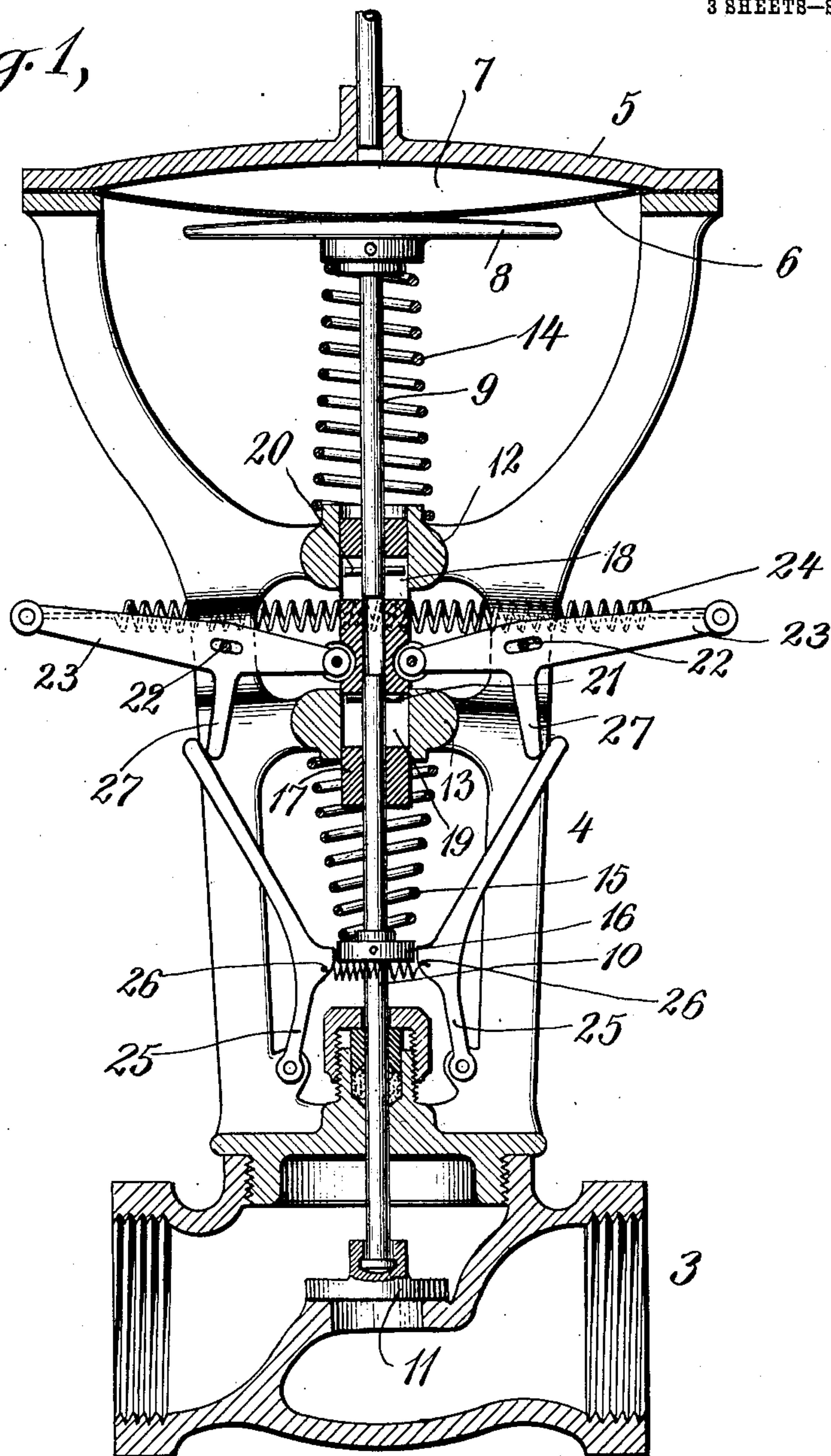


905,426.

3 SHEETS—SHEET 1.

Fig. 1,



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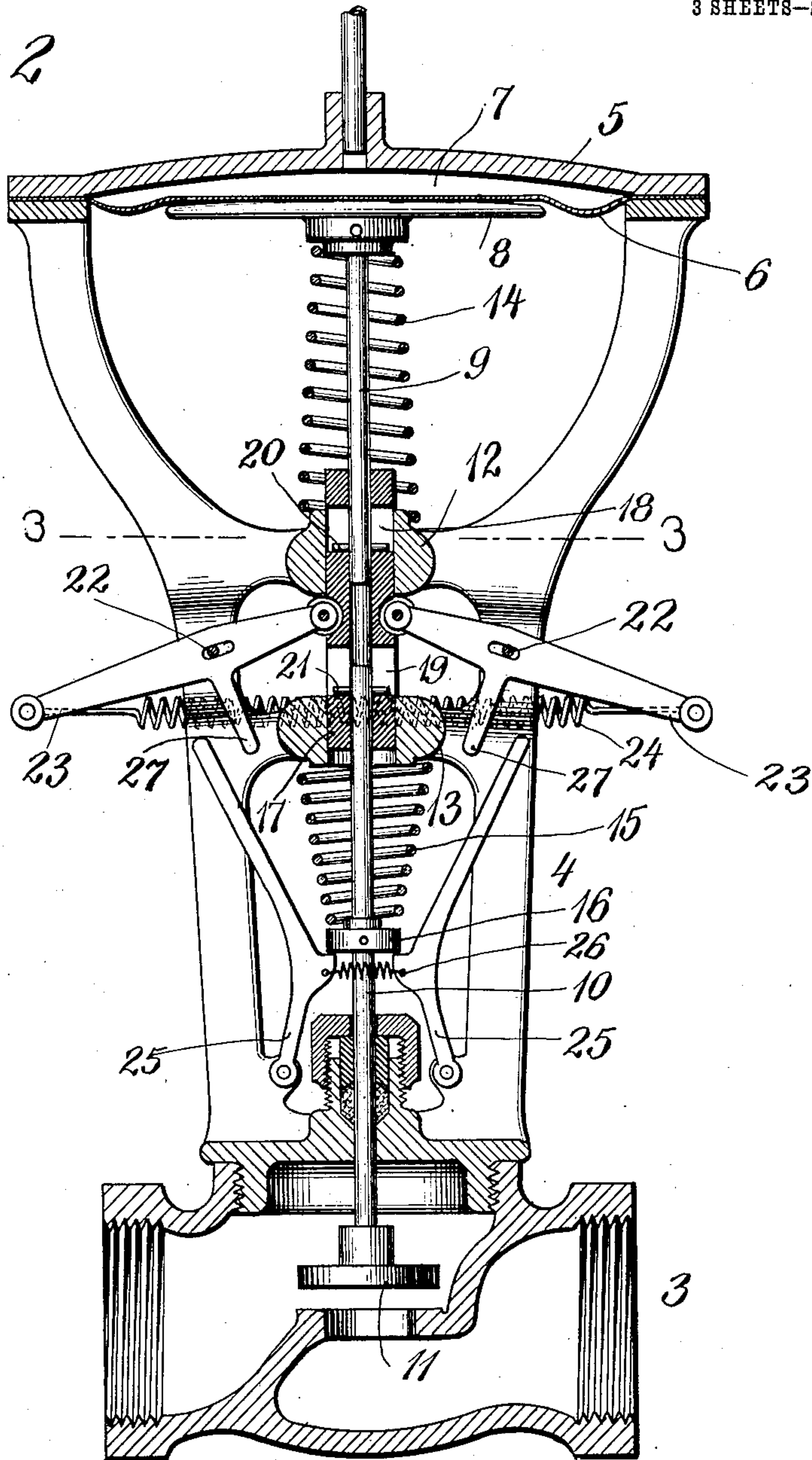
D. H. HAYWOOD.
REGULATING APPARATUS.
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905,426.

Patented Dec. 1, 1908.

3 SHEETS—SHEET 2.

Fig. 2



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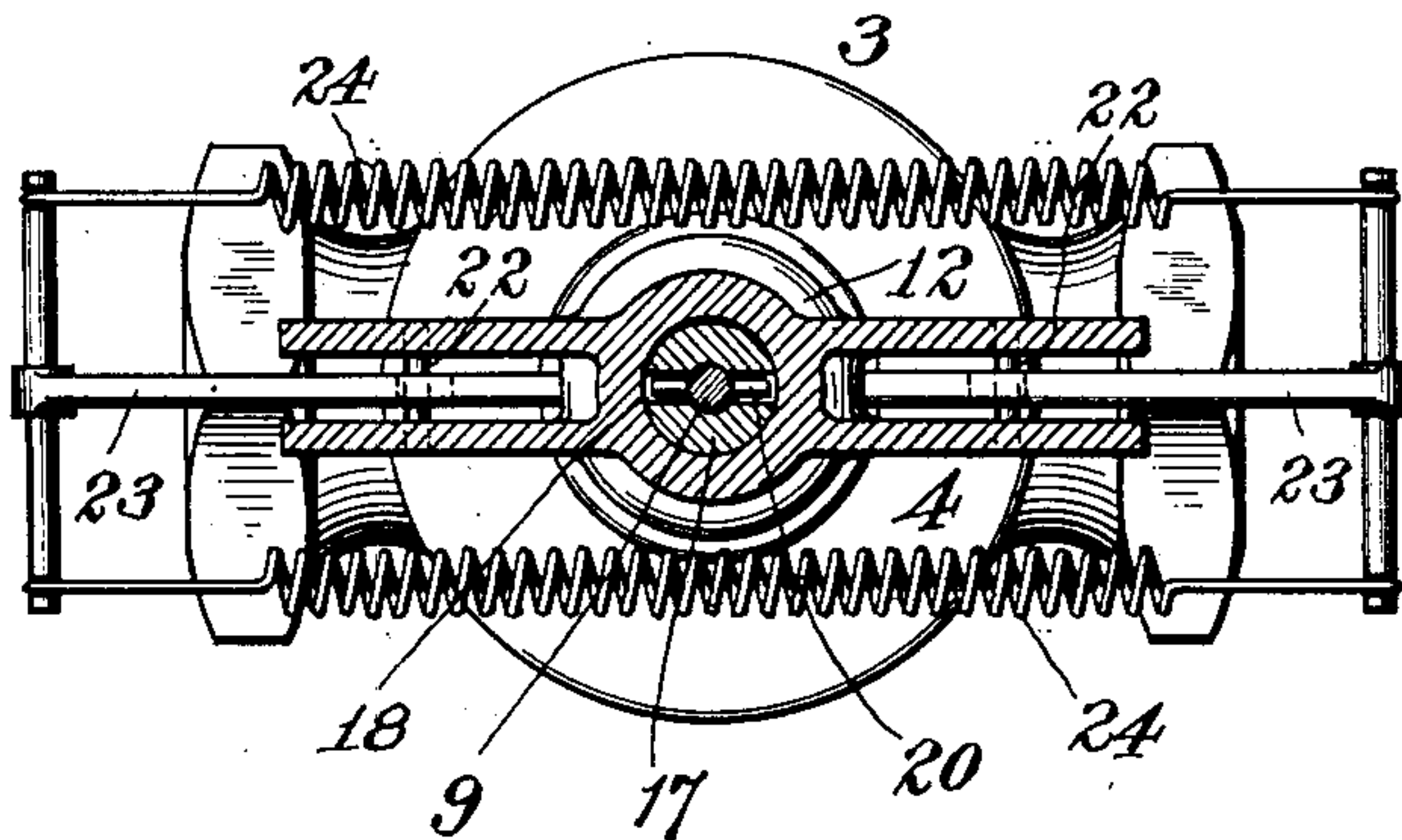
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3 SHEETS—SHEET 3.

Fig. 3,



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REGULATING APPARATUS.

No. 905,426.

Specification of Letters Patent.

Patented Dec. 1, 1908.

Application filed April 11, 1907. Serial No. 367,483.

To all whom it may concern:

Be it known that I, DANIEL HOWARD HAYWOOD, a citizen of the United States of America, and a resident of the city, county, and State of New York, have invented certain new and useful Improvements in Regulating Apparatus, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

My invention relates to improvements in regulating apparatus, and particularly to motor controlled valves employed as regulating means in steam heating systems.

The main object of my invention is to cause the valve to open and close quickly and positively regardless of the speed of movements of the motor which brings about such operation, and also to prevent the valve piece from resting in intermediate positions, that is to say, in any position between that of either entirely closed or entirely open.

To these ends my invention consists in a power storing means employed between the motor proper and the valve piece, power being stored in such power storing means during one portion of a movement of the motor while the valve piece remains at rest, such power being given off suddenly to operate the valve after the motor has moved a predetermined distance.

In order that my invention may be fully understood, I will now proceed to describe an embodiment thereof, having reference to the accompanying drawings illustrating the same, and will then point out the novel features in claims.

In the drawings: Figure 1 is a view in central vertical section through the valve, showing the same in a closed position. Fig. 2 is a similar view showing the valve in an open position. Fig. 3 is a view in horizontal section through the valve, the said section being taken upon the plane of the line 3—3 of Fig. 2.

The valve as a whole includes a casing 3, a frame 4 supported thereby and arranged in turn to support the operating mechanism and the fluid pressure motor, and a cap 5. A diaphragm 6, secured in position by the cap 5, constitutes the movable wall of the fluid pressure motor, the chamber therefor being designated by the reference character 7. The diaphragm 6 rests upon an abutment 8, said abutment provided with an operating stem 9. A valve stem 10 is ar-

ranged in line with said operating stem 9, said valve stem connected at its lower end to a valve piece 11.

The frame 4 has two central bearing hubs 12 and 13, the hub 12 forming an abutment for engaging a spring 14 which is coiled around the operating stem 9 and exerts pressure between the said hub 12 and the abutment 8, while the hub 13, in like manner, forms an abutment for a spring 15 which is coiled around the valve stem 10 and exerts pressure between the said abutment 13 and a collar 16 fast upon the said stem 10. The normal tendency of the spring 14 is to force the abutment 8 and movable wall 6 of the fluid pressure motor upward, while the normal tendency of the spring 15 is to force the valve stem and valve downward to a closed position. The adjacent ends of the stems 9 and 10 are mounted to slide in a central operating member 17 itself mounted to slide in the bearings 12 and 13. The said central operating member 17 is provided with cross-slots 18 and 19, said slots arranged to receive pins 20 and 21, with which the said stems 9 and 10 are provided respectively. This pin and slot connection allows a certain amount of lost motion between the stems and the operating member, but enforces synchronous movements of the parts after such lost motion has been taken up.

Pivoted at 22—22 upon the frame 4 are a pair of levers 23, said levers being pivotally connected at their inner ends with the central operating member 17, and connected at their outer ends to opposite ends of one or more springs 24. The pivotal connection 22 is a sliding one so as to permit the necessary endwise movements of the levers caused by the straight line movements of their inner pivoted ends. The said levers 23 constitute, in effect, a toggle. When the said levers are in the position in which they are shown in Fig. 1, the springs 24 will be so disposed with relation thereto as to exert a pressure downward upon the central operating member 17, while, if the levers are shifted to an opposite position, as shown in Fig. 2, the springs 24 will then exert a pressure to lift the said operating member, as will be quite clear from an inspection of the drawings. When the levers are in the position in which they are shown in Fig. 1, the said operating member, by its engagement with the pin 21 upon the stem 10, will be holding

the valve piece 11 down to its seat, and in this it will be aided by the spring 15, the normal tendency of which, it will be remembered, is to move the valve in the same direction. The abutment 8 will be in its lower position, being held in such position either partly or wholly by fluid pressure contained in the diaphragm chamber 7, or partly by fluid pressure contained in such diaphragm chamber and partly by engagement of the pin 20 upon the stem 9 with the said central operating member. The abutment 8 is held down against the tension of the spring 14. The power exerted by this spring is sufficient, when pressure is relieved from the chamber 7, to lift the central operating member 17 against tension of the spring 24. When, therefore, the fluid pressure is so relieved, the central operating member will be slowly lifted, thereby straightening out the toggle levers, until finally the springs 24 cross the centers 22 thereof. Directly this happens the springs 24 and 14 will unite their action to lift the operating member, thereby causing the same to be lifted quickly and positively. The first movement of the central operating member will impart no corresponding movement to the stem 10 or valve piece 11 carried thereby, because the said member will merely take up lost motion with respect to the pin 21. After the central operating member has moved to a position wherein the said springs 14 and 24 unite their energy in an upward direction, and the central operating member hence begins to move quickly and positively, the said member will engage the pin 21, said pin being at this time against the lower walls of the slot 19, and, in its further movement, the said central operating member will hence lift the stem 10 and valve piece 11 against the tension of the spring 15. The valve will thus be quickly opened to its extreme position. Fig. 2 shows the parts in this condition.

From the foregoing it will be seen that, during the first portion of the operation of the fluid pressure motor, no movement will be imparted to the valve piece, but power will be stored in the device, which power will be given off after a predetermined movement of the said fluid pressure motor, to then open the valve quickly and positively.

I have provided a locking device for holding the valve open during the initial return movement of the motor, such locking device comprising pivoted latches 25 pressed yieldingly together by means of a spring 26, said latches having portions arranged to engage the collar 16 of the stem 10, passing beneath said collar when the valve is in its open position. When they so engage the collar they will prevent a downward movement of the

valve piece and stem, even though it be released by the central operating member, and the said latches will retain their hold until they are thrown out by means of arms 27, which are carried by the levers 23 and which swing against the projecting ends of the latches 25 as the levers are forced from the position in which they are shown in Fig. 2 to the position in which they are shown in Fig. 1. The operation of closing the valve is then as follows: Fluid pressure being admitted to the chamber 7, the abutment 8 and stem 9 will be forced downward against the tension of the spring 14, the central member 17 being forced downward because of the engagement of the pin 20 with the lower wall of the slot 18, said central member being thus forced downward against the tension of the springs 24, the levers 23 being gradually straightened out. During this time there is a lost motion between the pin 21 and the central operating member, the valve being held open by the latches 25. As the levers cross the line of their centers the portions 27 thereof engage and trip the latches 25 whereby to release the valve 11 and stem 10. Immediately this happens both the spring 15 and the springs 24 unite to force the said valve and stem to its seat and to hold it there. The valve will thus be forced quickly and positively to its seat, and intermediate positions of the valve at any time will be rendered impossible.

In practice the latches 25 may, in certain cases, be dispensed with if desired. This is for the reason that it is more important to obtain a quick opening valve than a quick closing one. In steam heating systems, to which this device is particularly adapted, the valve may be closed slowly when the part of the system controlled thereby is hot, without any particular trouble resulting, but if the valve were opened slowly, or held in a partly opened condition when that part of the system controlled thereby was cold, steam thus allowed to enter in minute quantities would be likely to condense and the heating system fill up with water. If the latches are dispensed with, it will be apparent that the valve 11 will be slowly closed during the initial downward movement of the central operating member, and that the valve will be entirely closed before the levers 23 cross the line of their centers. In this way the lost motion will be during the last portion of the movement of the central operating member downward, instead of during the first portion of such movement, but all the parts present will finally move to the position in which they are shown in Fig. 1. In dispensing with the latches, the slight disadvantage accruing to a slowly closing valve will be somewhat overbalanced by the fact that the valve will be closed carefully,

and the pounding to which it is necessarily subjected in being closed quickly, as when released by the latches, will be obviated.

What I claim is:

5 1. In apparatus of the class described, the combination with a valve, and a fluid pressure motor therefor, of an operating member between said motor and valve, a lost motion connection between said operating member and said valve, another lost motion connection between said motor and said operating member, and power storing means connected to said operating member, said power storing means arranged to store power during a portion of the movement of the operating member in either direction, and to give it off during the completion of such movement, whereby to effect a quick opening and closing of the said valve.

20 2. In apparatus of the class described, the combination with a valve including a valve stem, and a fluid pressure motor including a movable abutment and a stem connected thereto arranged axially in line with the valve stem, of an operating member having independent lost motion connections with the two said stems, and power storing means operatively connected with said member, the said power storing means arranged to store power during a portion of the movement of the said operating member, and then to give off such power so as to effect a quick operation of the valve.

35 3. In apparatus of the class described, the combination with a valve and a spring normally tending to close same, of a fluid pressure motor, an operating member between said fluid pressure motor and said valve, and power storing means arranged to store power during the first portion of the movement of the motor in a direction to open said valve, and to give off the power thus stored after the operating member has been moved a predetermined distance by the said motor, whereby to effect a quick opening of the said valve.

40 4. In apparatus of the class described, the combination with a fluid pressure motor including a diaphragm, an abutment therefor, and a spring opposing movement of said abutment and diaphragm in one direction, of a valve, a spring for closing said valve, an operating member having lost motion connections with said valve and with said abutment, and power storing means, connected with said movable member, arranged to store power during the first portion of the movement of said operating member in either direction, and to give it off during the completion of such movement, whereby to effect a quick operation of the said valve.

50 5. In apparatus of the class described, the combination with a valve and a fluid pressure motor therefor, said valve and fluid pressure motor having stems axially in line

with each other, of an operating member arranged to slide upon said stems, pin and slot connections between said stems and said operating member, and power storing means arranged to store power during a portion of the movement of the operating member in either direction, and to give it off during the completion of said movement, whereby to effect a quick operation of the said valve.

6. In apparatus of the class described, the combination with a valve, and a fluid pressure motor provided with stems axially in line with each other, of central bearing means axially in line with the said stems, a bearing member arranged to slide upon said stems and having a bearing in said bearing member, pin and slot connections between said stems and said bearing member, and power storing means arranged to store power during a portion of the movement of the operating member in either direction, and to give it off during the completion of such movement, whereby to effect a quick operation of the said valve.

7. In apparatus of the class described, the combination with a valve and a fluid pressure motor therefor, of an operating member between said motor and said valve, said operating member having a lost motion connection with said valve and with said motor, and power storing means comprising toggle levers pivoted at their inner ends to said central operating member, and spring connected together at their outer ends, the said power storing means arranged to store power during a portion of the movement of the operating member, and to give it off during a further movement thereof whereby to effect a quick operation of the said valve.

8. In apparatus of the class described, the combination with a valve having a valve stem, and a fluid pressure motor having an operating stem in axial line with said valve stem, of an operating member fitted to slide upon said stems and having lost motion connections therewith, and toggle levers pivotally connected at their inner ends to said operating member and spring connected together at their outer ends, said toggle levers provided with stationary pivots intermediate their ends, the said spring connected toggle levers constituting a power storing means in which power is stored during a portion of the movement of the operating member, such power being given off during a further movement thereof, whereby to effect a quick operation of the said valve, substantially as set forth.

9. In apparatus of the class described, the combination with a valve, and a spring normally tending to move same in one direction, of a fluid pressure motor for said valve, power storing means arranged intermediate said motor and said valve, the said power

storing means arranged to store power during a portion of the movement of the said motor, and to give off such power during a further movement thereof, whereby to effect a quick operation of the valve, and a latch for holding said valve in one position against the tension of the spring tending to close it, said latch arranged to be tripped after the power storing means has been moved a predetermined distance by the motor.

10. In apparatus of the class described, the combination with a valve and a spring normally tending to close same, of a fluid pressure motor therefor, intermediate mechanism including a power storing means between said motor and said valve, the said power storing means arranged to store power during a portion of the movement of the said motor, and to give off such power during a further movement thereof; whereby to effect a quick operation of the valve, a latch for holding said valve open against the tension of its spring, and means for tripping said latch after the intermediate means has moved a predetermined distance.

11. In apparatus of the class described, the combination with a valve, a spring normally tending to close same, and a latch for locking said valve in an open position, of a fluid pressure motor for operating said valve, an operating member between said fluid pressure motor and said valve, power storing means connected with said operating member, the said power storing means arranged to store power during a portion of the movement of the said motor, and to give off such power during a further movement thereof, whereby to effect a quick operation of the valve, and means movable with said operating member for tripping the said latch after the said operating member has

moved a predetermined distance in a direction to close the said valve.

12. In apparatus of the class described, the combination with a valve, a spring normally tending to close same, and a latch for locking said valve in an open position, of a fluid pressure motor for said valve, an operating member having a lost motion connection with said valve and with said motor, a power storing device connected to said operating member, the said power storing device arranged to store power during a portion of the movement of the said motor, and to give off such power during a further movement thereof, whereby to effect a quick operation of the valve, and means movable with said operating member for engaging and tripping said latch after the operating member has moved a predetermined distance.

13. In apparatus of the class described, the combination with a valve, a spring normally tending to close same, and a latch for holding the said valve in an open position, of a fluid pressure motor for said valve, an operating member having a lost motion connection with said fluid pressure motor and said valve, and a power storing device comprising toggle levers spring connected at their outer ends and pivotally connected at their inner ends to said operating member, said toggle levers arranged in their movement to engage and trip said latch, the said power storing device arranged to store power during a portion of the movement of the said motor, and to give off such power during a further movement thereof, whereby to effect a quick operation of the valve.

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