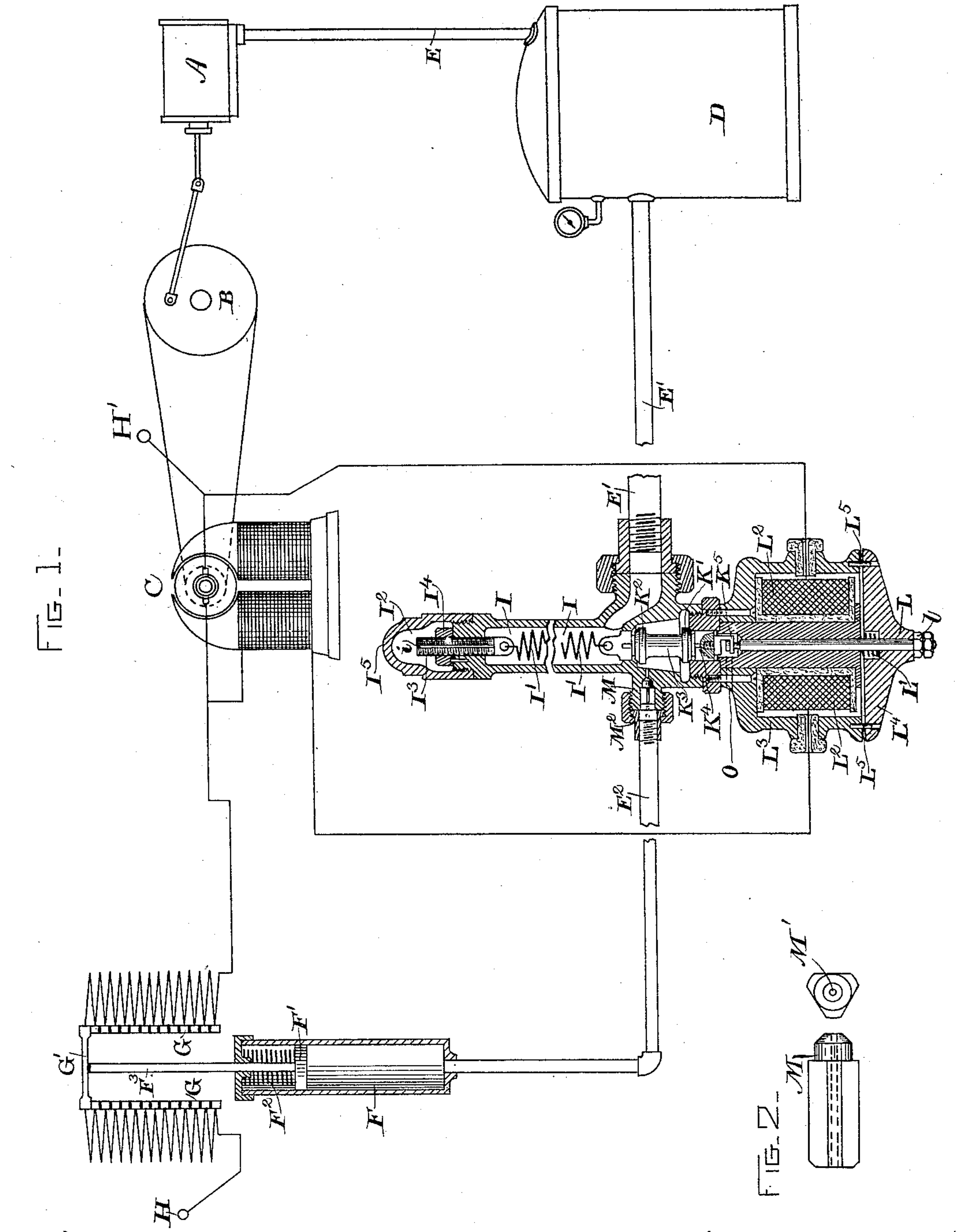
(No Model.)

C. H. VEEDER & E. D. PRIEST.

FLUID PRESSURE REGULATOR.

No. 523,873. Patented July 31, 1894.



ATTEST
J. Johnston.
A. F. Macdonald.

INVENTORS
Curtiss H. Veeder and
Edward D. Priest, by
Bentley and Blodgett,
Attys.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

CURTIS H. VEEDER AND EDWARD D. PRIEST, OF LYNN, MASSACHUSETTS, ASSIGNORS TO THE GENERAL ELECTRIC COMPANY, OF NEW YORK.

FLUID-PRESSURE REGULATOR.

SPECIFICATION forming part of Letters Patent No. 523,873, dated July 31, 1894.

Application filed January 6, 1894. Serial No. 495,991. (No model.)

To all whom it may concern:

Be it known that we, CURTIS H. VEEDER and EDWARD D. PRIEST, citizens of the United States, residing at Lynn, county of Essex, State of Massachusetts, have invented certain new and useful Improvements in Fluid-Pressure Regulators, of which the following is a specification.

Our invention relates to controllers for regulators for mechanisms adapted to use compressed air or other fluid and is especially devised to control the operation of railway brakes upon electric locomotives or cars; and it has for its object to provide means by which a definite increase of pressure in the reservoir tends to suddenly throw on a resistance which acts to cut out current from the motor operating the pump, and by which the diminution of pressure consequent upon the use of the stored air withdraws the resistance from the motor circuit slowly so as to start the motor at a low speed, which will increase in accordance with the demand for air, and as such demand affects the pressure in the reservoir. We also provide means by which, upon a sudden cessation of current for any reason, the resistance will be thrown in; so that, should the current be thrown in again suddenly (as when a trolley leaves the wire and is replaced by the conductor or motorman), the motor will not be in circuit without resistance and with no counter electromotive-force, by which means we prevent all injury to the motor and adapt the apparatus for absolutely automatic operation within reasonable limits.

To these ends we arrange our improved regulating apparatus as illustrated in the accompanying drawings, in which—

Figure 1 shows diagrammatically the arrangement best adapted to effect the objects of our invention, and Fig. 2 is an enlarged view of the check-valve employed.

A is a pump of ordinary construction, supplying compressed air to the reservoir D through the pipe E.

C is an electric motor driving a pulley B, operating by a crank and pitman the pump A; in circuit with the motor is a resistance G, through which the current supplied from the generator through the mains and the trolley H is transmitted to the motor, the amount of resistance in the circuit being determined by the position of the bridge G′.

All of the parts so far described are old and in common use in the art.

E′, E^2 are pipes communicating respectively from our improved fluid pressure controller to the reservoir D and the cylinder F within which is a piston F′ normally depressed by a spring F^2; the piston rod F^3 carries the movable bridge G′ which serves to cut in or out the successive sections of the resistance G in circuit between the trolley H and the motor C.

Referring now to the illustration of our improved controller, I is a chamber for the fluid pressure closed by a valve, to be more particularly described presently. Within the chamber is a coil spring I′ tending to keep the chamber closed by drawing the valve against its seat. A second and smaller chamber I^2 is arranged above the chamber I and an adjusting screw I^3 for the spring I′ bears in the threaded partition between the two chambers.

A key way *i* is provided in the adjusting screw, within which a pin slides as the screw is raised or lowered by the nut I^4, thus preventing the turning of the screw and forcing it to rise or fall vertically.

I^5 is a cap inclosing the second chamber I^2, so as to make a tight joint between the chamber I and the external air. Immediately below the pressure chamber I is a valve chamber within which reciprocates a double-ended valve K^3; the two seating parts of this valve are shown at K′, K^2, the lower valve K′ being larger than the upper, and being provided with an extension bearing within a cylindrical exhaust chamber K^4. Attached to the base of the valve is a lost motion connection K^5, presently to be described.

A second or check-valve M, more fully illustrated in Fig. 2, is provided in or controlling the pipe E^2; through the center of this valve M is a small perforation M′. The valve body is of polygonal form so as to be guided centrally to its seat, while it permits the air or fluid to pass freely by it when off its seat.

Its motion in its seat is checked at one end by the pin M^2.

Below the governor, as thus described, is an electro-magnetic safety attachment co-operating therewith and arranged to cut out the motor at certain times.

L^3 is a casing of iron within which the coil L^2 is passed, making it a powerful electro magnet; this coil is connected in any suitable circuit, as, for instance, in the field magnet circuit of the motor C, and between the trolley H′, and the ground H, and so long as the current is on, the coil energizes its core.

L is a rod attached to the valve K^3 by the lost motion connection K^5, consisting, as illustrated, of a collar and a pronged bearing piece; but any other form of lost motion connection may be employed in place of the one illustrated.

l shows the adjusting nuts arranged to give the rod L just the amount of motion necessary. L′ is a spring surrounding the rod and bearing on the armature L^4 of the electro-magnet.

L^5, L^5 are pins preventing the rotation of the armature.

The operation of our improved controller is as follows: As the pressure rises in the reservoir D, it also rises in the pressure chamber I, having free communication with the reservoir through the pipe E′ until it overcomes the spring I′ and forces down the valve K^3; the lower valve K′ being of slightly larger area than the valve K^2, tends to maintain its seat and admits pressure to the pipe E^2, displacing the check-valve M, bringing it against the pin M^2. The air then reaches the cylinder F and forces up the piston F′ against the pressure of the spring F^2, carrying the bridge piece G′ clear of the rheostat contacts, or to the end of the resistance, cutting it all in circuit. The piece G′ might also open an ordinary open-circuiting switch by its movement with certain types of motors used at C. The motor is cut out of circuit or its rotation slowed down. As the air is released from the reservoir D, the pressure falls, and the valve K^3 resumes its seat, closing access to the cylinder F. The air or fluid in the cylinder F then passes slowly back through the perforation M′ in the check-valve into the valve chamber and out through an exhaust passage O, shown in dotted lines. The piston F′ then slowly settles under the force of the spring F^2 and the resistance is withdrawn, thus again starting up the motor and pump. Should the trolley jump the wire, or should a fault occur in the line, cutting off the current from the motor, the arrangement thus described would not operate to cut it out of circuit, and when the current again came on, the motor having stopped and being left, possibly, with no resistance in circuit and with no counter electro-motive-force to protect it, the current would be likely to melt the motor fuse every time the trolley was placed upon the wire, or it might injure the motor windings by overheating. It is here that the electro-magnetic safety attachment which we have devised comes into play.

The armature L^4 is, so long as current is passing, attracted by the electro-magnet L^3 and does not interfere with the operation of the fluid pressure mechanism upon the occurrence of the variations in pressure in the reservoir; but when from any cause the current ceases, the spring L′ forces the armature away from the magnet, drawing down the valve K^3 and opening the motor circuit or inserting a maximum resistance, so that when the trolley is placed on the wire or the current is again turned on, the motor will be fully protected. It is of course preferred to have the bridge piece G′, in its upward movement, entirely open the circuit through the motor C, but in case a sufficiently high resistance is used in the rheostat the limit of movement of the bridge piece G′ could be its position across the end contacts, as shown in the drawings. In case, also, the motor had a very high self-induction which would prevent a sudden rush of current through it, a simple switch could be used instead of the rheostat, but the construction illustrated is the one preferred.

Many changes might be made in our invention without altering its scope.

What we claim as new, and desire to secure by Letters Patent of the United States, is—

1. In combination, an electric motor, a variable resistance in the circuit thereof, a pump actuated by the motor, a reservoir, a piston actuated by the compressed air and arranged to short-circuit variable parts of the resistance in accordance with its position, a valve adapted to open suddenly when a determinate pressure is reached and admit full pressure to the piston operating the resistance, and a check-valve in the pipe leading to the piston operating the resistance, such check-valve having a slight leakage.

2. An electric motor, a variable resistance in the circuit thereof, a pump actuated by such motor, a reservoir receiving the compressed air from the pump, a contact-piece arranged to vary the resistance, a piston actuating the contact-piece and itself actuated by the compressed air, a check-valve in the pipe supplying air to such piston, such check-valve having a slight leakage, a chamber having an adjustable valve therein controlling the access of air to another chamber and a differential piston in such other chamber adapted to open communication between the source of compressed air and the piston actuating the resistance.

3. In combination, an electric motor, a resistance in circuit therewith, an air pump actuated thereby, a reservoir for the compressed air, means actuated by the pressure in such reservoir adapted to suddenly increase the resistance in the motor circuit as the pressure rises and to diminish such resistance slowly as the pressure falls, and an electro-magnetic

device also in the motor circuit adapted to actuate such means when the current ceases, substantially as described.

4. An electric motor, a resistance in the circuit of such motor, an air pump actuated thereby, a reservoir for the compressed air, means actuated by the compressed air adapted to vary the resistance and suitable valves and valve chambers arranged as described to cause the air pressure to actuate such means suddenly when a determinate limit of pressure is reached and to permit a slow reversal of the operation as the pressure falls; in combination with an electro-magnetic device, comprising an armature having a lost motion connection with one of such valves and normally attracted by the electro-magnet against the force of a spring arranged, substantially as herein described, to open the valve when the current ceases.

5. In combination, an electric motor, a resistance in circuit with such motor, an air pump actuated thereby, a reservoir for the compressed air, means actuated by the pressure in such reservoir adapted to suddenly increase the resistance in the motor circuit as the pressure rises and to diminish such resistance slowly as the pressure falls, an electro-magnet in circuit with the motor, an armature normally attracted by such electro-magnet, a spring opposing the force of the electro-magnet, a lost motion connection between the electro-magnet and the valve controlling the fluid pressure, and an adjusting nut for the armature arranged to carry the amount of the lost motion; all arranged and adapted, substantially as herein described, to increase the resistance in circuit with the motor to a maximum upon the cessation of current.

6. In combination, a fluid reservoir, a pump, an actuating electric motor for said pump, a rheostat or switch in the circuit of said motor and an arm therefor connected to a movable fluid pressure device, connections between said device and the reservoir, and a controller in said connection responsive to the pressure in the reservoir for governing the action of said fluid pressure device.

7. In a fluid controller, the combination of an inclosing casing having a valve chamber and a pressure chamber or chamber connected with a fluid reservoir, a valve in the valve chamber having two seats of different area and adapted to connect said chambers together or to connect one chamber with the external air, a fluid motive device, and a connection between said valve chamber and the motive device.

8. In a fluid controller, the combination of the containing casing having two chambers, a valve therein having two seats of different areas and adapted to either connect said chambers together or to connect one chamber with the external air, and an adjustable retractile device, such as a spring, opposing the action of the fluid pressure upon said valve.

9. The combination with a fluid controller having a valve for opening and closing communication between a fluid reservoir and a fluid motive device, of an electro-magnetic mechanism for operating said valve through connections permitting the fluid pressure or said mechanism to move said valve independently of each other.

In witness whereof we have hereunto set our hands, at Lynn, Essex county, Commonwealth of Massachusetts, this 1st day of January, 1893.

CURTIS H. VEEDER.
EDWARD D. PRIEST.

Witnesses:
JOHN W. GIBBONEY,
BENJAMIN B. HULL.