No. 730,756. PATENTED JUNE 9, 1903.

H. F. GABEL.

WATER HEATER.

APPLICATION FILED MAR. 5, 1900.

NO MODEL. 2 SHEETS—SHEET 1.

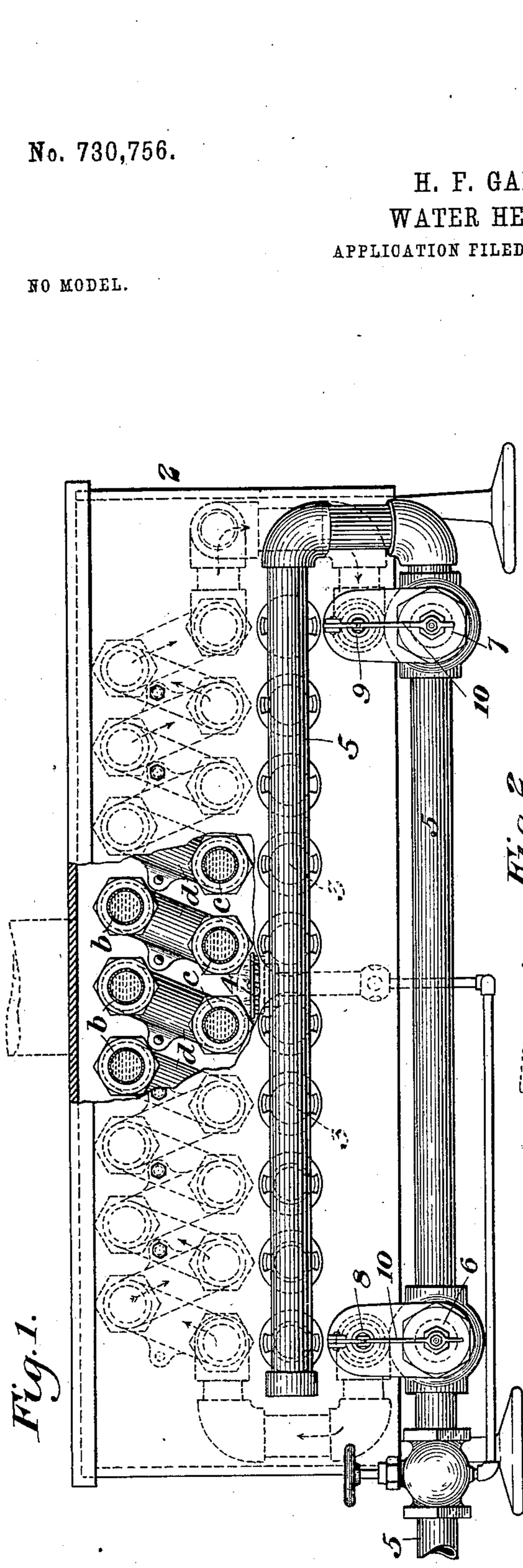

Fig. 1.

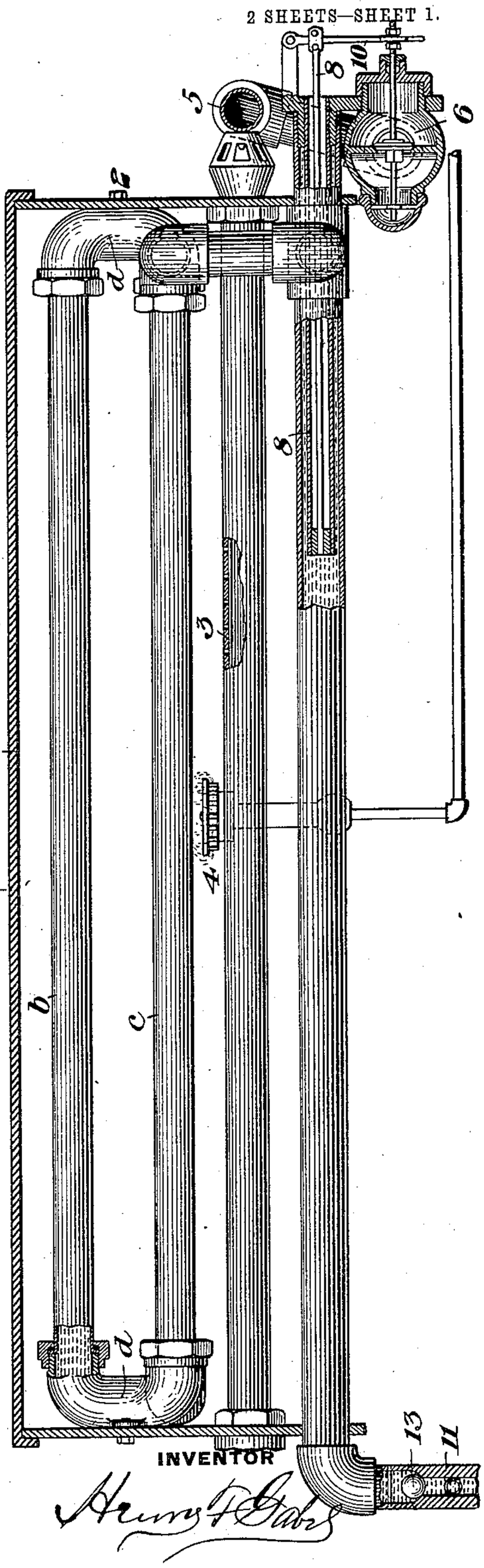

Fig. 2.

WITNESSES

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INVENTOR

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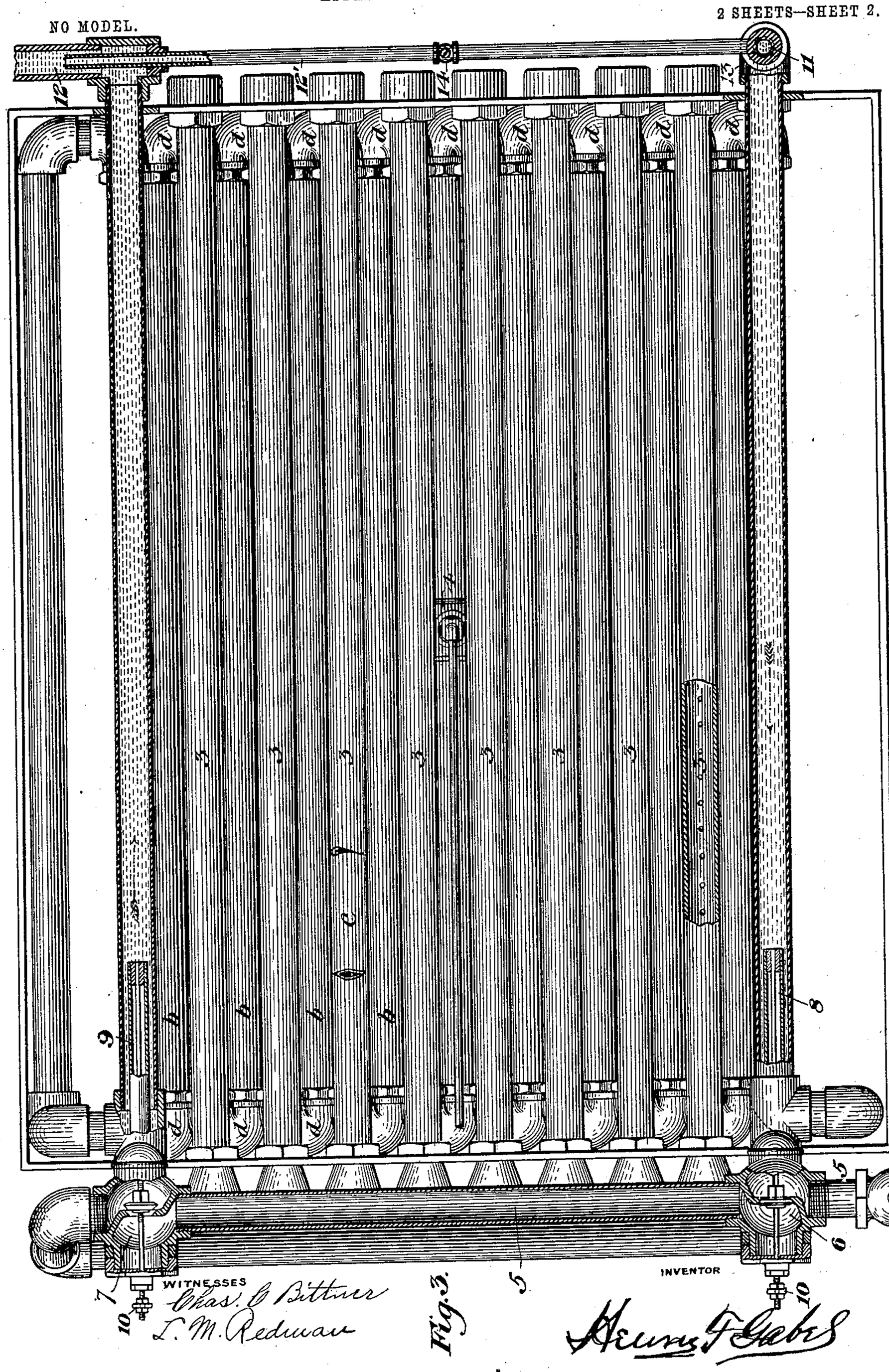

WITNESSES
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Fig. 3.

INVENTOR
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UNITED STATES PATENT OFFICE.

HENRY F. GABEL, OF PITTSBURG, PENNSYLVANIA.

WATER-HEATER.

SPECIFICATION forming part of Letters Patent No. 730,756, dated June 9, 1903.

Application filed March 5, 1900. Serial No. 7,264. (No model.)

To all whom it may concern:

Be it known that I, HENRY F. GABEL, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Water-Heaters, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is an end elevation, partly broken away, showing my improved water-heater. Fig. 2 is a side elevation, partly in section. Fig. 3 is a bottom plan view showing the thermostat and gas-valves in section.

My invention relates to the class of automatic water-heaters, and is designed to improve the economy of such heaters and prevent liability to accidents.

In the drawings, 2 represents the water-heater, which is composed of two horizontal banks of pipes—an upper bank *b* and a lower bank *c*—arranged horizontally and connected at the ends in series by inclined return pipes or elbows *d*, forming, in effect, a flat coil with its axis in substantially horizontal position. Under the several members of the lower bank of pipes *c* are gas-pipes 3, preferably extending parallel therewith, so that the heat is applied along the entire heater and preferably isapplied individually to the several branches, and the upper members of the coils are directly above the lower members in alternate or staggered position, so that the flame and heat from the burners act upon all parts of the series and the instantaneous heating is very thorough and efficient, and by equalizing the expansion and contraction the durability of the heater is greatly increased. The coil or series of pipes constituting the heater may be made in a single piece, if desired.

4 is the pilot-light, which is kept burning continuously in the usual manner, the main burners 3 being supplied with gas only when water is being drawn from the spigot.

5 is the gas-supply pipe, which leads to the burners 3, and 6 7 are two valves arranged to control the passage of gas therethrough. The valve 6 is operated by a thermostat 8, which I call the "cold-water" thermostat, and the valve 7 is operated by a thermostat 9, which I call the "safety-thermostat." These thermostats are preferably arranged below the heater, and, as shown in Fig. 2, consist of expansible metal rods arranged in tubes connected with the heater. These rods are connected by a lever 10 or directly to the gas-valve 6 or 7.

11 is the cold-water-inlet pipe, which enters the heater near the end at which the thermostat 8 is applied, and 12 is the delivery-pipe or hot-water pipe which leads from the heater, and is in communication with the chamber containing the thermostat 9, the purpose being that when so long as the heater contains hot or warm water (that is constantly so long as the heater is ready for use) the water will act upon the thermostat 9 and will hold the gas-valve 7 constantly open; but if for any reason the water in every part of the heater should become chilled, as when the pilot-light should be blown out accidentally, the thermostat 9, contracting under the influence of the cold water, will close the gas-valve 7 and will hold it closed, thus stopping the gas-pipe and preventing the subsequent outflow of gas until the pilot-light is again ignited. This is a safety device of importance and will prevent accidents from the escape of gas, which sometimes are serious in their results. The thermostat 8 is arranged to open its valve by contraction, while the thermostat 9 is arranged to close its valve by contraction. When the water becomes hot and the thermostat 8 cuts off the gas-supply, the pilot-light will supply sufficient heat to keep the valve 7 unseated.

The operation is as follows: The pilot-light 4 being ignited, if the service-spigot is open, so as to cause the flow of water through the heater, the entrance of cold water near the thermostat 8 will contract it, so as to open the valve 6. The gas will then flow out at the burners 3, the gas-valve 7 being open, and the water in the heater will be instantaneously heated. As soon as the spigot is closed the flow of cold water through the heater will stop, and thereupon the thermostat 8, no longer being subjected to the inflowing cold water and being heated by back circulation of the hot water from the heater, as explained below, expands somewhat, closes the valve 6, and shuts off the gas. If, as above explained, the pilot-light should be accidentally extinguished, the safety-thermostat 9 will close the

valve 7 and will keep the gas shut off at this valve until the pilot-light is again ignited. This back circulation of the hot water by the cold-water thermostat is effected by a circulating device consisting of a pipe 12′, which extends from the hot-water-delivery pipe back to the cold-water-inlet pipe at a point in the rear of the connection of the latter to the cold-water thermostat. When the hot-water spigot is closed, as above stated, the hot water from the hot-water-delivery pipe will circulate by way of the pipe 12′ and heater-pipes to the cold-water-inlet pipe, where it will act upon the thermostat and will close it quickly. I effect great economy of gas by such quick closing of the valve after the hot water is shut off. This pipe 12′ also serves another very important function. Heretofore in instantaneous water-heaters operated by thermostats when the hot-water spigot leaks, either by imperfect closing of the spigot or by defect in its construction, a flow of water is caused through the heater which will gradually chill the thermostat, and will thus cause it to operate at intervals of a few minutes to light the gas. This causes a waste of gas which in the aggregate is considerable in amount and very greatly increases the cost of operating the heater, so that this has constituted a principal objection to thermostat-heaters. In my apparatus, however, I provide a by-pass constituted by the pipe 12′, leading from the cold-water side to the hot-water side, so that the leakage, if any, at the hot-water spigot will not be drawn through the heater, but will be taken directly from the cold-water pipe, and thus will not affect the thermostat. To improve the operation of this by-pass, I prefer to employ a check-valve 13, arranged between the by-pass and the heater, which is closed to exclude cold water from entering the heater when the spigots are leaking. When the stream is larger than the rate of leakage permitted through the by-pass, the check-valve rises and the cold water passes to the heater and operates the thermostats. I prefer also to provide the by-pass 12′ with a regulating valve or cock 14, which may be set so as to throttle the leakage-passage to any desired size.

Within the scope of my invention as defined in the claims this leakage by-pass may be applied to any kind of thermostatic heater, whether operating with one or two thermostats or whether composed of a coil, pipes, or vessel, and that in like manner the two thermostats may be used without the leakage by-pass or with heaters of any construction, also that my improved heater may be used with instantaneous-heating apparatus of other constructions, since

What I claim is—

1. A water-heater having a cold-water inlet and hot-water outlet, a gas-burner arranged to heat the same, a plurality of valves arranged to control the supply of gas to the burner, a thermostat at the inlet portion of the heater, and in operative relation thereto, said thermostat being arranged to actuate one of the gas-control valves by contraction to allow flow of gas to the burner, and a safety-thermostat at the hot-water outlet in operative relation to the heater arranged to actuate another of said valves by contraction to shut off the gas-supply; substantially as described.

2. An automatic water-heater, having a cold-water inlet and a hot-water oulet, a burner adjacent to the heater, a gas-control valve in the supply-pipe leading to the burner, a thermostat in operative relation to the heater and connected to said gas-valve, and a leakage by-pass leading from a point back of the thermostat to the hot-water outlet; substantially as described.

3. An automatic water-heater having a heating-burner, a gas-control valve in the supply-pipe leading to the burner, a thermostat in operative relation to the heater and connected to said gas-valve, and a leakage by-pass leading around the heater from the cold-water inlet to the hot-water outlet; substantially as described.

4. A water-heater having a heating-burner, a gas-control valve in the supply-pipe leading to the burner, a thermostat in operative relation to the heater and connected to said gas-valve, a leakage by-pass leading from a point back of the thermostat to the hot-water outlet, and an automatic valve between the by-pass and the heater; substantially as described.

In testimony whereof I have hereunto set my hand.

HENRY F. GABEL.

Witnesses:

LENDELL A. CONNER, Jr.,

GEO. B. BLEMING.