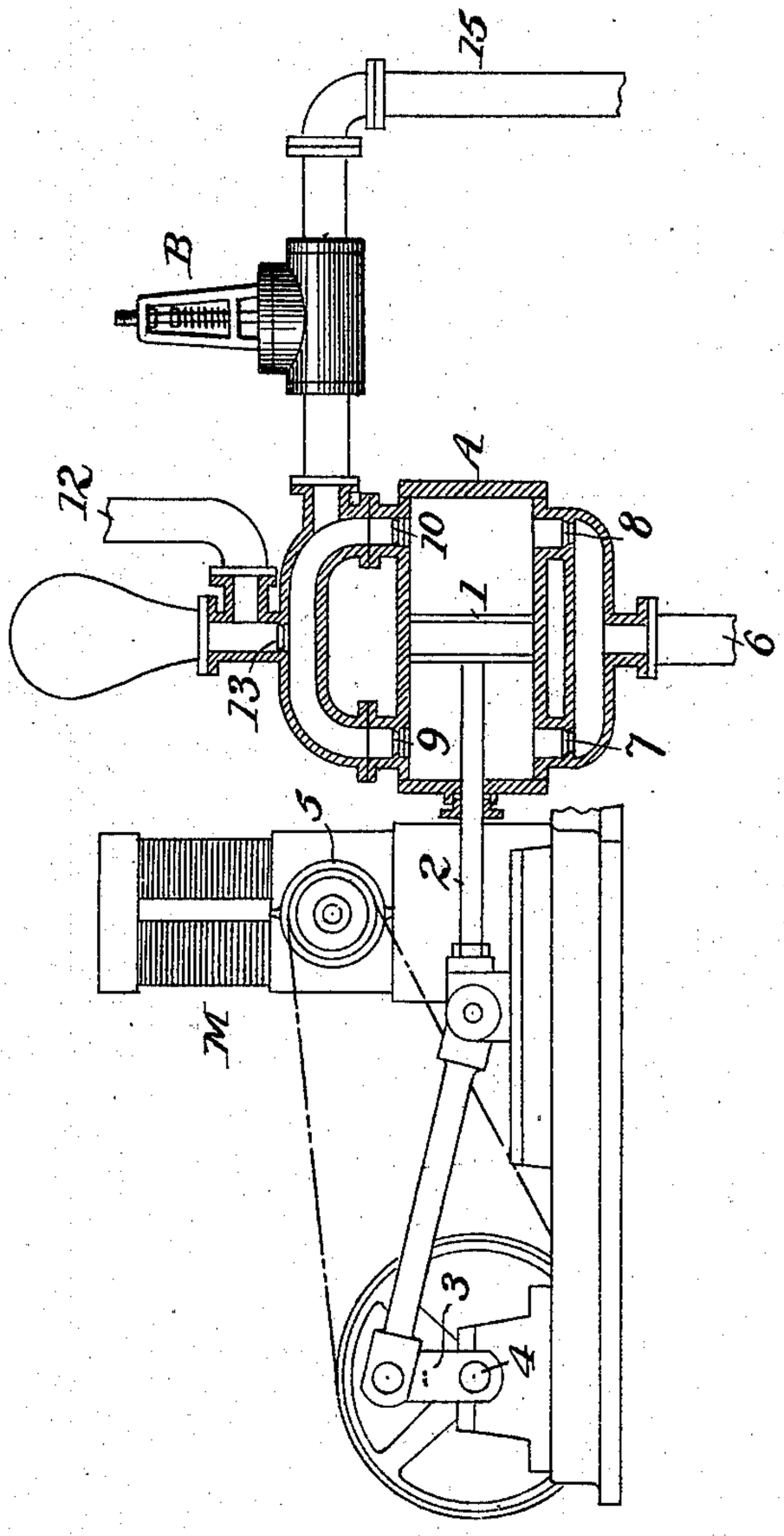
(No Model.) 2 Sheets—Sheet 1

M. W. HALL.

AUTOMATIC RELIEF VALVE FOR ELECTRIC PUMPS.

No. 562,463. Patented June 23, 1896.

Fig. 1.



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(No Model.) 2 Sheets—Sheet 2.

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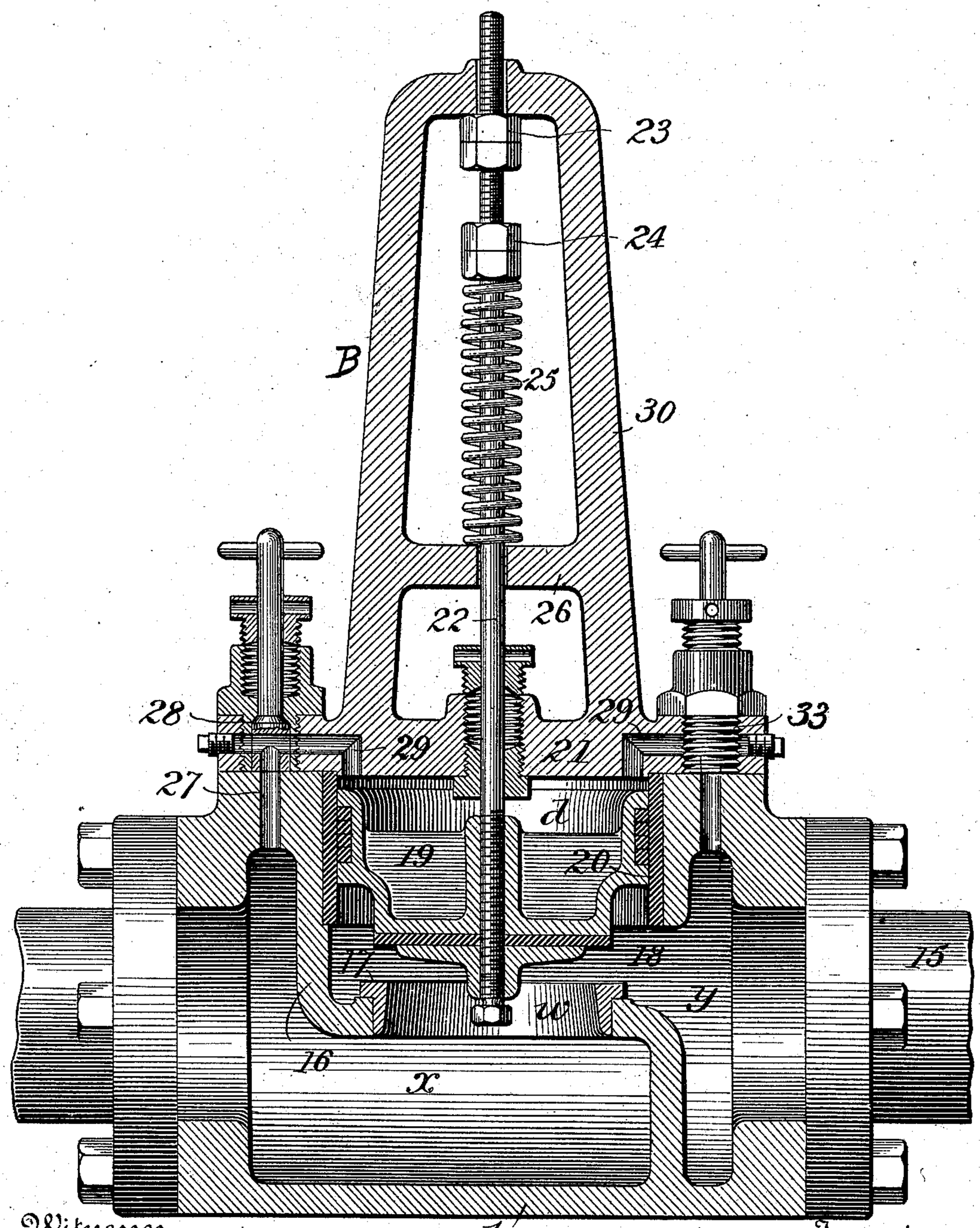
No. 562,463. Patented June 23, 1896.

Fig. 2.



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UNITED STATES PATENT OFFICE.

MILAN W. HALL, OF PLAINFIELD, NEW JERSEY, ASSIGNOR TO THE OTIS BROTHERS & COMPANY, OF NEW YORK, N. Y.

AUTOMATIC RELIEF-VALVE FOR ELECTRIC PUMPS.

SPECIFICATION forming part of Letters Patent No. 562,463, dated June 23, 1896.

Application filed October 20, 1893. Serial No. 488,707. (No model.)

To all whom it may concern:

Be it known that I, MILAN W. HALL, a citizen of the United States, residing at Plainfield, in the county of Union and State of New Jersey, have invented certain new and useful Improvements in Automatic Relief-Valves for Electric Pumps, of which the following is a specification.

In the operation of pumps, and more especially in the operation of those actuated by electromotors, difficulties arise from the necessity or tendency of the motor-engine to start rapidly into operation when the pump-piston action is resisted by the full load of the water column at the discharge side of the pump. Efforts have been made to overcome this difficulty by providing means whereby to control the initial movements of the motors; but in many instances this regulation is attended by complication of mechanism and expense of construction and operation and decreased efficiency.

To overcome the aforesaid difficulties in starting and yet avoid the objections incident to attempts to control the motor, I provide the pump with a supplemental outlet, and with an automatic relief-valve, whereby, when the pump is started, it can discharge the water freely and without material resistance and without working against the pressure of the water column in the main discharge-pipe, the said relief-valve closing automatically and causing the water to be discharged into the main discharge-pipe only after the pump has attained its maximum speed.

On reference to the accompanying drawings, Figure 1 illustrates diagrammatically the arrangement of the relief-valve in relation to a pump of ordinary construction connected to be actuated by an electromotor. Fig. 2 is an enlarged sectional view of the automatic relief-valve device.

A is the cylinder of the pump, provided with a piston 1, the rod 2 of which is connected with the cranks 3 of the operating-shaft 4, the latter being driven by a belt or suitable means from the armature-shaft 5 of an electromotor M.

The pump is provided with a branched inlet 6, having two valves 7 8 opening inwardly and with a branched outlet having two valves 9 10 opening outwardly, the outlet communicating with the main discharge-pipe 12, through a passage provided with a valve 13, that seats against the pressure of the pipe 12. With any point of the discharge-passage between the valve and the pump communicates the inlet-port of the automatic relief-valve B, from which extends a discharge-pipe 15.

The automatic relief-valve device B is so constructed that normally when the pump is at rest the secondary discharge-channel through the said device B shall be open, and as the pressure in the receiving end of the device increases, or as the pressure at the discharge end decreases, the valve of the said device will automatically close and throttle the secondary discharge-channel, so that as the motor attains its maximum efficiency the flow from the pump will gradually be transferred from the secondary discharge-channel to the main discharge-pipe.

The device B may be constructed in different ways to secure the desired effect but so as to be automatically operated by variations in the secondary discharge-channel, the construction which is illustrated in Fig. 2 having proved to be very effective. As shown, the said device has a casing *b*, divided into an inlet-chamber *x* and discharge-chamber *y* by a partition 16, having a port *w*, with a seat 17 for a valve 18. The valve 18 is connected with a piston 19 of greater diameter which slides in a cylinder 20, forming part of the valve-casing, communicating at one end with the chamber *y*, and closed at the other by a head or cap 21. The valve-spindle 22 extends through a packed opening in the head 21 and through the cross-pieces of a hollow bracket 30 and is provided with nuts 23 upon the threaded end of the stem for regulating the throw of the valve and piston and with nuts 24, bearing upon a spring 25, coiled around the stem and resting on one of the cross-pieces 26, said spring acting to lift the piston 19. A by-passage 27, controlled by a valve 28, adjustable from the outside of the device, forms a communication between the inlet-chamber *x*, and the chamber *d*, above the piston 19, while a passage 29, controlled

by a valve 33, forms a communication between the chamber *d* and the discharge-chamber *y*.

Normally the valve 18 and the piston 19 are maintained by the spring 25 in the position shown in Fig. 2, so that when the pump starts in operation there will be an open passage through the valve device constituting a secondary discharge-passage for the water, the main discharge-passage being closed by the valve 13, which supports the filler-column in the main discharge-pipe 12.

As the pump starts, the water passes into the chamber *x*, through the port *w*, into the exhaust-chamber *y*, and thence out by the pipe 15, and at the same time a portion of the water passes through the auxiliary or by-pass 27 into the chamber *d*, above the piston 19, and thence through the passage 29 into the exhaust-chamber *y*. The valve 33 of the passage 29 is adjusted so as to throttle or restrict the flow of water therethrough, causing an excess of pressure on the top of the piston 19. It will thus be seen that there is a greater pressure upon the upper face of the piston than upon the valve, and the consequence is that there is a tendency to close the valve against the upward pressure of the spring 25, and as the speed of the pump increases this difference becomes proportionately greater, so that finally, when the motor and pump have attained their maximum efficiency, the variation of pressure between the upper side of the piston 19 and the under side of the valve 18 is sufficient to overcome the tension of the spring 25, and the valve 18 is closed, and the water passes through the main discharge-pipe 12, the pressure being sufficient to raise the valve 13 therein. It will be seen that by proper adjustments of the device the valve 13 will be gradually raised, and the weight of the column above it overcome without excessive or sudden strain upon the pump.

The device may be regulated to adapt it to different pressures and conditions by regulating the channels 27 by the valve 28, and the resistance of the piston 19 to the water-pressure by the spring 25, while the superior pressure in the chamber *d* is maintained by throttling the passage 29 by the valve 33, so as to prevent the escape of water from the chamber *d* as fast as it enters. The valve 33 is so adjusted as to secure a preponderating pressure in the chamber *d*, but at the same time permit such an escape of water as will prevent the valve 18 from being closed too suddenly and before the motor has acquired the desired rapidity of movement.

Where a by-pass or relief-valve is used and closed arbitrarily by motion of some of the working parts, as by a governor, &c., it is difficult to expel the air that collects while the pump is at rest, but with a relief-valve actuated by the variations of the pressure in the water, whatever might be the speed of the motor, the valve will naturally remain open until the air has all been exhausted from the suction-pipe and expelled through the auxiliary passage, which cannot be closed until the water flows through the same in an undivided stream.

Without limiting myself to the precise construction and arrangement of parts shown, I claim—

1. The combination with a pump provided with a main discharge pipe or passage, a check-valve therein, and with a secondary discharge-passage, of an automatic relief-valve device connected with said secondary discharge-passage the said valve device being provided with a port, a valve for closing said port, adjustable means for keeping said valve normally open, a piston connected with the valve having a larger area than the port, a chamber above the piston, and by-pass passages connecting with the main passage of the valve and provided with throttling devices, substantially as described.

2. The combination with a pump provided with a main discharge pipe or passage, a check-valve therein, and a secondary discharge-passage, of an automatic relief-valve device having an inlet-chamber and an outlet-chamber connected by a port, a valve for said port, a spindle for said valve, adjustable means for maintaining the valve normally open, a piston connected with the valve having an area greater than the face of the valve, a by-pass leading from the inlet-chamber to a chamber above the piston and provided with adjustable means for controlling the flow therethrough, and a by-pass leading from the chamber above the piston to the exhaust and having means for controlling the flow therethrough, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

MILAN W. HALL.

Witnesses:
HENRY L. BRANT,
CHARLES W. EGGERT.