

(No Model.)

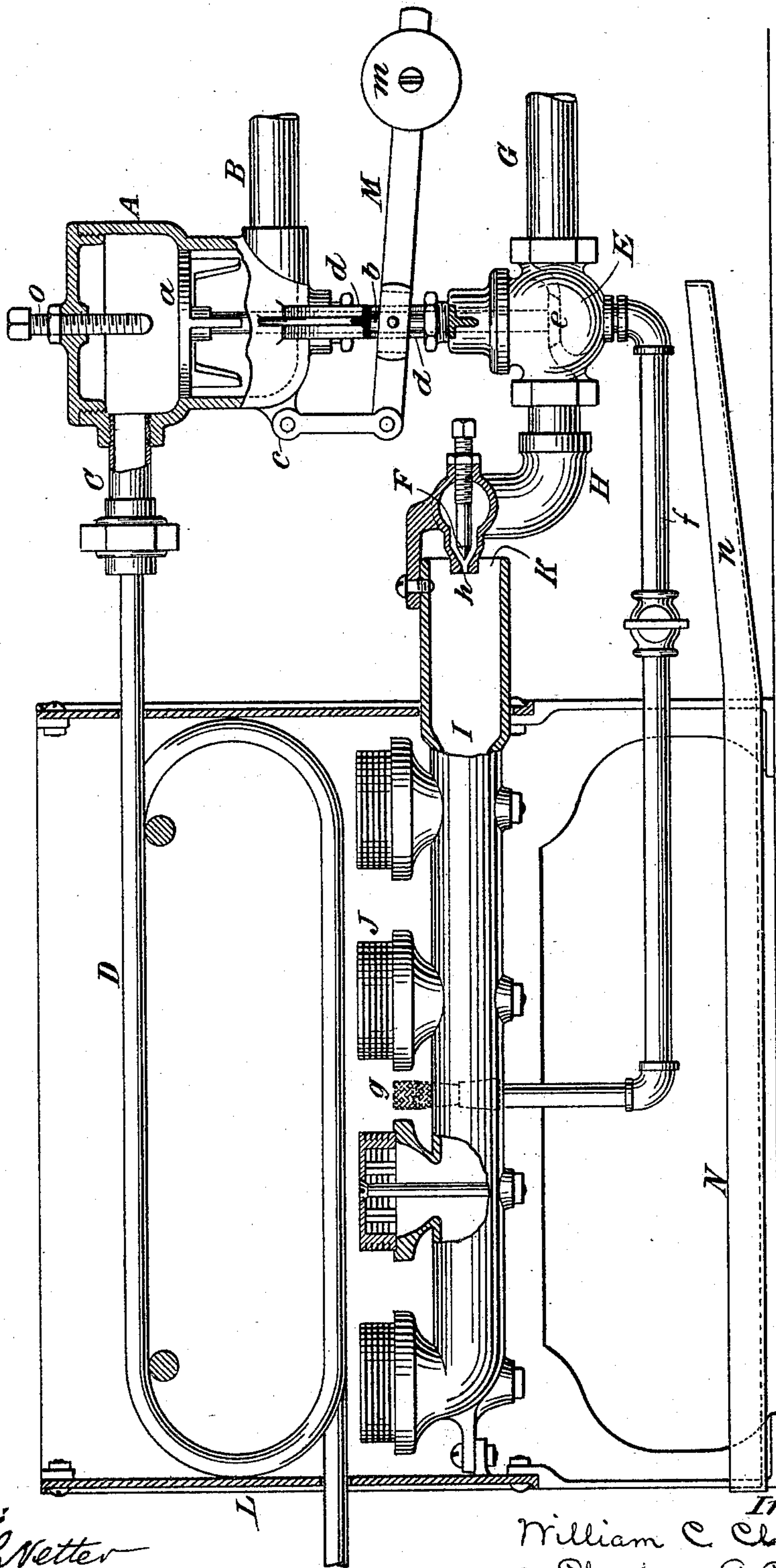
2 Sheets—Sheet 1.

W. C. CLARKE.  
APPARATUS FOR HEATING WATER.

No. 584,326.

Patented June 15, 1897.

Fig. 1



Witnesses:

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Sando F. Randall

Inventor  
William C. Clarke  
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Attorney

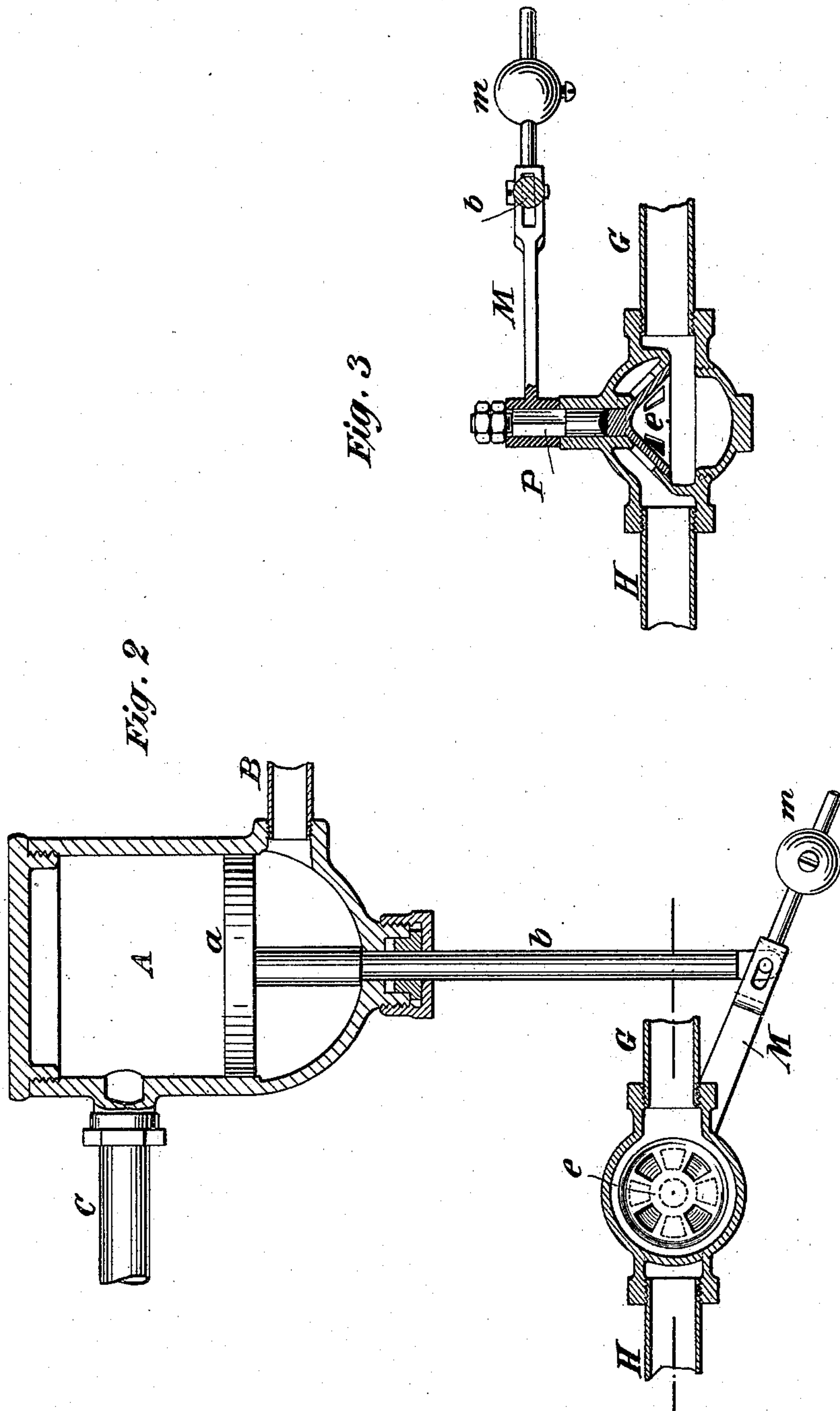
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by *Clarkson A. Collins*  
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# UNITED STATES PATENT OFFICE.

WILLIAM C. CLARKE, OF NEW YORK, N. Y., ASSIGNOR TO THE GILBERT & BARKER MANUFACTURING COMPANY, OF MASSACHUSETTS.

## APPARATUS FOR HEATING WATER.

SPECIFICATION forming part of Letters Patent No. 584,326, dated June 15, 1897.

Application filed January 15, 1895. Serial No. 534,991. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM C. CLARKE, a citizen of the United States, residing in the city of New York, in the county and State of New York, have invented certain new and useful Improvements in Apparatus for Heating Water, of which the following is a specification.

My invention relates particularly to a device for heating water by gas in which a valve in a gas-pipe leading to heating-burners shall be automatically opened whenever water is drawn from the vessel heated by such burners and closed when water ceases to be drawn. This may be accomplished by utilizing the hydraulic pressure in the water-pipe leading to the heating vessel. All efforts to this end heretofore have been in the direction of making a purely automatic non-adjustable device. I have found, however, that owing to the great difference in water and gas pressures in different locations it is essential to the practical use of such a device that it shall be not only automatic in its operation, but that it may be accurately adjusted to meet the different conditions to which different heaters will be subjected. For example, a heater so constructed that its gas-valve will be properly opened and shut and a proper supply of gas will be carried to the burners when it is located in the basement of a building may, if located on an upper floor of the same building, either fail to open its gas-valve at all or if the gas-valve is opened such a volume of gas may be carried to the burners as will produce a smoky flame. It is essential also in order to prevent smoking at the burners that a percentage of atmospheric air proportioned to the quality of the gas shall be mixed therewith, and such apparatus must therefore be able to conform not only to different gas and water pressures, but also to the different qualities of gas found in different locations. These requirements have heretofore not been recognized, or their importance has been disregarded in all former attempts to construct apparatus of this class, so that notwithstanding the evident desirability of such a device it has not heretofore come into practical use. To meet these conditions and provide a form of apparatus

which while adaptable for use in connection with different qualities of gas and different gas and water pressures shall at the same time be automatic in its operation and shall be simple and durable in its construction is the object of my invention.

To this end I provide two chambers having independent walls and separated by an air-space, one of which is connected with a feed-water pipe, which supplies a water-heating vessel, and the other is connected with a gas-pipe, which supplies gas to burners employed to heat such vessel.

In the chamber connected with the water-pipe is a piston-head adapted to be raised by the hydraulic pressure when water is flowing through the pipe, and to this is attached a rod or spindle, which projects through the wall of the chamber and operates a valve in the gas-pipe.

The separation of the chambers prevents any water that may escape around the spindle from entering the gas-pipe and enables me to attach to the spindle a pivoted lever, carrying a weight which is adjustable thereon, which operates to bring down the piston-head and spindle and close the gas-valve when water is not flowing in the water-pipe. By this means I am enabled to pack the spindle which projects through the wall of the water-valve chamber as tightly as may be required to prevent the escape of water in view of the pressure at the point where the device is located and at the same time to adjust the force operating to close the gas-valve so that it will overcome the friction of the packing and close the valve when water is not flowing and will, on the other hand, permit the water-pressure to operate to open the gas-valve when water is flowing through the pipe.

In the gas-pipe, between the automatic valve and the burners, I provide a manually-adjustable valve and an air-induction port whereby air is drawn into the pipe and mingled with the gas and the proportions of air and gas adjusted with reference to the quality of gas used, so as to regulate the quality of the flame at the burners and prevent smoking, whatever may be the pressure in the gas-pipe.

The invention will be best understood by



reference to the accompanying drawings, in which—

Figure 1 shows a vertical elevation, partly in section, of the apparatus; and Figs. 2 and 3 show the details of a modified form of valve in the gas-pipe.

Referring to Fig. 1 of the drawings, A indicates a chamber connected with a supply water-pipe B. In the chamber A, above the point of entrance thereto of the water-pipe B, is located a valve-disk or piston-head *a*, and from a point in the chamber A above the piston-head *a* a pipe C leads to a heater-coil D, whence it passes to a hot-water cock or by branch pipes to the various hot-water cocks in a building. These cocks, which are the usual hot-water cocks located at any convenient points of consumption, are not shown in the drawings, not being necessary to an understanding of the operation of the apparatus. Above the piston-head *a* the chamber A is, as shown in Fig. 1, somewhat enlarged, so as to permit water from the pipe B when the piston-head is raised to pass around it and so on to the pipe C and heater-coil D.

Below the chamber A and separated therefrom by an open space is a valve-chamber E, connected with a gas-pipe G. To the piston-head *a* is attached a spindle *b*, which extends downward through the wall of the chamber A and into the valve-chamber E, where a valve-disk carried upon the spindle *b*, or the lower end of the spindle itself, is seated to form a gas-valve *e*.

To the spindle *b* is attached a jointed arm or lever M, pivoted at *c* to a projection on the shell of the chamber A and carrying an adjustable weight *m*, which serves to draw down the spindle *b* and close the valve *e* when water is not flowing through the pipe B. The chamber A may, if desired, be provided with supporting-legs *d d*, resting upon the valve-chamber E or a part thereof. From the valve-chamber E leads a pipe H, forming a continuation of the pipe G and provided with a manually-adjustable valve F and a nozzle *h*, through which the gas is discharged into the pipe I, to which are connected the burners J under the heater-coil D. The end of the pipe I into which projects the nozzle *h* of the pipe F is open, forming an induction air-port K, through which air is drawn into the pipe I and mixed with the gas.

While other forms of valve may be employed, the valve F is preferably a needle-valve, as shown in the drawings, since with this form of valve the jet of gas acts most effectively as a piston to draw the air through the port K.

From a point in the valve-chamber E back of the valve *e* a small gas-pipe *f* leads to a pilot-burner *g*, located contiguous to one of the burners J. The burners J and the heater-coil D are located within a case L, beneath which is preferably placed a sink N to receive any water of condensation from the burners, which may be provided with a trough-arm *n*,

projecting out under the water-valve, into which any leakage from the water-valve will fall and be conducted into the sink N.

The heating vessel employed must bear such a relation to the inlet and outlet water-pipes that the water cannot be drawn therefrom more rapidly than it is admitted thereto, so that there shall be no break in the column of water from the supply water-pipe to the point of consumption. It is essential also that the heater shall admit of the rapid heating of the water, which must be raised to the required temperature during its passage therethrough. I find that both these objects are best accomplished by using as the heating vessel simply a coil of pipe or closed circuitous passage of a capacity not less than that of the outlet or draw-off pipe. Such a heater will be always full of water, so that the water will be under constant pressure from the point of supply to the point of discharge, thus insuring the prompt closing of the gas-valve when water ceases to be drawn, and at the same time the water is most effectively heated by reason of the comparatively long time during which any given portion of it is exposed on all sides and in a small stream to the heat of the burners while passing through the heater.

In setting the apparatus the spindle *b* is packed with sufficient tightness to prevent the water from being forced out around the spindle under the pressure to which the apparatus will be subjected, and the weight *m* is adjusted upon the arm or lever M to correspond with the water-pressure in the pipe B and the friction of the packing around the spindle, so that the valve *e* will be properly opened and shut, and the valve F is adjusted with reference to the gas-pressure and the quality of gas at the point of location of the heater, so that when the valve *e* is opened a mixture of gas and air of proper proportions and in proper quantity will be delivered at the burners.

When water is drawn from a cock connected with the heater-coil D, the pressure of water in the pipe B will lift the piston-head *a*, and the water will flow on past the piston-head to the heater-coil. By the movement of the piston-head *a* the spindle *b* is lifted and the valve *e* opened, and the gas passes on through the pipe H and nozzle *h* to the pipe I and the burners, where it is ignited by the flame at the pilot-burner *g*, which is kept burning for the purpose. Other forms of equivalent igniting devices, such as an ordinary electric gas-lighter actuated by the movement of the gas-valve, may be employed for this purpose without departing from the spirit of my invention, though I prefer to use the pilot-light, which is simple and certain in its operation. Air is drawn into the pipe I through the port K by the injection of the gas from the nozzle *h* into the pipe I, and the quality of the gas is reduced so that a blue smokeless flame is produced at the burners.



In case of a change in the gas-pressure or in the quality of the gas the delivery of a changed quantity or quality of gas at the burners, which would otherwise occur, can be prevented by proper manipulation of the valve F, so that smoking of the flame can always be prevented. When water ceases to flow through the pipe B, the piston-head *a* and spindle *b* are carried down by the weight *m*, and the valve *e* is closed, shutting off the supply of gas. The separation of the valve-chambers by an open space instead of by a partition or diaphragm, as has been done in the attempts heretofore made to construct such an apparatus, permits any water that may escape from the valve A around the spindle *b* to flow away freely instead of entering the gas-pipe, thereby choking it and putting stop to the operation of the apparatus, and at the same time provides an opportunity for the attachment of the lever and adjustable weight thereon and also enables me to use other forms of valve in the gas-pipe than the puppet-valve hereinbefore described and illustrated in Fig. 1—such, for example, as the rotary chronometer-valve illustrated in Figs. 2 and 3. In this case the lever M instead of being jointed and pivoted on the shell of the chamber A is rigid and attached directly to the stem of the gas-valve *e*, which projects horizontally through the wall of the valve-chamber. When water is drawn and the piston-head *a* and spindle *b* rise, the lever M is lifted by means of the spindle *b*, turning the valve-stem P and opening the ports of the gas-valve, and when water ceases to flow the weight *m* depresses the lever, turning the valve-stem P in the opposite direction and closing the valve.

By means of my improvements I provide a means for heating water by gas with the least possible consumption of fuel which I have proven by actual use to be practical and certain in its operation and adaptable to the various conditions to which such a heater can be subjected.

I am aware that the automatic opening of a gas-valve by means of the hydraulic pressure in a water-pipe has heretofore been suggested and employed in connection with the so-called "geyser" water-heaters. In all practicable forms of such apparatus, however, the water-supply has been controlled by a manually-operated valve located between the heating vessel and the source of supply in addition to the automatic valve in the water-pipe, and the water has been discharged freely into the heating vessel instead of passing through it under pressure. With this arrangement it is necessary to locate the heater close to the point of consumption, with the attendant disadvantages of heat and vitiated air, instead of in the basement or at any convenient part of the building remote from the point of consumption, as in my device.

The importance of my invention will be readily apparent to those skilled in the art

in which a practically-working automatic device for the purpose has long been desired, but hitherto unknown.

It is apparent that where the pressure of the water, the pressure of the gas, and the quality of the gas are not liable to change the adjustability of the valve-closing mechanism and adjustability of the gas-supply opening *h* have their principal utility in adjusting the machine to the particular circumstances of each use when it is first set up.

By the expression "normally open water-supply pipe" used in the claims I do not exclude the presence of the piston-head *a* in the valve-chamber A, which merely operates to effect the movement of the gas-valve, but only any arrangement of cocks or valves by which in the normal operation of the device the connection between the heater and the water-supply pipe will be shut off.

What I claim as new, and desire to secure by Letters Patent, is—

1. In an automatic water-heater the combination of a normally open water-supply pipe, a water-chamber in the water-pipe, a piston-head in said chamber adapted to be opened by the flow of water through the chamber and closed by gravity when the flow of water is stopped, a water-heater located in the water-pipe and arranged to be continuously filled with water, gas-burners in operative proximity to the water-heater, a gas-pipe leading to the gas-burners having an air-induction port and a manually-adjustable gas-outlet, a gas-valve chamber in the gas-pipe separated from the water-chamber by an interposed open space, a gas-valve in the gas-valve chamber, a valve-stem connecting the gas-valve with the said piston-head, a lever pivoted to the valve-stem and provided with an adjustable weight for assisting in closing the valve, and means for automatically igniting the gas at the burners, substantially as and for the purposes set forth.

2. In an automatic water-heater the combination of a normally open water-supply pipe, a water-chamber in the water-supply pipe, a piston-head in the chamber adapted to be opened by the flow of water through the chamber and closed by gravity when the flow of water is stopped, a water-heater located in the water-pipe and arranged to be continuously filled with water, gas-burners in operative proximity to the water-heater, a gas-pipe leading to the gas-burners having an air-induction port and a manually-adjustable gas-outlet, a gas-valve chamber in the gas-pipe separated from the water-chamber by an interposed open space, a gas-valve in the gas-valve chamber, a valve-stem connecting said gas-valve with said piston-head, a weight connected with said stem for assisting in closing said valve and means for automatically igniting the gas at the burners, substantially as and for the purposes set forth.

3. In an automatic water-heater the combination of a normally open water-supply



pipe, a chamber in the water-supply pipe, a  
water-heater located in the water-pipe and  
arranged to be continuously filled with water,  
gas-burners in operative proximity to the  
5 water-heater, a gas-pipe leading to the gas-  
burners, a gas-valve chamber in the gas-pipe  
in alinement with the chamber in the water-  
pipe and separated therefrom by an inter-  
posed open space, a gas-valve in the gas-valve  
10 chamber for controlling the flow of gas to the  
burners; a piston-head in the chamber in the  
water-pipe mechanically connected by a single

stem with the gas-valve and operating to  
open the gas-valve when water is drawn from  
the heater and means for automatically ig- 15  
niting the gas at the burners substantially as  
and for the purposes set forth.

In testimony whereof I have hereunto sub-  
scribed my name this 12th day of January,  
A. D. 1895.

WILLIAM C. CLARKE.

Witnesses:

SANDS F. RANDALL,  
CLARKSON A. COLLINS.