E. W. COMFORT & J. L. FITTS.
MODULATION VALVE FOR STEAM HEATING SYSTEMS.
APPLICATION FILED JAN. 7, 1908.

929,657. Patented Aug. 3, 1909.

Fig. 4

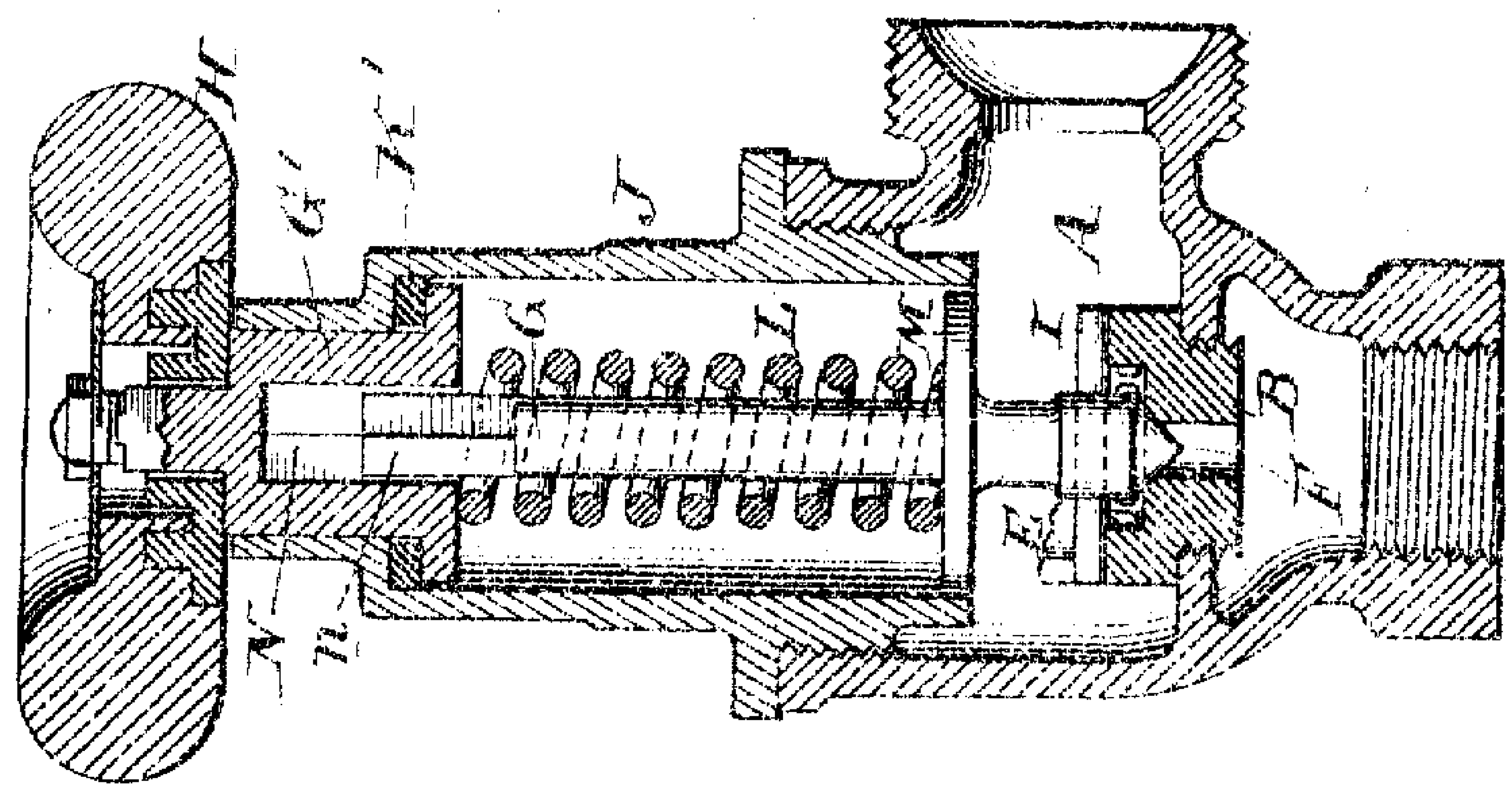


Fig. 2

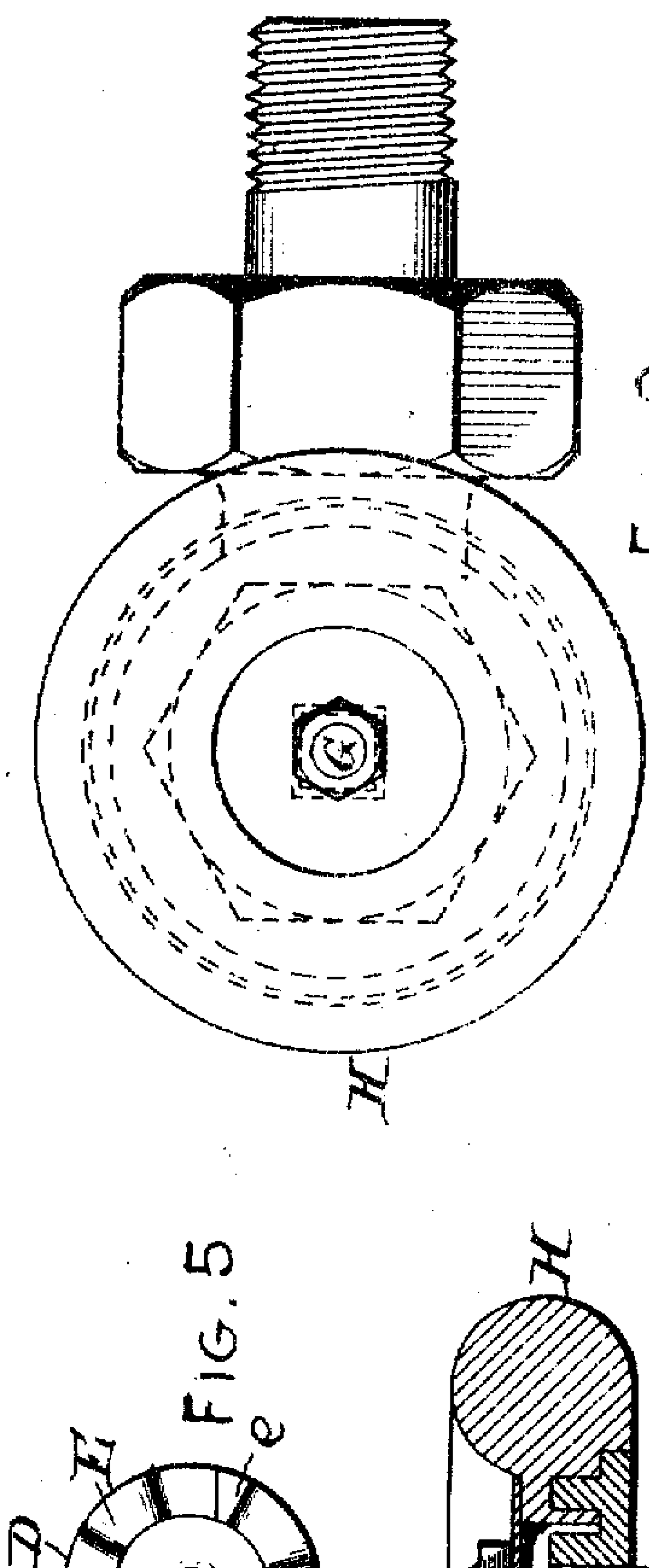


Fig. 3

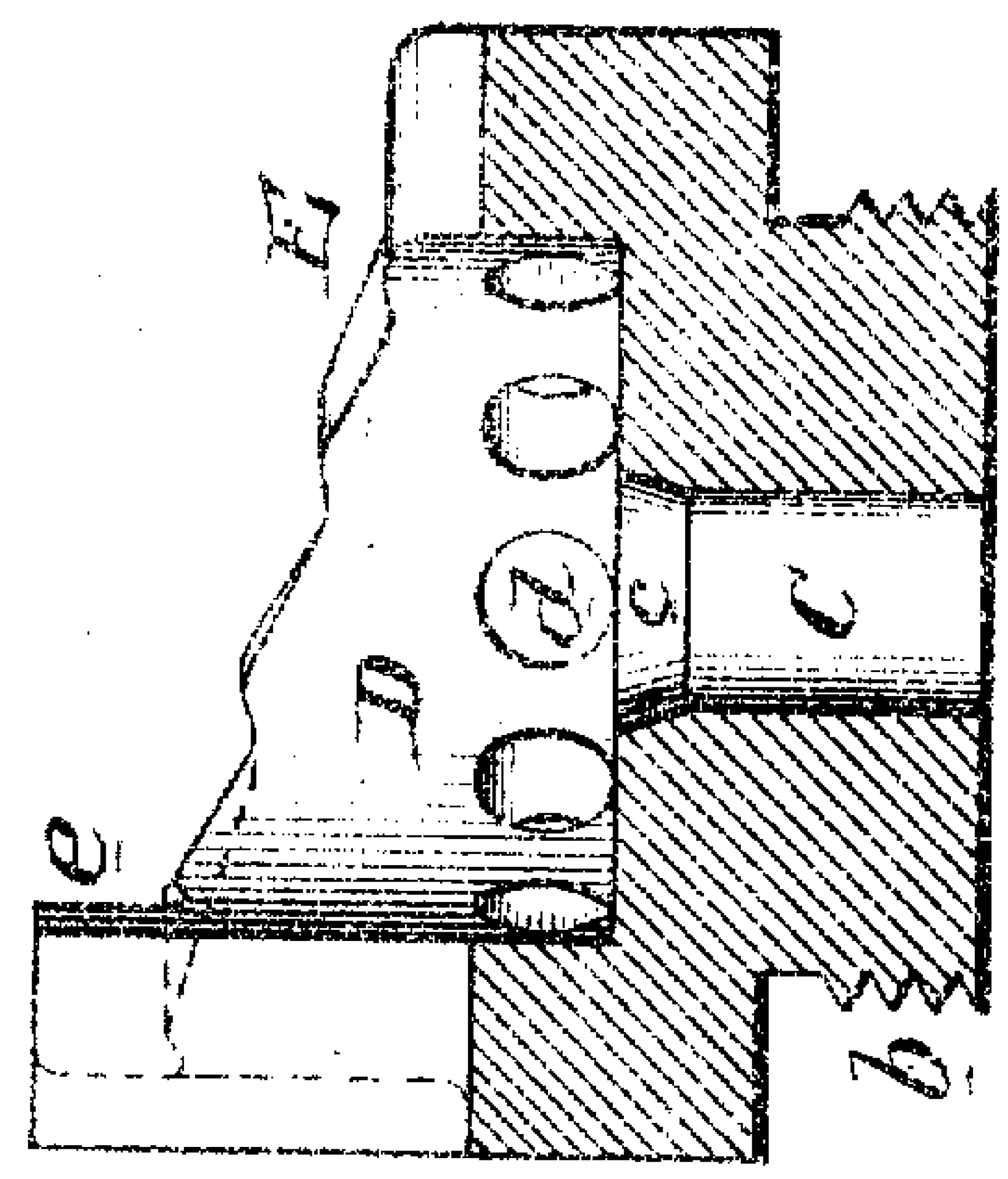


Fig. 5

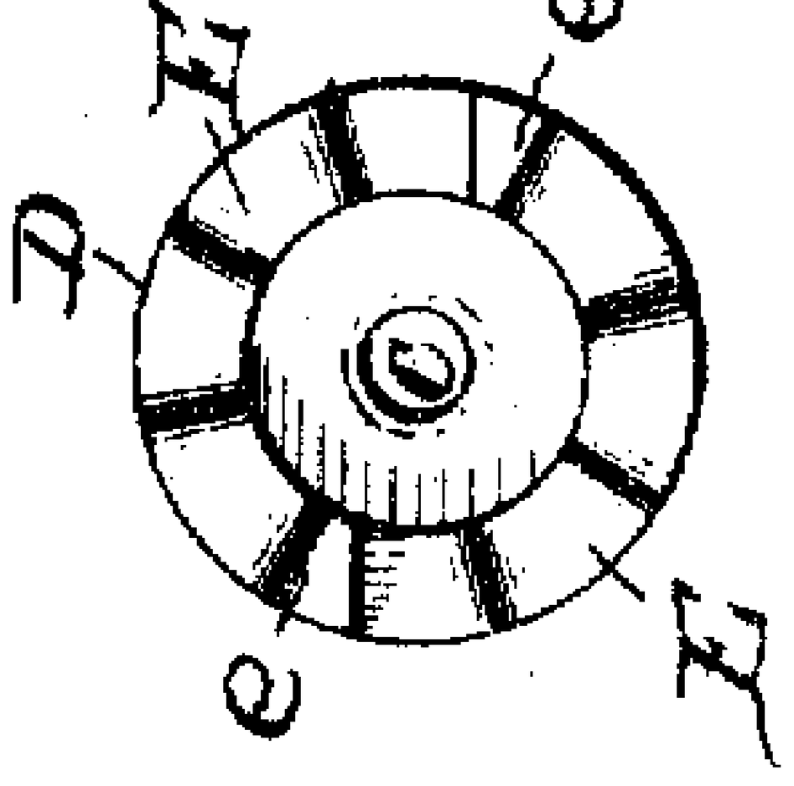
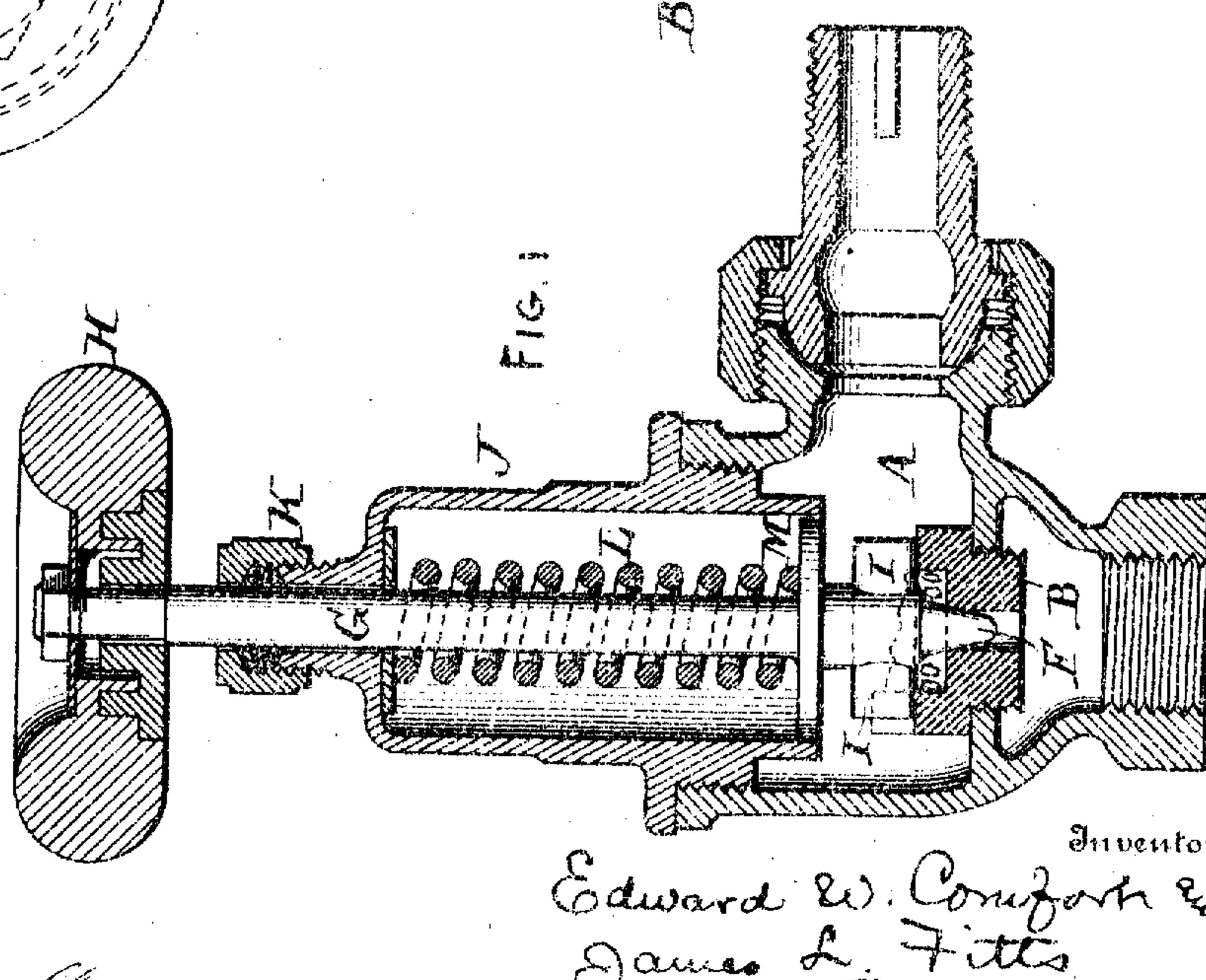


Fig. 1



Witnesses
R. F. Driscoll.
Daniel Webster, Jr.

Inventors
Edward W. Comfort and
James L. Fitts
By
Attorney

UNITED STATES PATENT OFFICE.

EDWARD W. COMFORT AND JAMES L. FITTS, OF PENSAUKEN TOWNSHIP, CAMDEN COUNTY, NEW JERSEY, ASSIGNORS TO WARREN WEBSTER & COMPANY, A CORPORATION OF NEW JERSEY.

MODULATION-VALVE FOR STEAM-HEATING SYSTEMS.

No. 929,657. Specification of Letters Patent. Patented Aug. 3, 1909.

Application filed January 7, 1908. Serial No. 409,600.

To all whom it may concern:

Be it known that we, EDWARD W. COMFORT and JAMES L. FITTS, citizens of the United States, and residents of Pensauken township, county of Camden, State of New Jersey, have invented an Improvement in Modulation-Valves for Steam-Heating Systems, of which the following is a specification.

Our invention has reference to modulation valves for steam heating systems, and consists of certain improvements, which are fully set forth in the following specification, and shown in the accompanying drawings, which form a part thereof.

The object of our invention is to provide a suitable construction of steam supply valve adapted for use in connection with a steam radiator in a heating system to accurately regulate the supply of steam to the radiator to suit the requirements of heating.

More particularly, our object is to provide such means of regulation that slight variations or increments with respect to quantity of the steam supply may be accurately and intelligently controlled.

Our invention also has for its object the capacity for quickly opening the steam port to full extent with a minimum manipulation of the valve stem.

Our invention consists in providing within the valve body a valve seat through which the steam port extends and a cam surface adjacent to the steam port, combined with a valve stem having at the bottom a valve piece adapted to the steam port in the valve seat and furnished with a lateral extension for coaction with the cam surface for the purpose of raising the valve piece relatively to its seat by turning the valve stem.

Our invention also comprehends the above features, when combined with a handle outside of the valve case and connected through a packed joint with the valve piece and for operating it, and a spring device for forcing the valve piece toward its seat in opposition to the action of the cam surface thereof.

Our invention also comprehends details of construction which, together with the features above specified, will be better understood by reference to the drawings, in which:—

Figure 1 is a sectional elevation of a modulation valve embodying our improvements; Fig. 2 is a plan view of same; Fig. 3 is an enlarged view of the valve seat shown in Fig. 1; Fig. 4 is a sectional elevation of a modified form of our invention; and Fig. 5 is a plan view of the valve seat shown in Figs. 1 and 3.

A is the body of the valve and is made of any outward shape desired, the form shown being an angle valve. The body is provided with a valve seat B of brass or other suitable material which may be screwed into a transverse diaphragm within the body of the valve, as shown. The valve seat is provided with a screw-threaded neck *b* which screws down into the transverse diaphragm to make a steam tight joint therewith and yet allow the valve seat to be removable. The valve seat is provided with a steam port C which may be slightly conical at the upper end, as at *c*. At a higher elevation than the seat, there is provided an annular wall D which is furnished on its upper edge with cam shaped or stepped portions E which increase gradually in height. Adjacent to the extreme upper cam portion, there may be provided a stop or shoulder *e* for purposes to be explained. To facilitate the escape of steam into the valve body after it passes between the valve seat and valve piece, apertures *d* may be provided through the annular wall D of the valve seat.

F is the valve piece and is made conical so as to fit tightly upon the conical portions *c* of the steam port in the valve seat. This valve piece F is connected with a valve stem G by which it may be rotated. It is also provided with radial arms I which rest upon the cam shaped portions E so that when the stem is rotated, the arms I mount the inclined portions E, and thereby under cam action raise the valve piece to a greater or less extent above its seat to permit the passage of steam to the degree desired.

J is a bonnet for the valve body A and is made cylindrical, opening at the bottom into the interior of the valve body, and provided at the top with a stuffing box K. The valve stem G is provided with a handle H at the top; it extends thfough the stuffing box K of the bonnet and terminates at the bottom in the valve piece F. Immediately above the valve piece, the valve stem G is provided with a piston M which loosely fits the lower part of the cylindrical bonnet J, and thereby acts as a guiding means for the centralization of the valve piece. Sur-

rounding the valve stem and resting at the bottom against the piston M and at the top against the interior of the bonnet, is a coil spring L, the function of which is to depress the valve stem and valve piece when not otherwise prevented by the action of the cam surface E and the radial arms I.

In the operation of the valve above described and illustrated in Figs. 1, 2 and 3, the mere rotation of the valve stem G will cause the arms I to mount the inclined cam surface E, and thereby imparting to the valve piece F a longitudinal motion away from the valve seat, while at the same time rotating. The cam shaped surfaces E are formed somewhat stepped, so that the arms I will rest at various elevations corresponding to these stepped portions of the cam surface E. When the valve is fully raised, the arms I strike the stops *e* to prevent accidental sudden closing the valve again by passing beyond the highest step down to the lowest. While one cam surface E may be employed on the valve seat for the purposes of our invention, nevertheless we prefer to employ duplicate cam surfaces E as indicated more fully in Fig. 5, there being a cam surface E for each of the radial arms I I.

Referring to Fig. 4, the general construction of the main part of the valve corresponds closely to that already described, but in this case the valve stem G does not extend through a stuffing box at the top of the bonnet J, but instead is made with a square upper end, as at *n*, which fits into a square socket N in a bushing G′ loosely fitting the upper end of the bonnet and flanged at its lower end so as to confine and rest against a packing ring K′. The operating handle H is secured to the bushing G′. In this valve, the radial arms I are shown as formed of a pin driven through the valve piece. In the operation of this valve, the turning of the handle H rotates the valve stem and the valve piece as before. The rising of the valve stem due to the radial arms I riding up on the cam surfaces E causes the end *n* of the valve stem to slide within the socket portion N of the bushing G′, and thereby enable the bushing to maintain a practically steam tight condition in the bonnet.

It is evident that where great nicety is required in the regulation of the steam, such as intended to be secured by the employment of the steam valves herein described, there is a limited capacity for change with any particular orifice in the valve seat, so that with the construction of a given valve body and other parts, the valve seat may be replaced by other and similar ones with the exception of the size of the orifice or steam port of the valve seat and the vertical thickness of said seat above the diaphragm of the valve body, so that with a corresponding action of the radial arms I upon the cam surface E, a relatively larger steam passage will be provided and governed. Thus, for example, for a one-half inch valve, there would be provided three sizes of seats, one suitable for supplying steam for ten square feet of radiation, one for twenty square feet, and one for thirty square feet; and in the most perfect form, these different valve seats would be respectively provided with its own configuration of cam surface E so as to obtain the proper increments of opening and the desired modulation in temperature. On a three-quarter inch valve, the corresponding seats would furnish steam for forty-five square feet, sixty square feet, and seventy-five square feet of radiation respectively. From these examples, it is seen that the same general body and working parts may be employed for a considerable variation in the capacity of the valve by simply changing the particular valve seat B thereof.

It will be noticed that, aside from the capacity for accurate adjustment for modulation, these valves may be employed for quick opening where a full opening is required; and where this alone is desired, it is evident that the stepped portion feature of the cam surface E may be omitted, and the radial arms I be made to ride upward from the lowest position to the highest portions of the cams before being arrested. The important feature of this invention lies in the employment of the cam device on the valve seat, whereby the adjustment of the valve piece may be very accurate and positive, and whereby valve seats may be changed to adapt the valve as a whole to suit different requirements.

While we prefer the construction shown as having been found by commercial practice to be excellently adapted for the purposes of our invention, we do not limit ourselves to the minor details, as these may be modified without departing from the spirit of the invention.

Having now described our invention, what we claim as new, and desire to secure by Letters Patent, is:—

1. In a steam valve, a valve body provided with a removable valve seat having a cam surface close to the orifice in the seat, combined with a valve piece having means to rotate it and a laterally extending portion guided upon the cam surface of the valve seat for applying power close to the seat for raising the valve piece relatively to the seat.

2. In a steam valve, a valve body provided with a removable valve seat having a conical port and an adjacent cam surface, combined with a conical valve piece having means to rotate it and a laterally extending portion guided upon the cam surface of the valve

seat for raising the valve piece relatively to the seat, and a spring for depressing the valve piece and opposing the action of the laterally extending arm and cam surface.

3. In a steam valve, a valve body provided with a removable valve seat having a cam surface close to the orifice of the seat, combined with a valve piece having a laterally extending portion guided upon the cam surface of the valve seat for applying power close to the seat for raising the valve piece relatively to the seat, a spring arranged above the cam surface for depressing the valve piece and opposing the action of the laterally extending arm and cam surface, and a handle arranged above the valve body and upon the outside thereof adapted to rotate the valve stem.

4. In a steam valve, a valve body provided with a removable valve seat having a cam surface, combined with a valve piece having means to rotate it and a laterally extending portion guided upon the cam surface of the valve seat for raising the valve piece relatively to the seat, a central valve stem for the valve piece having a disk at its lower part near the valve piece, a tubular bonnet secured to the valve body and having its lower part coöperating with the disk of the valve stem to guide it, steam tight means at the top of the bonnet surrounding the valve stem through which the valve stem may be operated, and a spring within the bonnet for depressing the valve stem to cause the valve piece to close upon its seat.

5. In a steam valve, the valve body provided with a removable cam surface adjacent to the steam port thereof, combined with a valve piece for said steam port having a lateral arm adapted to travel over the cam surface and a conical steam controlling end adjacent to the lateral arm, and means to rotate the valve whereby the rotation thereof and the action of the arm upon the cam surface causes the valve piece to open the steam port.

6. In a valve, a removable valve seat provided with a central port and a lateral wall having a stepped cam surface, combined with a valve piece adapted to the seat and having a laterally projecting arm arranged to travel over the cam surface and be retained at rest at the various stepped portions thereof.

7. A removable valve seat for a valve, consisting of a central part having an aperture forming a seat, and a surrounding part formed with two series of cam shaped surfaces arranged diametrically opposite and substantially concentric with the aperture.

8. A removable valve seat for a valve, consisting of a central part having an aperture forming a seat, and a surrounding wall part formed with two series of cam shaped surfaces arranged diametrically opposite and concentric with the aperture, and lateral ports or openings through the surrounding wall part beneath the cam shaped surfaces.

In testimony of which invention, we have hereunto set our hands.

EDWARD W. COMFORT.
JAMES L. FITTS.

Witnesses:
F. JOSEPH MILLER,
P. Y. QUINN.