No. 778,015.

PATENTED DEC. 20, 1904.

J. A. & W. T. DONNELLY.

AUTOMATIC VALVE FOR STEAM HEATING APPARATUS.

APPLICATION FILED NOV. 25, 1903.

NO MODEL.

2 SHEETS—SHEET 1.

Fig. 1.

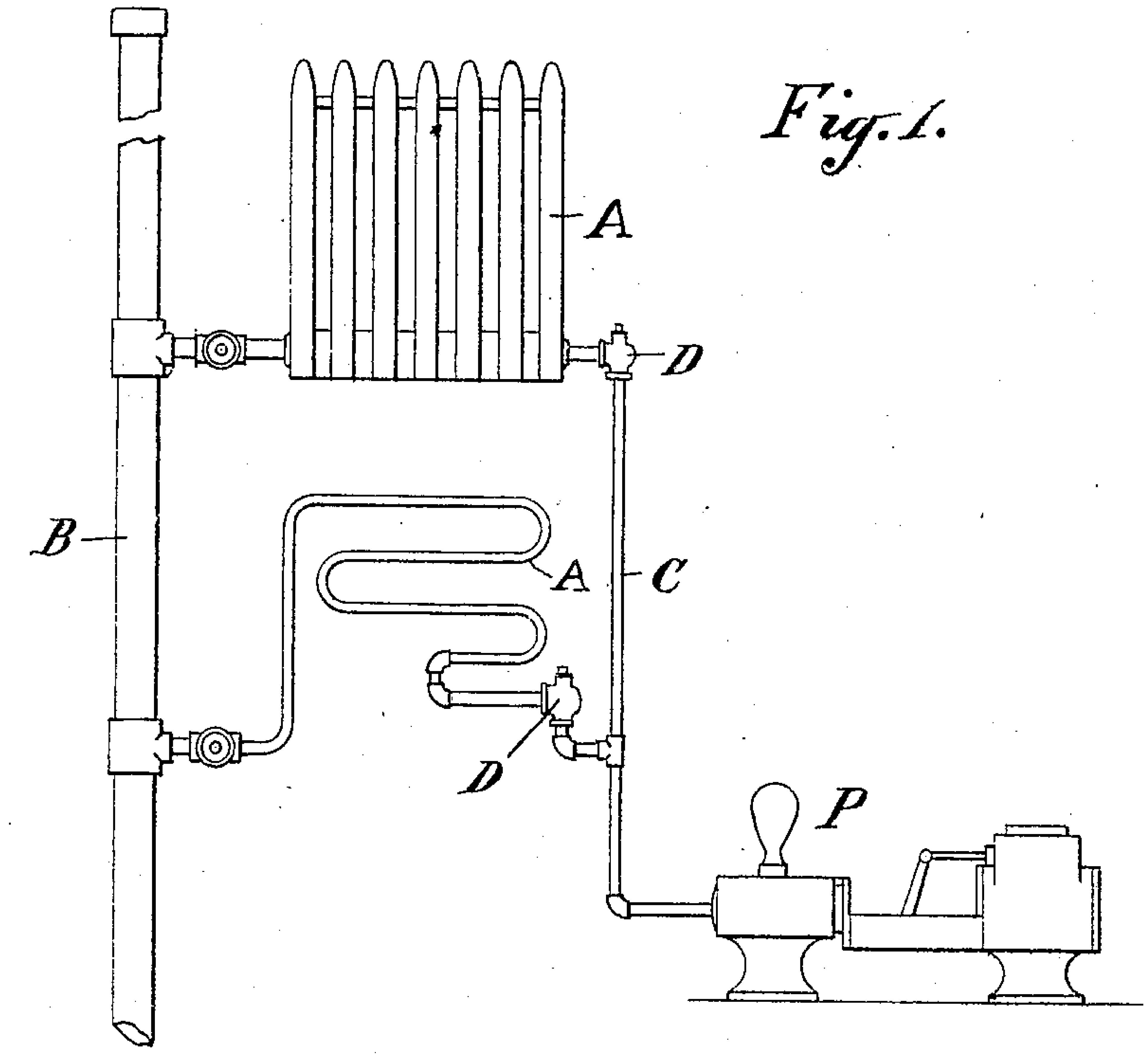
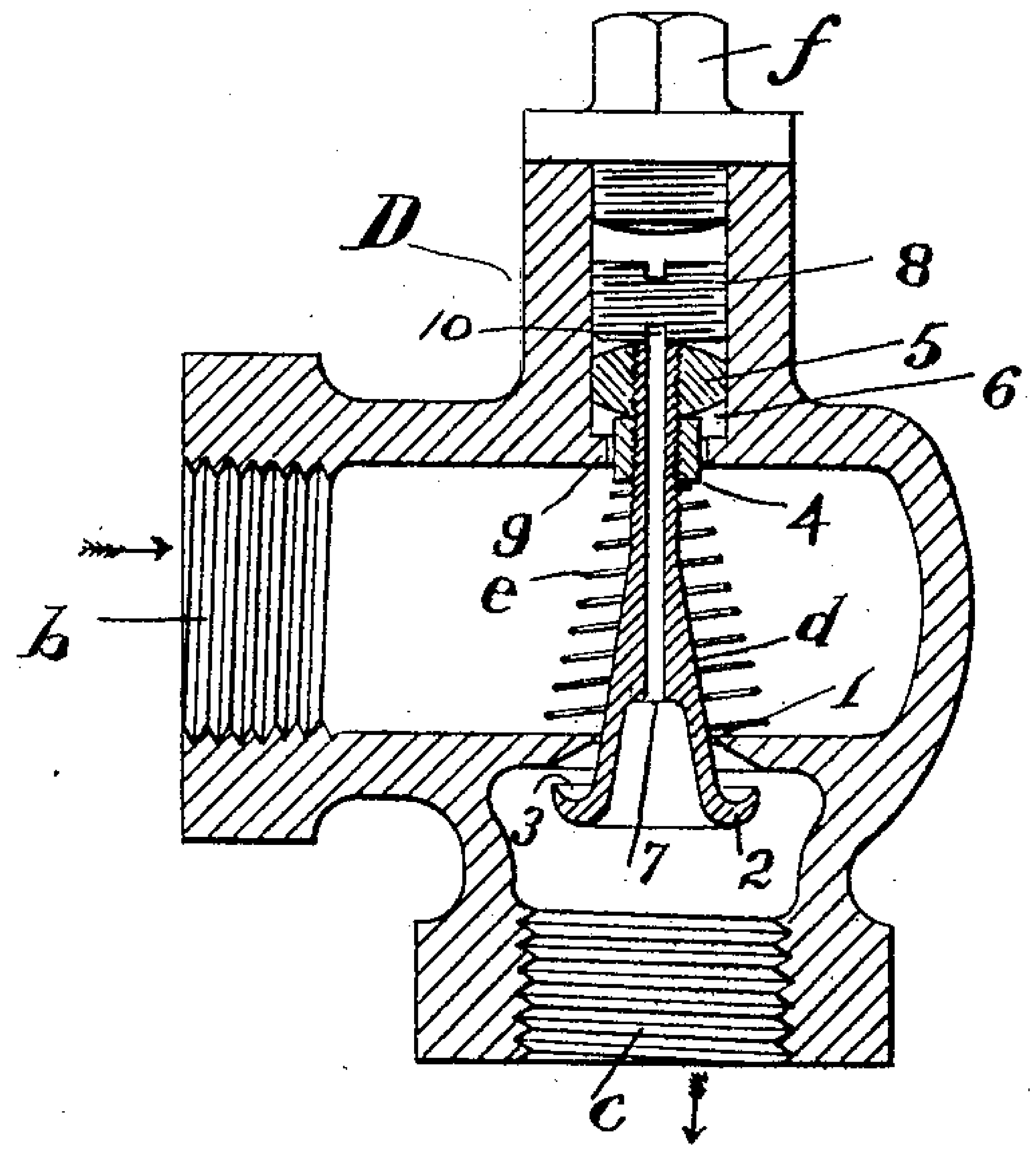


Fig. 2.



WITNESSES:

Geo W Eisenbrauer
Raena H. Yudizky.

INVENTORS:

James A. Donnelly.
William T. Donnelly
BY
A Faber du Faur Jr.
ATTORNEY.

No. 778,015. PATENTED DEC. 20, 1904.

J. A. & W. T. DONNELLY.

AUTOMATIC VALVE FOR STEAM HEATING APPARATUS.

APPLICATION FILED NOV. 25, 1903.

NO MODEL. 2 SHEETS—SHEET 2.

Fig. 4.

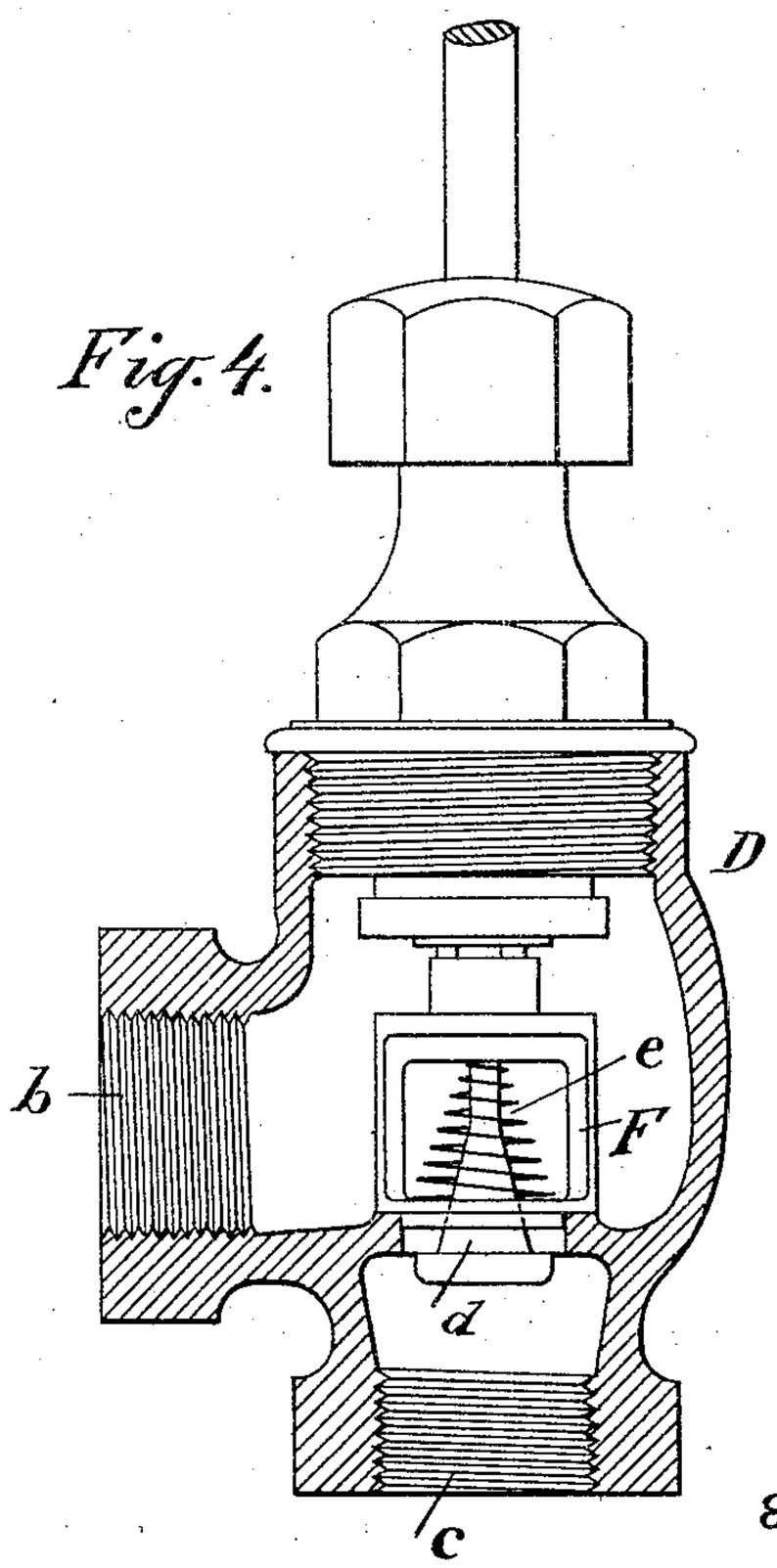


Fig. 5.

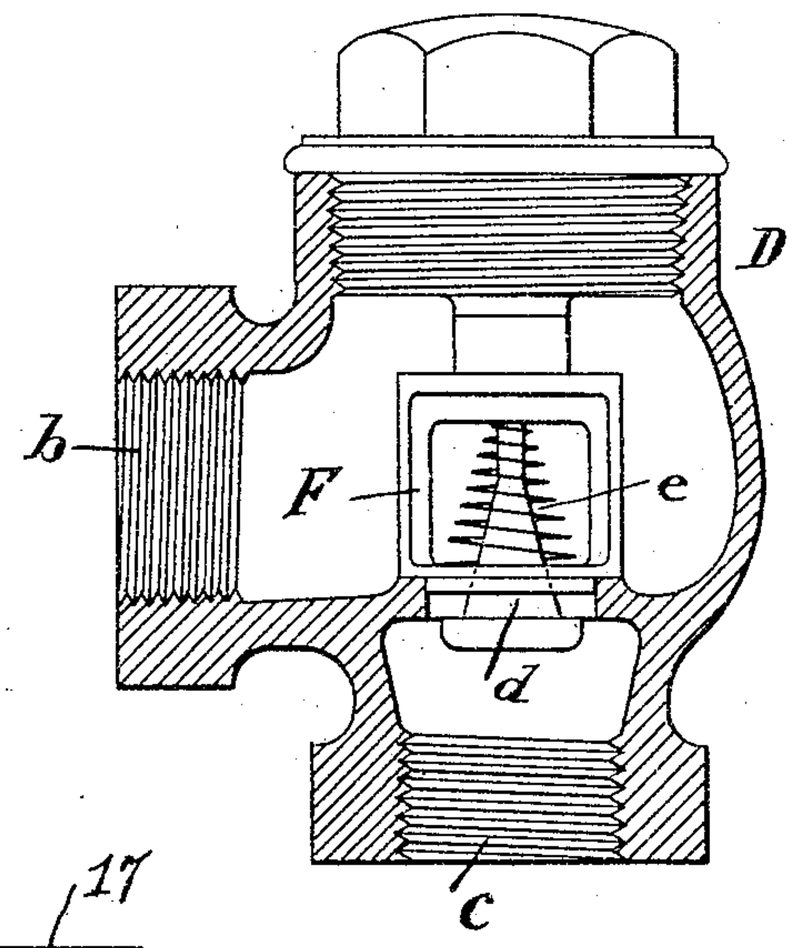
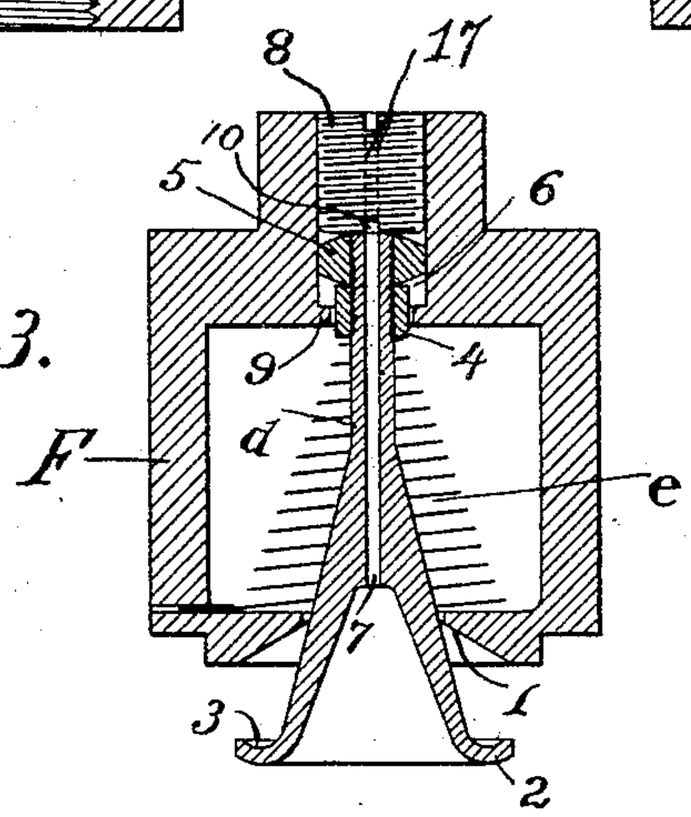


Fig. 3.



WITNESSES:
Geo. W. Eisenbrandt
Raena M. Yudisky.

INVENTORS:
James A. Donnelly
William T. Donnelly.
BY
A. Faber du Faur Jr.
ATTORNEY.

No. 778,015. Patented December 20, 1904.

UNITED STATES PATENT OFFICE.

JAMES A. DONNELLY AND WILLIAM T. DONNELLY, OF NEW YORK, N. Y.

AUTOMATIC VALVE FOR STEAM-HEATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 778,015, dated December 20, 1904.

Application filed November 25, 1903. Serial No. 182,588.

To all whom it may concern:

Be it known that we, JAMES A. DONNELLY and WILLIAM T. DONNELLY, citizens of the United States, residing at New York, in the county of Kings and State of New York, have invented certain new and useful Improvements in Automatic Valves for Steam-Heating Apparatus, of which the following is a specification.

Our invention has reference to improvements in automatic valves of that type particularly adapted for use on the return or outlet sides of radiating devices for the purpose of controlling the discharge of air and the water of condensation from the heaters, coils, or other radiating devices.

Heretofore valve-actuating devices have been employed which were operated by the difference in pressure in the return or outlet side and in the radiator or inlet side, combined with means controlled by the conditions on the inlet side, such as the pressure, or the presence of steam or water to control the differential pressure acting on the valve-actuating devices.

According to our present invention we control the discharge-valve directly by the head of the accumulating water of condensation and by the impact of the issuing jet, and to this end we employ a valve located on the return or outlet side of the radiating device and having a yielding balanced valve-piece provided with an impact-surface below the seat or passage-way. This valve is caused to move downwardly or away from its seat by the impact of the issuing-jet to gradually open the passage-way until the water of condensation is substantially discharged and then moves upwardly to its normal position, in which it presents a minimum opening, as usual, thus reducing the loss of steam to a minimum, and very regular and certain operation is obtained.

The nature of our invention will best be understood when described in connection with the accompanying drawings, in which—

Figure 1 represents a diagrammatic view of part of a steam-heating apparatus with our improved outlet-valve applied. Fig. 2 is a vertical section of the valve device in the form of an automatic valve and drawn on a larger scale. Fig. 3 is a vertical section showing the parts of the valve device arranged in a cage for their insertion as a whole into an ordinary valve-body. Figs. 4 and 5 are sectional elevations showing the valve device of Fig. 3 applied to ordinary forms of valve-bodies.

Similar letters and numerals of reference designate corresponding parts throughout the several views of the drawings.

Referring at present to Fig. 1 of the drawings, the letter A designates a radiating device—such as a heater, coil, &c.—communicating with a source of steam-supply B in the usual manner.

C is the return from the radiating device, which, as usual, is in communication with an exhausting apparatus, such as the pump P, connected with all the returns of the system and adapted to create a partial vacuum or lower pressure therein.

D is the valve device, which is located in the outlet of the radiating device or at any other suitable place in the return portion of the system between the outlet of the radiating device and the exhausting apparatus, as usual. The body of the valve device D is provided with the usual inlet *b* and the outlet *c* and with the valve passage-way 1, controlled by a valve-piece *d*. This valve-piece is preferably made conical in form and has an enlarged base 2, located below the passage-way 1, which said base is preferably hollowed out to a cup form or otherwise formed into an impact-surface 3, located in the path of the discharging water of condensation. The valve-piece is forced or drawn upwardly to its normal position by means of a spring *e*, resting upon and secured to the body of the valve device and having its upper end abutting against an adjustable device, such as the nut 4, on the threaded cylindrical stem of the valve-piece *d*, by which nut its tension can be adjusted.

To balance the valve, we make use in the present instance of a piston 5, threaded to the stem of the valve-piece above the adjusting-nut 4 and fitted to the bore 6, formed in the

valve-body. Sufficient clearance is left between the adjusting-nut and the adjacent portion of the valve-body for the entrance of steam into the bore 6 below the piston. The upward movement of the valve-piece *d* is limited by a suitable stop 8, against which the upper end of its stem strikes, and said stop is preferably in the form of an adjusting-screw threaded to the valve-body. The screw 8 is so adjusted in practice that when the valve-piece contacts therewith a minimum restricted opening for the passage of air and water of condensation under normal conditions is presented, as usual in minimum restricted closing-valves. The downward movement of the valve is limited by an abutment 9 or other suitable device, against which the piston strikes when the valve-piece has the full opening desired. The area of this opening or the stroke of the valve-piece can be predetermined by adjusting the position of the piston 5 relative to the abutment 9. The valve-piece is provided with a longitudinal duct 7, extending therethrough and which opens above the piston 5 for the purpose of draining off steam, air, or water of condensation which may leak past the piston 5, so as to maintain the valve in a balanced condition. The groove 10, shown in the lower end of the adjusting-screw 8, establishes communication between the space above the piston 5 and the longitudinal duct 7 even when the piston is up to the screw 8. The valve-body is closed, as usual, by a plug or cap *f*.

The operation of the valve device is as follows: The tension of the spring *e* being properly adjusted and the valve-piece set to present a minimum restricted opening, the water of condensation trickles through the valve passage-way without affecting or altering the position of the valve-piece. When, however, there is an accumulation of water of condensation to a sufficient level to form a jet of water, the impact of the latter upon the impact-surface 3 carries the valve downwardly to increase the area of opening, thus increasing the jet and furthering the downward movement of the valve until it is thrown wide open and checked by the abutment. When the water is substantially discharged, the valve-piece gradually closes under the action of the spring *e* until it resumes its normal position, when its movement is arrested by the stop 8. In place of a spring for effecting the sealing of the valve-piece a weighted lever may be employed.

In Fig. 5 we have shown the operative parts of the valve arranged in the cage F, adapted to be seated or placed in the bodies of ordinary forms of valves and held therein by the usual valve-spindle, as shown in Fig. 4, or by the closing cap or plug, as shown in Fig. 5. The cage in this instance is provided with the passage-way 1, the cylindrical bore 6, and abutment 9 for the piston 5, as shown in Fig. 3. With this construction any of the ordinary forms of valves can be converted into the new form.

We do not wish to restrict ourselves to the precise form of valve-piece or to the means for balancing or adjusting the same, as these may be altered without departing from our invention, which consists, essentially, in so forming and mounting the valve as to be operated by liquid impact.

When the valve is applied as shown in Figs. 4 and 5, the stop 8 is provided with a longitudinal duct 17, forming a continuation of the duct 7 in the valve-piece *d*. This duct is normally closed by the valve-spindle or closing-cap; but when either of the latter is partially lifted high-pressure steam enters the ducts 17 and 7 and the valve is thrown wide open, thus clearing the valve passage-way of sediment.

What we claim as new is—

1. In a steam-heating apparatus, the combination of a radiating device, a return for the air and the water of condensation leading therefrom, and a valve interposed between the outlet of the radiating device and the return, and having a valve-piece operated by direct impact of the issuing jet of water of condensation, substantially as described.

2. An automatic valve comprising a valve-body with inlet and outlet, and a valve passage-way, a balanced, minimum restricted closing valve-piece controlling the passage-way and having an impact-surface below the passage-way for causing said valve-piece to be operated by impact of the water of condensation, substantially as described.

3. In an automatic valve, a yielding valve-piece controlling the outlet and having an impact-surface below the valve passage-way for causing said valve-piece to be operated by impact of the water of condensation, substantially as described.

4. In an automatic valve, the combination of a balanced, coned valve-piece controlling the valve passage-way and having an impact-surface below the passage-way for its operation by the impact of the water of condensation, substantially as described.

5. In an automatic valve, a balanced, spring-supported valve-piece controlling the outlet and having an impact-surface below the valve passage-way for causing said valve-piece to be operated by impact of the water of condensation, substantially as described.

6. The combination with a cage adapted for insertion into a valve-body, and having a valve passage-way, of a yielding valve-piece mounted in said cage and controlling the passage-way, and having an impact-surface below said passage-way, substantially as and for the purpose specified.

7. The combination with a cage adapted for insertion into a valve-body and having a valve

passage-way, of a yielding valve-piece mounted in said cage and controlling the passage-way, and having an impact-surface below said passage-way, and said valve-piece being provided with a longitudinal duct, and a stop for the valve-piece provided with a longitudinal connecting-duct and adapted to be engaged by the valve-stem or closing-cap for normally closing said duct, substantially as described.

8. In a steam-heating apparatus, the combination of a radiating device, a return for the air and the water of condensation leading therefrom, and a valve interposed between the outlet of the radiating device and the return and having a valve-piece provided with an impact-surface beyond the valve passage-way for causing said valve-piece to be operated by impact of the water of condensation, substantially as described.

9. In an automatic valve, a yielding valve-piece controlling the outlet and having an impact-surface beyond the valve passage-way for causing said valve-piece to be operated by impact of the water of condensation, substantially as described.

In testimony whereof we have hereunto set our hands in the presence of two subscribing witnesses.

JAMES A. DONNELLY.
WILLIAM T. DONNELLY.

Witnesses:
RAENA H. YUDIZKY,
A. FABER DU FAUR, Jr.