleasure, provided, of course, first that the water-supply has been shut off from the side opening J and otherwise the apparatus has had its gas connection properly prepared therefor. With this portion of lower shell-section A^2 detached the tube D and also the mercury-reservoir are removed, and thus the chamber of the lower portion of same section is open for inspection, cleaning, &c.

In the connection, which as a whole has been now described plainly, the mercury of the reservoir is subject to the temperature of the water in the boiler, and thereby made either by its full rise to shut off and by its fall to open fully or partially, as the case may be, the main supply of gas to the burner, the gas in the first instance then passing to the burner only through the port *a* and in the second instance through said port and the inner tube of the reservoir, and thence from the reservoir through the opening G into the gas-burner section of gas-passage, all according as required, and in any event and at all times the gas-burner is supplied with gas. Again, plainly when the outer tube D is used the mercury-reservoir can be detached by simply detaching the upper section A from the lower section A^2 of shell, first, of course, having disconnected the gas-pipes at the gas-passage F and stopped up its opposite end opening, which obviously is advantageous—a very important feature, in that it enables the mercury-reservoir to be detached without disturbance of the water connections. Again, plainly the said connection is compact and carries practically in one whole all parts for the gas connections and the passages of the gas, as stated; also all parts for water connections, except that for one pipe N of the auto-

matic circulating-pipes M N and the mercury-reservoir, the parts being all practically within and embraced by one outer shell or casing A, and when that is attached placing all in position.

The outer tube D surrounding the mercury-reservoir constitutes an essential feature of this invention; but in so far as relates to the result produced by the downward spiral run of the water from the supply to the boiler it can be as well produced by removing said tube and having the water-supply run in direct contact with the mercury-reservoir. (See Fig. 3.)

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

1. In an apparatus for heating water, which embraces a water-boiler and a gas-burner to heat said boiler, a combination fixture consisting of a vertical shell closed at its upper and open at its lower end and there adapted to be connected to the boiler, a vertical mercurial reservoir held on and vertically having a space between it and said shell closed at its upper end, two openings at the side of said shell, one within the height of and the other below said reservoir and both adapted for separate exterior water connection, and a gas-passage which at its opposite ends is adapted to be connected to a gas-supply and said burner and lies across the upper end of said shell and reservoir and is divided intermediately into opposite end portions having separated gas communications between them, one direct and the other indirect and by way of and through said reservoir, substantially as described, for the purposes specified.

2. In an apparatus for heating water, which embraces a water-boiler and a gas-burner to heat said boiler, a combination fixture consisting of a vertical shell closed at its upper and open at its lower end and there adapted to be connected to the boiler, a vertical mercurial reservoir held on and vertically having a space between it and said shell closed at its upper end and at its lower portion having a downward spiral way, two openings at the side of said shell, one within the height of and the other below said reservoir and both adapted for separate exterior water connection, and a gas-passage which at its opposite ends is adapted to be connected to a gas-supply and said burner and lies across the upper end of said shell and reservoir and is divided intermediately into opposite end portions having separated gas communications between them, one direct and the other indirect and by way of and through said reservoir, substantially as described, for the purposes specified.

3. In an apparatus for heating water, which embraces a water-boiler and a gas-burner to heat said boiler, a combination fixture consisting of an outer vertical shell divided into upper and lower parts continuous with but separable from each other and having the lower part closed at its upper and open at its lower end and there adapted to be connected to the boiler, a vertical shell within and having its upper and open end held on the upper portion of said lower part of the outer shell and its lower end closed and vertically having a space between it and said outer shell closed at its upper and open at its lower end, a vertical mercurial reservoir held on the upper part of said outer shell and extending therefrom into said inner shell, two openings at the side of said outer shell, one within the height of and the other below said inner shell and both adapted for separate exterior water connection, and a gas-passage which at its opposite ends is adapted to be connected to a gas-supply and said burner and is held on the upper part of and lies across said outer shell and is divided intermediately into opposite end portions having separated gas communications between them, one direct and the other indirect and by way of and through said reservoir, substantially as described, for the purposes specified.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

ROBERT P. BARNSTEAD.

Witnesses:
ALBERT W. BROWN,
MARION E. BROWN.