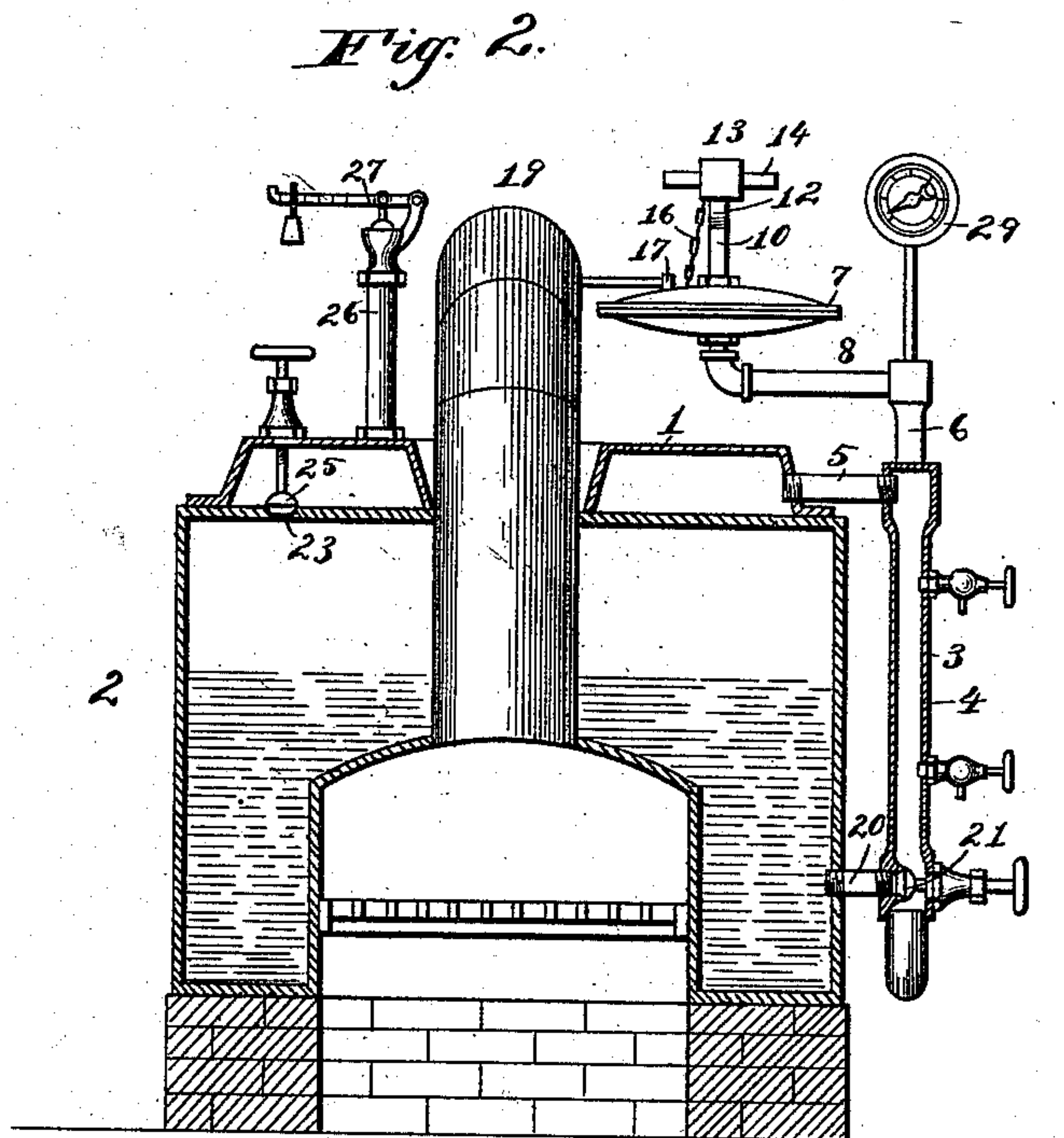
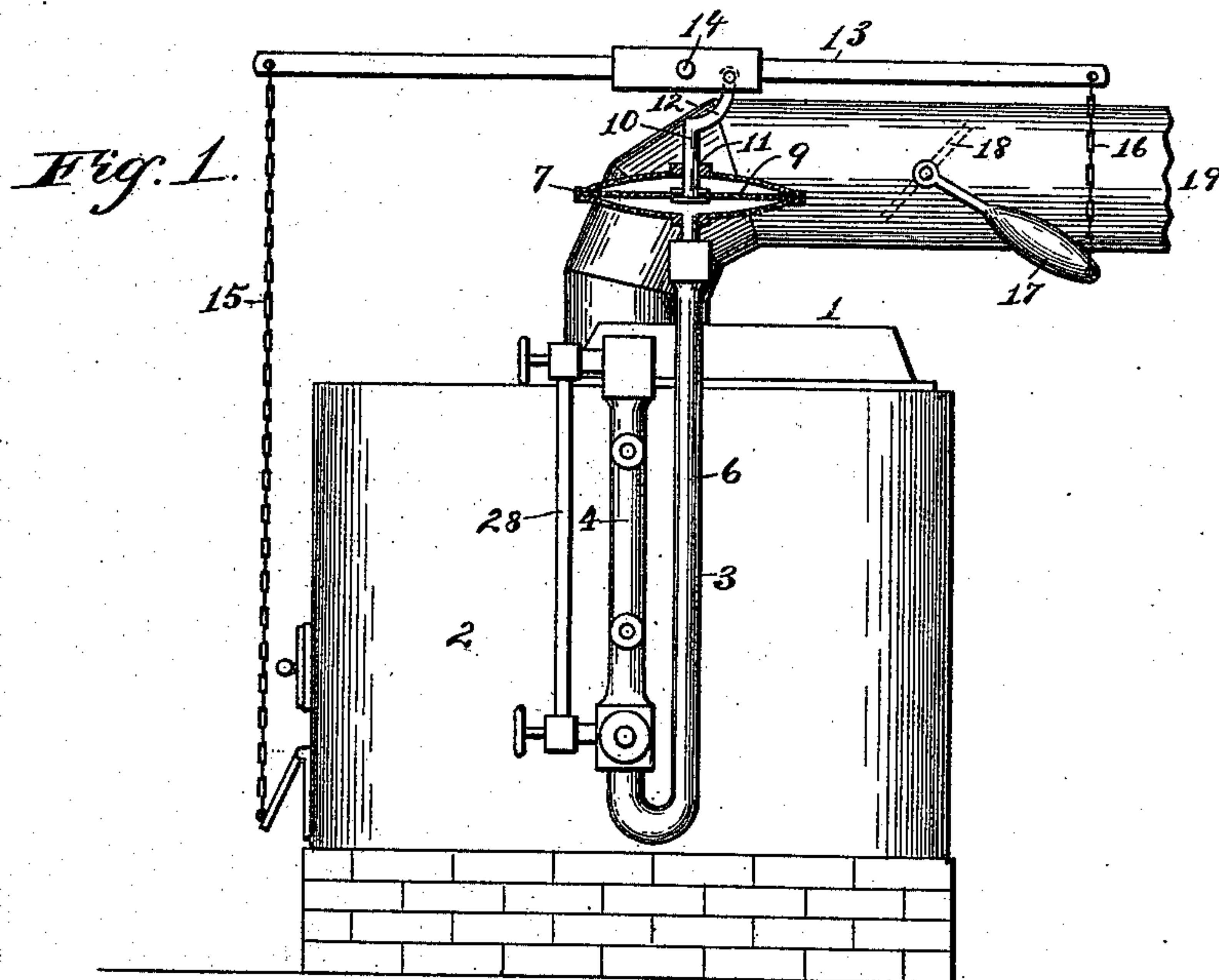


(No Model.)

W. H. PAGE.  
AUTOMATIC DRAFT REGULATOR.

No. 413,789.

Patented Oct. 29, 1889.



WITNESSES:

*Rey C. Bowen,*  
*James S. Smith.*

INVENTOR

*William H. Page*  
By *Edson Bros.*  
Attorneys



# UNITED STATES PATENT OFFICE.

WILLIAM H. PAGE, OF NORWICH, CONNECTICUT.

## AUTOMATIC DRAFT-REGULATOR.

SPECIFICATION forming part of Letters Patent No. 413,789, dated October 29, 1889.

Application filed March 14, 1889. Serial No. 303,289. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM H. PAGE, a citizen of the United States, and a resident of Norwich, in the county of New London and State of Connecticut, have invented certain new and useful Improvements in Automatic Draft-Regulators; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

In the practical use of a steam heater or boiler for heating dwellings and other structures it is sometimes customary to supply live steam to the radiators in cold weather and hot water in milder weather; and the object of my invention is to provide a draft-regulator which will automatically control the draft, whether live steam or hot water is used, and which will prevent the hot water from coming in contact with the diaphragm of the regulator, which would be liable to injure the same. With this end in view I employ a reservoir or tank which is to be nearly filled with water, and which may be located exteriorly of the shell of the boiler or heater to heat the water in the tank by contact with the shell and by radiation of the heat from the boiler. Above the tank or reservoir is arranged a diaphragm-chamber having an ordinary flexible diaphragm, with which it is connected by a vertical post or arm, and a lever that controls the opening or closing of the draft-regulating door of the boiler, and this diaphragm is operated and controlled through the medium of a siphon-column, presently described, by the liquid or fluid contents of the reservoir or tank, which, when hot water is employed as the heating medium, is prevented from coming in contact with the diaphragm to avoid injury thereto. This vertical siphon tube or column, which is employed to connect the reservoir or tank with the diaphragm-chamber, has the upper end of its shorter member connected to the reservoir, and the elevated diaphragm-chamber is connected with the corresponding end of the other member of the column, whereby, when the hot water enters and is raised in the siphon-column, the air in the longer member thereof becomes compressed and serves as a cushion between the water and the flexible

diaphragm, so as to operate the latter and keep the hot water out of direct contact with the diaphragm, as will be readily understood. The water in the reservoir or tank is heated by contact with the metallic shell of the boiler or heater, which derives its heat from the hot water contained therein, so as to maintain the water in the reservoir at the same temperature as the water in the boiler. The lower end of the siphon-column is adapted to have communication with the boiler or heater below the water-line of the latter by means of an intermediate connection, which has a valve for closing the port or opening between the siphon-column and the boiler.

To adapt the regulator for use with the boiler or heater when live steam is used, I provide the tank or reservoir with an intermediate connection with the steam-space of the boiler, and this connection has a valve whereby communication between the tank and steam-space of the boiler can be cut off when it is desired to use the regulator with a hot-water boiler. When live steam is used, the valves between the reservoir or tank and the steam-space of the boiler are opened to permit the steam in the boiler to circulate through the siphon-tube and tank or reservoir, and have access to the diaphragm-chamber to raise the diaphragm therein and close the draft-doors when the pressure of steam is excessive.

To enable others to understand my invention, I will now proceed to describe the same in connection with the accompanying drawings, in which—

Figure 1 is a side elevation showing my improved regulator applied to an ordinary boiler. Fig. 2 is a vertical sectional view on the line *x x* of Fig. 1.

Like numerals of reference denote corresponding parts in both the figures of the drawings, referring to which—

1 designates the reservoir or tank of an automatic draft-regulator embodying my invention. This tank or reservoir is preferably applied exteriorly to the shell of the boiler or heater 2 and secured thereto in any suitable manner, so that the water in the reservoir is heated by contact with the shell and by radiation of the heat therefrom; but I would have it understood that I do not restrict my-



self to this exact location and arrangement of the tank or reservoir with relation to the boiler.

3 is the siphon tube or column, which is arranged in a vertical position laterally of the boiler, and the upper extremity of the short member 4 of this siphon-column communicates with the reservoir or tank, preferably by a short pipe-connection 5, (see Fig. 2,) while to the corresponding end of the longer member 6 of the siphon-column, which member is extended above the tank or reservoir, is connected a diaphragm-chamber 7, which is located laterally of said member 6 of the siphon-tube immediately over and above the tank or reservoir 1 and communicates with the siphon-column by a horizontal pipe-connection 8. (See Fig. 2.) Within this diaphragm-chamber is secured a vibrating flexible diaphragm 9, to the center of which is secured a vertical endwise-movable stem 10, that passes centrally through a vertical opening 11 in the upper side of the diaphragm-chamber. The upper extremity of this vertical endwise-movable stem is bent or formed laterally into a short arm 12, which is pivotally connected to a horizontal lever 13, arranged immediately above the boiler and fulcrumed, as at 14, at or near its middle on a suitable fixture or support (not shown) on the boiler, the arm 12 being pivoted to the lever at a point a short distance to one side of its fulcrum. (See Fig. 1.) One end of this horizontal oscillating lever is connected by a chain 15 with the draft-door (not shown) of the boiler, while the other end of the lever is likewise connected by a chain 16 to an arm 17, secured to the damper 18, pivoted in an outlet or smoke pipe 19, that leads from the boiler or heater, as is usual. The shorter member 4 of the vertical siphon-column is connected, near its lower end, at a point close to the elbow between the long and short members of the siphon-column, with the water-space of the boiler or heater by a short pipe-connection 20, by means of which the water in the boiler or heater can enter the siphon-column and ascend therein to the level of the water-line in the boiler, the height of the water in the siphon-column being indicated by a gage, as hereinafter described. A valve 21 is provided in the connection 20, between the lower end of the siphon-tube and the water-space of the boiler, by closing which communication between said boiler and siphon-column can be cut off.

Between the steam-space of the boiler or heater and that end or portion of the tank or reservoir most remote from the connection between the reservoir and the siphon-column I provide a connection or port 23, whereby steam may be admitted to the tank or reservoir when the valve 25 is opened and it is desired to regulate the draft door and damper by excessive pressure of the steam in the apparatus.

To the reservoir or tank is connected a ver-

tical pipe 26, which communicates at its lower end with the chamber of the reservoir, and has a safety-valve 27, of any preferred or ordinary construction, at its upper end, by means of which excessive steam or water pressure in the reservoir or tank can be relieved. The siphon-column has an ordinary gage 28, connected to its short member 4, by means of which the height of the water in the boiler can be ascertained when the live steam is supplied to the radiators. A steam-gage 29 is connected to the upper extremity of the longer member 6 of the siphon-column for readily ascertaining the pressure of steam in the boiler.

In operation, when it is desired to use hot water for operating the regulator and to heat the same in the tank or reservoir by contact with the shell of the boiler and without allowing the hot water in the boiler to commingle with and displace the water contained in the reservoir, both valves 21 and 25, between the steam and water spaces of the boiler and the tank and siphon-column, are closed, as indicated in Fig. 2; and when the water in the reservoir or tank is expanded by the excessive heat of the boiler it rises in the siphon-tube or column, so as to compress the air between the column of water and the diaphragm and to forcibly press the intervening body of air against the diaphragm, and thus cause the same to serve as a cushion and raise the diaphragm sufficiently to tilt the lever on its fulcrum and close the draft-door and damper proportionately to the movement of the lever, whereby the draft through the boiler is decreased and regulated. It is obvious that the chains between the lever and the draft-door and damper can be lengthened or shortened according to the temperature of the water, if it is desired to close or open the door and damper. Thus if it is desired to close the door and damper at a low temperature of the water in the tank or reservoir the chains can be suitably lengthened, a device being provided for this purpose, which, however, I have not deemed it necessary to illustrate nor describe. When live steam is supplied from the boiler to the radiators, the water is withdrawn from the tank or reservoir and steam allowed to circulate from the boiler through the port 23, the reservoir, and the siphon-column, so that any excess of steam-pressure will operate to move the diaphragm, and thus properly regulate the draft-dampers, as is obvious. It is oftentimes desirable, when the temperature or weather undergoes a change, to return to the use of live steam as the heating medium for the radiators in lieu of hot water, and I have adapted my improved regulator so that any change of the heating medium will not affect the regulator, and, in fact, it is equally adapted as well to hot water as to live steam as the heating medium. When it is desired to effect this change, the valves 25 and 21 are both opened to draw the water in the siphon-column down



to the level of the water in the boiler, and as the siphon-column communicates directly with the boiler it follows that the water in the column is of the same temperature as the water in the boiler, and that in a very short time steam will accumulate in the siphon-column, and thus the pressure of steam in both members of the siphon-column will remain practically the same. Excessive pressure of steam in the tank and siphon-column will operate to elevate the vibratory diaphragm, which in turn will tilt the lever and adjust the regulating-dampers, according to the movement of the diaphragm. Any excessive pressure of steam which would be liable to disrupture the tank or boiler is permitted to escape through the escape-valve. For hot-water circulation the boiler and the radiators (not shown) are filled with water and the valves 21 and 25 between the boiler and the reservoir and siphon-column are closed. The reservoir or tank and the siphon-column are now filled with water by removing the safety-valve to permit the introduction of water into the tank, after which the valve is replaced. It is obvious that as the water in the boiler is heated the water in the reservoir is correspondingly heated to the same temperature, and that when it is expanded by the excessive high temperature of the furnace in the boiler the water presses against the diaphragm to operate the lever and the draft-door and damper; and, further, that when the bulk of the water in the reservoir is increased by expansion beyond the capacity of the reservoir for holding the water the surplus quantity is forced up the vertical tube and permitted to escape through the safety-valve.

I am aware that changes in the form and proportion of parts and details of construction can be of the mechanisms herein shown and described as an embodiment of my invention without departing from the spirit or sacrificing the advantages thereof, and I would therefore have it understood that I reserve the right to make such changes and alterations as fairly fall within the scope of my invention.

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

1. In an automatic draft-regulator, the combination of an exterior tank or reservoir, an

elevated diaphragm-chamber above the tank, a vertical siphon-column located exteriorly of the heater or boiler and having its shorter member communicating directly with the tank or reservoir and its longer member with the diaphragm-chamber, substantially as described, and mechanism connected to the diaphragm for controlling the regulating-dampers of the boiler, all arranged and combined for service as herein shown and described, for the purpose set forth.

2. In an automatic draft-regulator, the combination of an exterior reservoir or tank, a vertical column or tube communicating with the reservoir and having a valved connection with the water-space of a boiler, and a diaphragm adapted to be operated by an excessive pressure of the fluid contents of the vertical column or tube to control the draft-door of the boiler, substantially as and for the purpose described.

3. In an automatic draft-regulator, the combination of an exterior tank applied laterally to a boiler, a vertical siphon-column arranged laterally of a boiler and one of its members having a valve-connection at its lower end with the water-space of said boiler and communicating at its upper end with the reservoir or tank, an elevated diaphragm-chamber communicating with the upper end of the longer member of the siphon-column, and mechanism connected with the diaphragm for controlling the movement of the draft-door, substantially as and for the purpose described.

4. In an automatic draft-regulator, the combination of an exterior reservoir or tank having a valved connection with the steam-space of a boiler, a vertical siphon-column having its shorter member communicating with the reservoir and by a valved connection with the boiler, an elevated diaphragm-chamber communicating with the upper end of the longer member of the siphon-column, and mechanism connected with the diaphragm for controlling the movement of the draft-door, substantially as described.

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

WILLIAM H. PAGE.

Witnesses:

JOS. FORREST,  
H. I. BERNHARD.