E. BERGE.

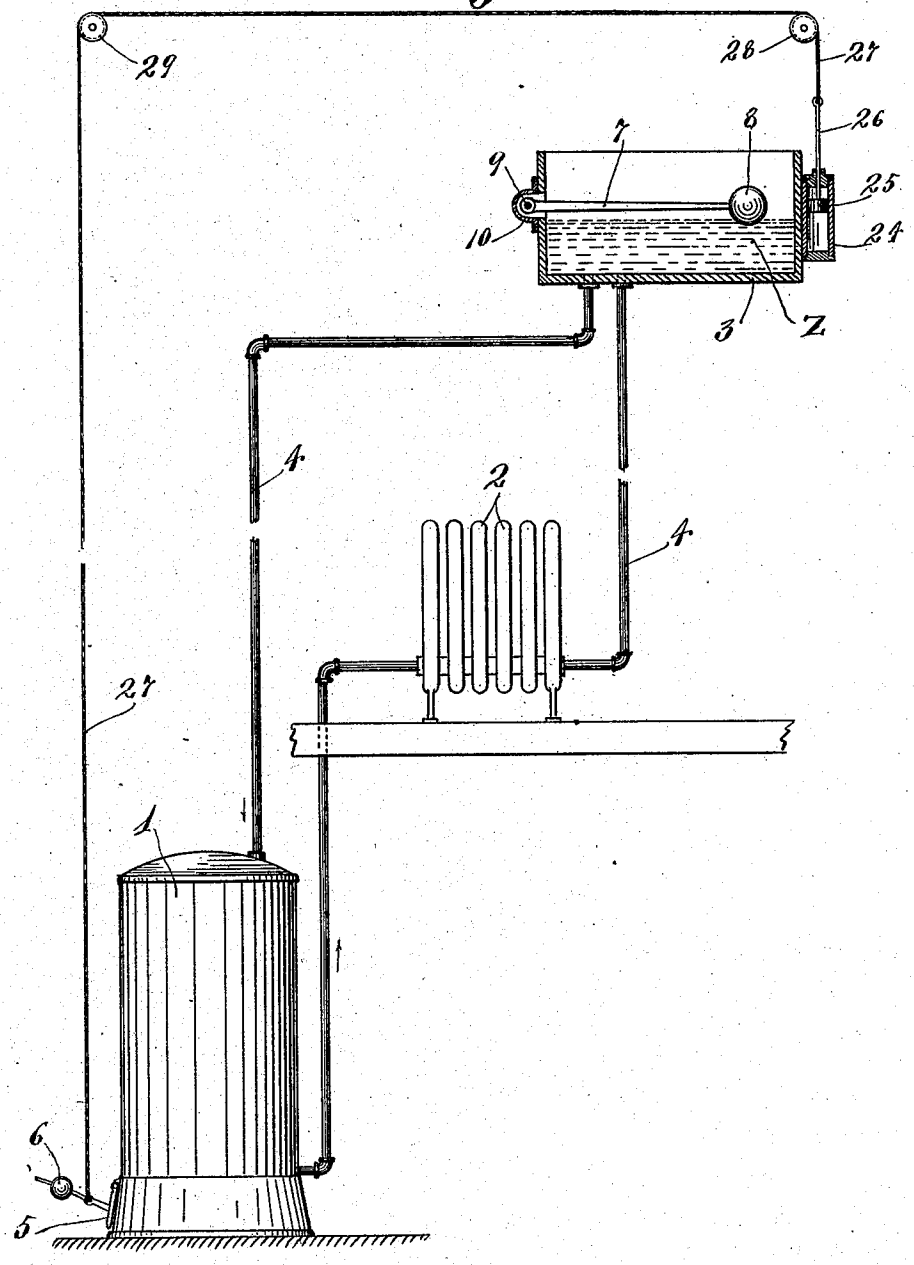
AUTOMATIC DRAFT REGULATOR FOR HOT WATER HEATING SYSTEMS.

APPLICATION FILED APR. 10, 1908.

**905,139.** Patented Dec. 1, 1908.

*Fig. 1.*

2 SHEETS—SHEET 1.




Witnesses.
A. H. Opsahl.
W. H. Souba.

Inventor.
Erick Berge.
By his Attorneys
Williamson Otterbach

THE NORRIS PETERS CO., WASHINGTON, D. C.

E. BERGE.

AUTOMATIC DRAFT REGULATOR FOR HOT WATER HEATING SYSTEMS.

APPLICATION FILED APR. 10, 1908.

**905,139.** Patented Dec. 1, 1908.

2 SHEETS—SHEET 2.

*Fig. 2*

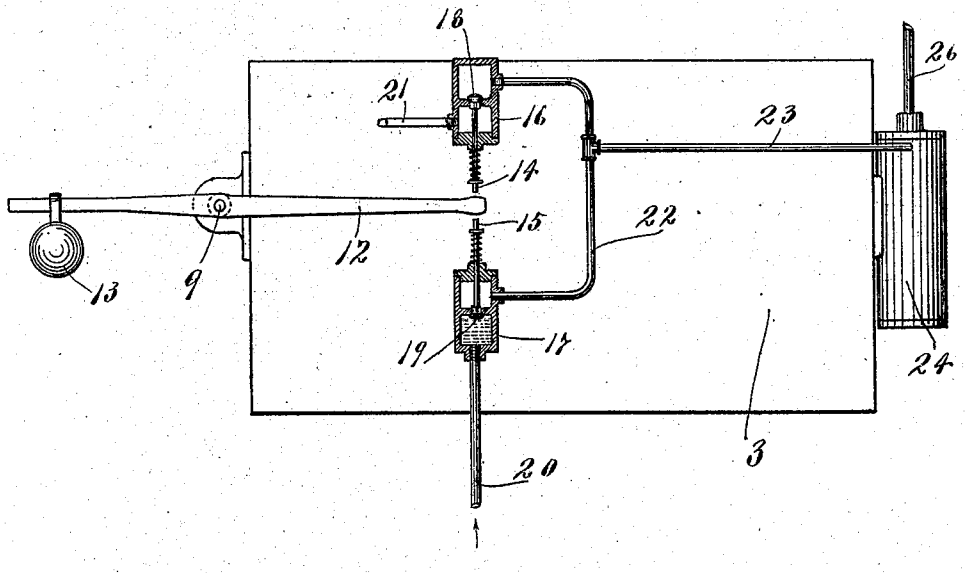
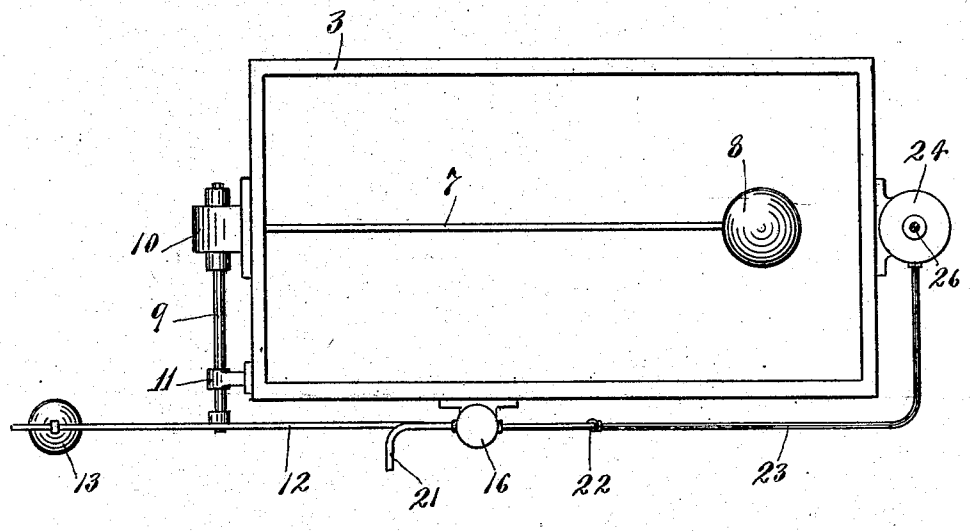



*Fig. 3.*




Witnesses.
A. H. Opsahl.
W. H. Souba.

Inventor
Erick Berge
By his Attorneys
Williamson Merchant

THE NORRIS PETERS CO., WASHINGTON, D. C.

# UNITED STATES PATENT OFFICE.

ERICK BERGE, OF MINNEAPOLIS, MINNESOTA.

## AUTOMATIC DRAFT-REGULATOR FOR HOT-WATER HEATING SYSTEMS.

No. 905,139. Specification of Letters Patent. Patented Dec. 1, 1908.

Application filed April 10, 1908. Serial No. 426,255.

*To all whom it may concern:*

Be it known that I, ERICK BERGE, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Automatic Draft-Regulators for Hot-Water Heating Systems; 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.

My invention has for its object to provide an improved regulator for controlling the draft in boilers of hot water heating systems; and to this end it consists of the novel devices and combinations of devices hereinafter described and defined in the claim.

The invention is illustrated in the accompanying drawings, wherein like characters indicate like parts throughout the several views.

Referring to the drawings, Figure 1 is a view chiefly in side elevation, but with some parts sectioned and some parts broken away, illustrating my improved draft regulator applied to a hot water heating system. Fig. 2 is a side elevation, showing on a larger scale than in Fig. 1 my improved regulator applied to the expansion tank of a hot water heating system; and Fig. 3 is a plan view of the parts shown in Fig. 2.

Of the parts of the hot water heating system, the numeral 1 indicates the boiler, the numeral 2 the radiator, the numeral 3 the expansion tank, and the numeral 4 the circulating pipes, all of which may be of the usual or any suitable construction. The boiler 1 is provided with the usual draft regulating damper or door 5, which, as shown, has a weighted arm 6 that normally tends to hold the same closed.

In accordance with my invention, I provide within the expansion tank 3 an arm 7, which, at its free end, carries a float, preferably in the form of a hollow metal ball 8. This arm 7 is secured to a shaft 9 that is pivotally mounted in a hollow bearing 10 secured to one side of the tank 3. The shaft 9 projects through a suitable stuffing box or other tight joint in one side of the bearing 10, and its extended end is journaled in a bearing 11 also secured to the tank 3. At its extreme outer end the shaft 9 is rigidly secured to the intermediate portion of a lever or two-ended arm 12, upon one end of which lever a counter-balancing weight 13 is adjustably hung. This weight 13 should be so set that it will partly, but not entirely, support the weight of the float 8, but will leave the said float free to float upon the surface of the water Z contained in the expansion tank. The other end of the lever 12 is adapted to alternately engage with the projecting ends of spring-pressed valve stems 14 and 15, the former of which extends upward therefrom into a valve casing 16, and the latter of which projects downward therefrom into a valve casing 17, both of which valve casings, as shown, are rigidly secured to one side of the expansion tank. The valve stem 14, at its upper end, is provided with a check valve 18 that normally closes a passage formed in the central partition of the casing 16; and likewise, the valve stem 15 is provided in its lower end with a check valve 19 that normally closes a passage in the central partition of the valve casing 17.

A water supply pipe 20 leads from a suitable source of water supply, under pressure, such as a city water main or an elevated tank, which is independent of the expansion tank 3 and opens into the lower compartment of the casing 17. An exhaust pipe 21 leads from the lower compartment of the upper casing 16 to a suitable point of discharge. The upper compartments of the two casings 16 and 17 are connected by a pipe 22 and this pipe 22 is connected by a pipe 23, to the upper portion of a cylinder 24, shown as rigidly secured to one end of the expansion tank. Working in the cylinder 24 is a piston 25, the stem 26 of which works upward through the upper end of said cylinder and is connected by a cable or other flexible connection 27 to the weighted arm 6 of the draft controlling damper 5. This cable 27, as shown, runs over guide sheaves 28 and 29 mounted on suitable supports (not shown).

Operation. The operation of the improved regulator above described is substantially as follows: It is a well known fact that when the water in the heating system is heated to a relatively high degree it will expand and raise the altitude of the water in the expansion tank, and that when the water is at a relatively low temperature it will contract and lower the altitude of the water in said expansion tank. When the altitude of the water in the expansion tank is lowered, by the cooling of the water in the heat-

ing system, the float 8 will lower and will cause the lever 12 to engage the valve stem 15 and press the valve 19 into an open position, thereby permitting water to flow from the supply pipe 20 through the casing 17 and pipes 22 and 23 into the upper end of the cylinder 24. The water thus admitted into the upper end of the said cylinder, under pressure, will force downward the piston 25 and, through the cable 27, will open the draft controlling damper 5 and thereby cause increased combustion in the fire box of the boiler. This increased combustion in the fire box will raise the temperature of the water, and the resulting expansion thereof will raise the altitude of the water in the expansion tank and cause the float 8 to rise. This movement of the float will cause the lever 12 to press against the valve stem 14 and raise the valve 18 into an open position, while the lower check valve 19 will, of course, be closed by the tension of its spring. When the supply of water under pressure to the cylinder 24 is thus cut off and the valve 18 is opened, the force of the weighted arm 6 will move the piston 25 upward to its normal position, thereby exhausting the water from the upper end of the cylinder, through the pipes 23 and 22, the casing 16 and exhaust pipe 21. In this way the draft controlling damper 5 is automatically opened and closed at the proper times to maintain the desired temperature.

The cylinder 24 and piston 25 constitute broadly what may be designated as a reciprocating water motor, the movable member of which is adapted to be reciprocated by a supply of water controlled by the reversely acting admission and exhaust valves.

What I claim is:

The combination with a hot water heating system, having an expansion tank and a draft controlling damper, of a draft regulating device comprising a cylinder and piston, a connection between said cylinder and said damper for opening and closing the latter, water supply and exhaust pipes connected to said cylinder, normally closed valves in said supply and exhaust pipes, a float subject to the water in said expansion tank, and an arm at the exterior of said tank connected to said float and arranged to open said valves in alternate order under upward and downward movements of said float, substantially as described.

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

ERICK BERGE.

Witnesses:
MALIE HOEL,
H. D. KILGORE.