No. 657,891. Patented Sept. 11, 1900.

J. A. DONNELLY.

FITTING FOR STEAM HEATING APPARATUS.

(Application filed July 17, 1900.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 2.

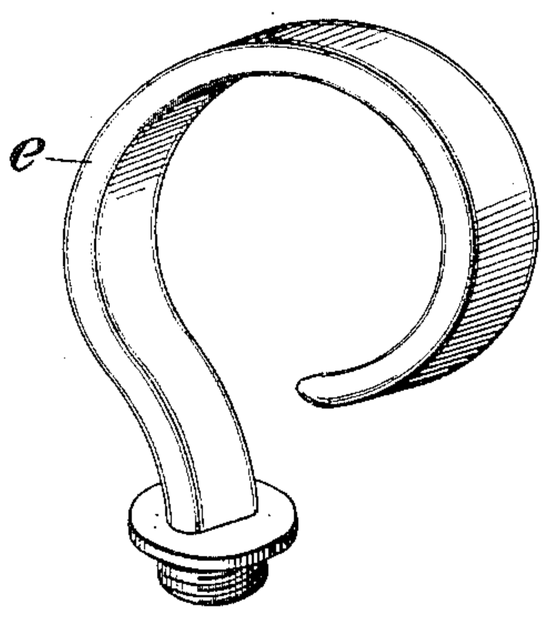


Fig. 4.

Fig. 1.

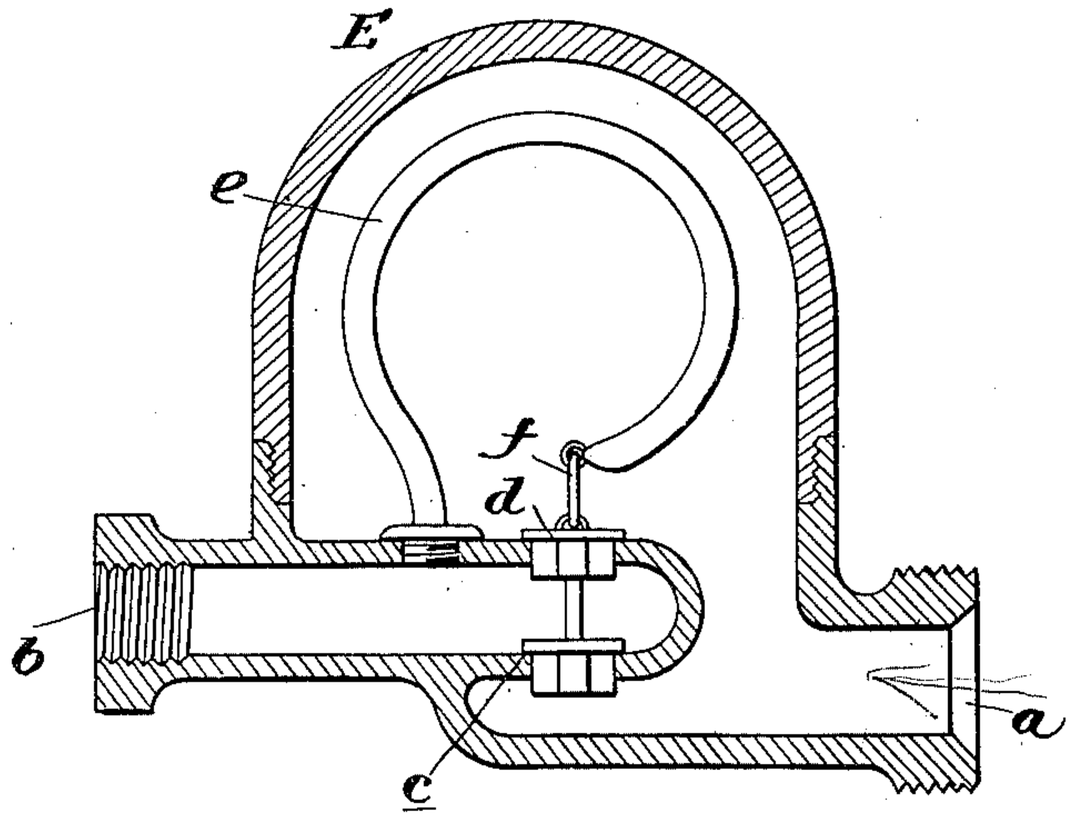
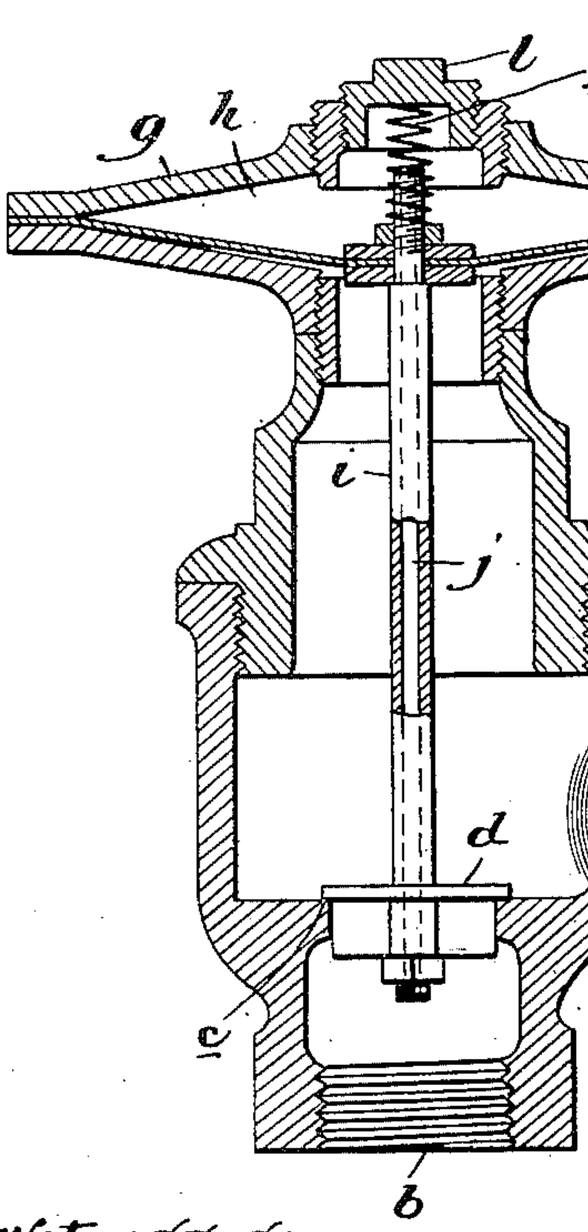
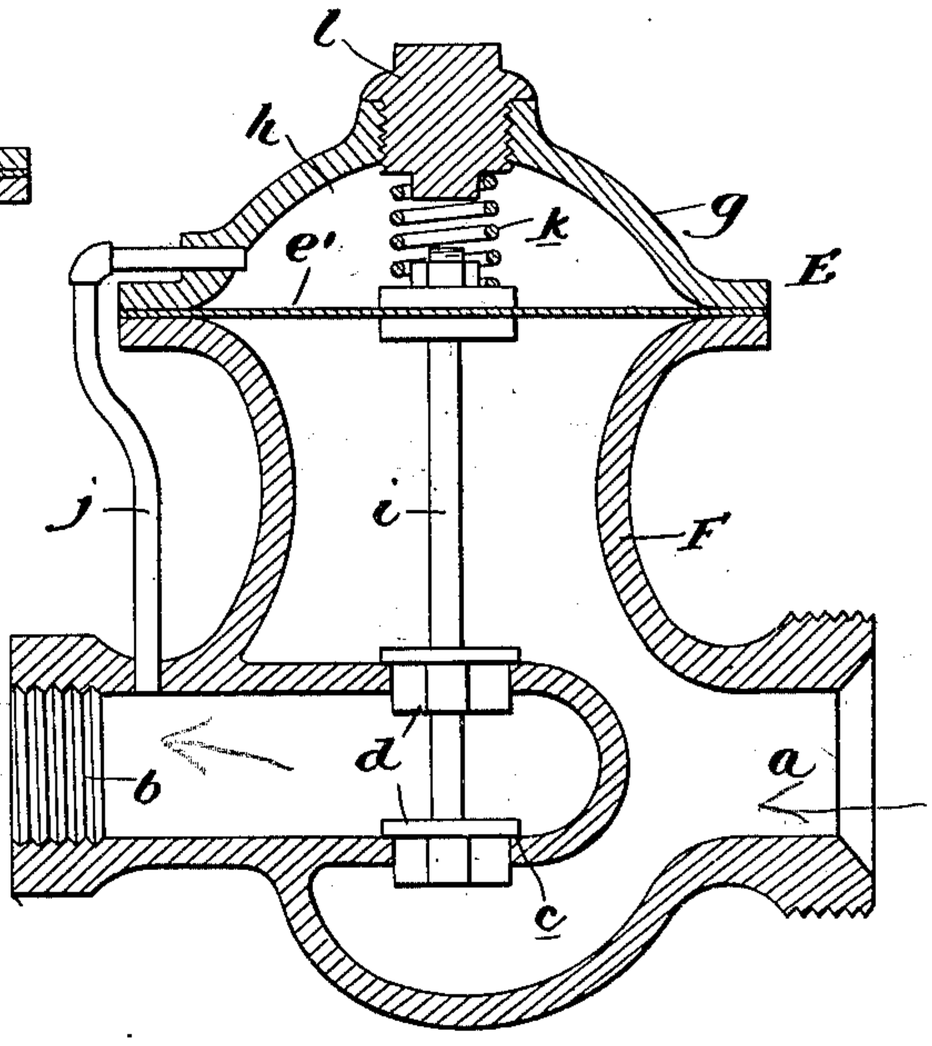


Fig. 3.





Witnesses:
H. B. Hallock.
R. M. Kelly

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James A Donnelly
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Atty.

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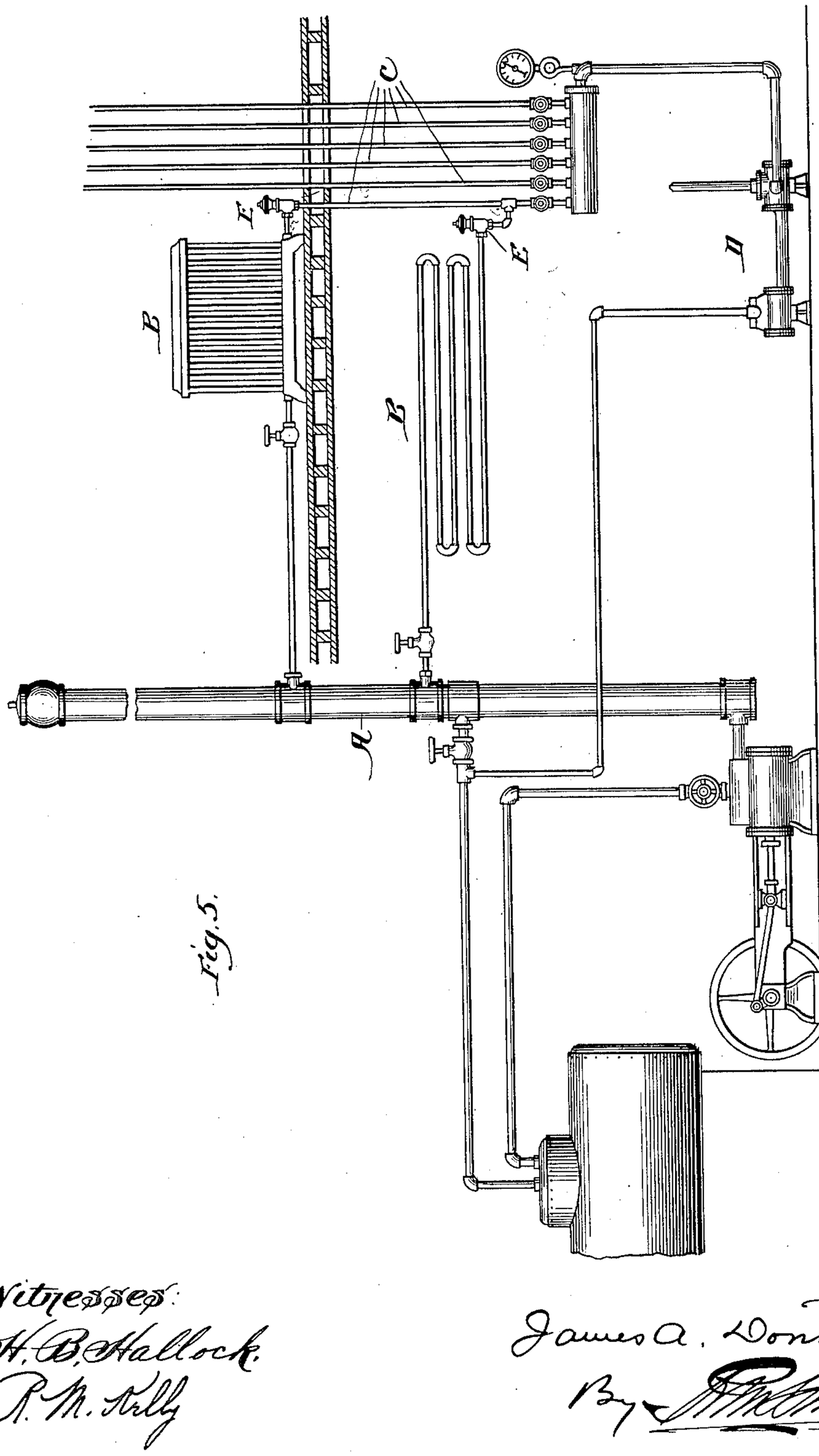

Fig. 5.

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UNITED STATES PATENT OFFICE.

JAMES A. DONNELLY, OF NEW YORK, N. Y.

FITTING FOR STEAM HEATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 657,891, dated September 11, 1900.

Application filed July 17, 1900. Serial No. 23,869. (No model.)

To all whom it may concern:

Be it known that I, JAMES A. DONNELLY, of New York, borough of Brooklyn, Kings county, State of New York, have invented an Improvement in Fittings for Steam Heating Apparatus, of which the following is a specification.

My invention relates to fittings for steam heating apparatus; and it consists of the improvements which are fully set forth in the following specification and are shown in the accompanying drawings.

It is the object of my invention to provide a fitting or valve device for steam heating apparatus adapted to automatically control the discharge of air and water of condensation from the heaters, coils, or other radiating devices and to prevent the uncondensed vapors, steam, air, or water of condensation being drawn back into the radiating device from the return when for any cause the pressure in the radiating device falls below that in the return.

In carrying out my invention I employ a valve-actuating device controlled by the difference in pressure in the return or outlet side of the valve and in the radiating device or inlet side, whereby the valve will be automatically actuated under variations in the relative pressures to open or close to a greater or less extent, as the existing conditions require. By so arranging this device that the valve will be closed when the pressure on the inlet side or radiator is lower than on the outlet side or return the suction of the air, vapors, or water of condensation back into the radiating device will be prevented.

In the accompanying drawings, Figure 1 is a vertical sectional view of one form of my automatic valve device for controlling the outlet from the radiators, &c. Fig. 2 is a perspective view of a portion thereof. Fig. 3 is a vertical sectional view of another form of my automatic valve device. Fig. 4 is a similar view of a still different form; and Fig. 5 is a vertical sectional view of a steam heating apparatus, showing the application of my improved fitting thereto.

A is any source of steam-supply, such as the exhaust-pipe of an engine.

B B are radiating devices—such as radiators, coils, &c.—communicating with the source of steam-supply A in the usual manner.

C C C are the returns from the radiating devices.

D is a vacuum-pump or other exhausting apparatus connected with the returns and adapted to create a partial vacuum or lower pressure therein.

E E are the automatic valves, located in the outlets of the radiating devices or at any other suitable place in the return portion of the system between the outlets of the radiating devices and the pump. These automatic valve devices contain a valve-piece to control the valve passage-way and an actuating pressure-motor device controlled by the pressures on the inlet and outlet sides of the valve and operated by the difference in said pressures. This device is so arranged that the valve-piece will be opened by an excess of pressure on the inlet side and will be closed by a deficiency of pressure therein.

F is the valve-body, having the usual inlet *a* and outlet *b*, with the thoroughfare or passage-way *c*, controlled by the valve-piece *d*.

In the construction shown in Fig. 1 the actuating pressure-motor *e* for operating the valve-piece *d* is the well-known Bourdon spring, consisting of a coiled and flattened tube closed at the outer end and arranged within a chamber of the valve-body in communication with the inlet *a*, with its interior in communication with the outlet *b*. The free closed end of the tube *e* is connected with the valve-piece *d* by a link *f*. According to the well-known operation of the Bourdon spring when the external pressure is greater than the internal pressure the tube will tend to flatten and coil, and this will result in the lifting of the valve-piece *d* and the opening of the passage-way *c*. When the external pressure is less than the internal pressure, the tube will tend to straighten, and this will close the valve-piece *d* tightly upon its seat.

In the construction shown in Fig. 3 the motor consists of a flexible diaphragm *e'*, stretched across the upper part of the valve between the body F and a cap *g* and forming

a closed motor-chamber *h*, which communicates with the outlet side of the valve through a duct or tube *j*. The diaphragm *e'* is connected with the valve-piece *d* by a stem *i*.

The construction shown in Fig. 4 is similar to that of Fig. 3, except that the duct *j* is formed through the stem *i*.

A small spring *k*, bearing upon the diaphragm, (the tension of which may be adjusted by a nut *l*,) may be employed to increase the internal tension on the diaphragm, and thus to regulate the differential in the internal and external pressures at which the valve will operate.

Supposing the valve device to be interposed between a radiator-outlet and the return, as shown in Fig. 5, with the motor adjusted for the desired differential, any increase in pressure in the radiator or inlet *a* beyond that differential will act to open the valve and maintain it open until the differential is restored. Thus the excess pressure in the radiator will be relieved. The opening of the valve *d* and the relief of the excess pressure from the inlet *a* into the outlet *b* tends to raise the internal pressure on the motor and close the valve, and where steam, air, or uncondensed vapors are passing this restoration of the differential will take place quickly and the valve will not remain open for sufficient length of time to result in any material waste of steam, as would occur with a static or permanently-adjusted valve. If, however, water of condensation is passing, the tendency to raise the internal pressure on the outlet side is not so great, and the valve will remain open sufficiently long to enable the water of condensation to escape. If for any reason the pressure in the radiator falls below that in the return—as, for instance, where a radiator is shut off and condensation occurs within it—the higher internal pressure in the motor will tend to force the valve tightly upon its seat and will maintain it closed until an excess pressure is again present in the radiator. Thus the drawing back of steam, air, or water of condensation from the returns into the radiator is effectively prevented. Another advantage of this operation of the valve-piece is that it automatically keeps the valve clean and prevents it from being clogged by particles of foreign matter. If any such particles adhere to the valve-seat, the tight closing of the valve-piece produced by the lower pressure on the inlet side acts to crush them, so that when the valve is again opened they are washed away and carried off by the water of condensation or steam.

I have shown my invention embodied in an apparatus in which a partial vacuum is maintained in the returns by means of an exhausting device or pump connected therewith; but it may be employed with a pressure system in which no exhausting devices are employed. It is apparent that in either case the valve device will be effective in automatically opening the outlet-valves under the variation in the relative pressures on the inlet and outlet sides. In a system in which a partial vacuum or lower pressure is maintained on the outlet side the valve device, while automatically controlling the outlet, also tends to maintain the desired low pressure in the radiating device.

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

1. In an automatic valve device for steam heating apparatus, the combination of a valve-body having a thoroughfare, a valve-piece to control said thoroughfare, and a pressure-motor for controlling said valve-piece communicating with the valve-body on the outlet side beyond the thoroughfare and controlled by the pressure on the said outlet side.

2. In an automatic valve device for steam heating apparatus, the combination of a valve-body having a thoroughfare, a valve-piece to control said thoroughfare, and means within the valve-body controlled by the pressure on the outlet side of said thoroughfare to control said valve-piece.

3. In an automatic valve device for steam heating apparatus, the combination with the valve-piece, of a pressure-actuated diaphragm for operating said valve-piece, and a duct leading to said diaphragm from the outlet side of the valve device, whereby the operation of said diaphragm and valve-piece is controlled by the pressure on the outlet side.

4. In an automatic valve device for steam heating apparatus, the combination of a valve-body having a thoroughfare, a valve-piece for controlling said thoroughfare, a pressure-actuated diaphragm for controlling said valve-piece, and a tube connecting said diaphragm and valve-piece and forming a communication between the inner side of said diaphragm and the outlet side of the valve-body.

5. In an automatic valve device for steam heating apparatus, the combination of a valve-body, a valve-piece to control the passage through said valve-body, a flexible diaphragm in the upper part of the valve-body forming a closed chamber, a connection between said diaphragm and valve-piece, and a duct between the chamber formed by said diaphragm and the outlet side of the valve-body beyond the valve-piece, whereby the operation of said diaphragm and valve-piece is controlled by the pressure on the outlet side of the valve-body.

6. In an automatic valve device for steam heating apparatus, the combination of a valve-body having a thoroughfare, a valve-piece to control said thoroughfare, and a pressure-motor controlling said valve-piece having one side in communication with the inlet side of said valve-piece and the other side in communication with the outlet side thereof.

7. In an automatic valve device for steam

heating apparatus, the combination of a valve-body having a thoroughfare, a valve-piece to control said thoroughfare, a pressure-motor controlling said valve-piece having one side in communication with the inlet side of said valve-piece and the other side in communication with the outlet side thereof, and means acting on said pressure-motor to control its movements under the action of the relative pressures on the inlet and outlet sides.

In testimony of which invention I have hereunto set my hand.

JAMES A. DONNELLY.

Witnesses:
JOHN A. SERRELL,
NETTIE CAMPBELL.