F. J. PEARSON.

GOVERNOR OR REGULATOR.

APPLICATION FILED SEPT. 19, 1906.

947,686. **Patented Jan. 25, 1910.**

Fig. 2.

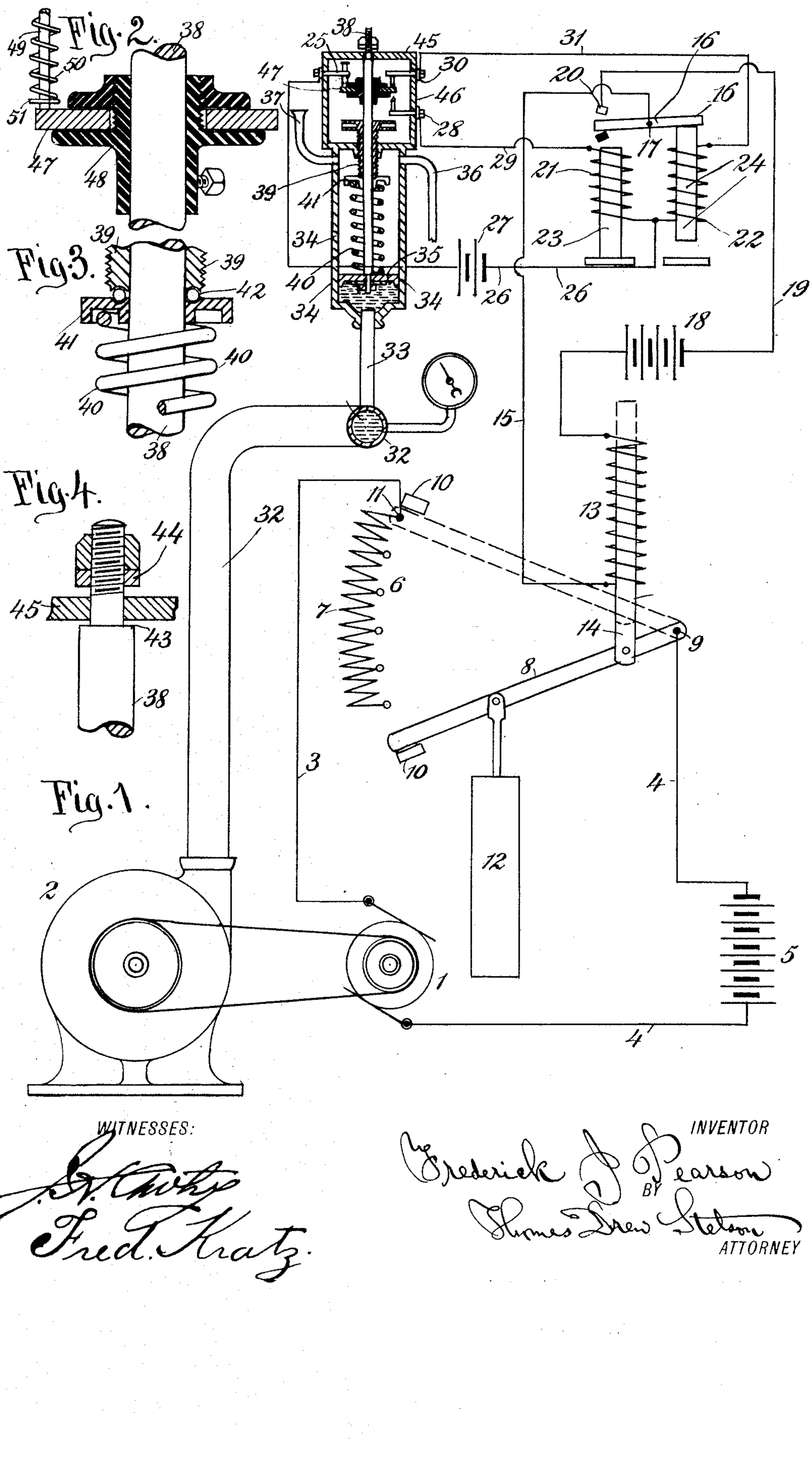

Fig. 3.

Fig. 4.

Fig. 1.

WITNESSES:

J. F. Hartz

Fred. Katz.

INVENTOR

Frederick J. Pearson

BY

Symmes Drew Stetson

ATTORNEY

UNITED STATES PATENT OFFICE.

FREDERICK J. PEARSON, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE FISHER GOVERNOR COMPANY, OF MARSHALLTOWN, IOWA, A CORPORATION OF IOWA.

GOVERNOR OR REGULATOR.

947,686. Specification of Letters Patent. Patented Jan. 25, 1910.

Application filed September 19, 1906. Serial No. 335,232.

To all whom it may concern:

Be it known that I, FREDERICK J. PEARSON, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Governors or Regulators, of which the following is a specification.

This invention relates to automatic means for controlling the operation of an actuator or prime mover. The particular embodiment herein shown comprises an electric motor arranged to drive a pump, and means responsive to variations in the pressure or quantity of the fluid being pumped, for starting or stopping the motor.

In the accompanying drawings, Figure 1 is a diagrammatic representation of one embodiment of the invention. Figs. 2, 3 and 4 are detail views upon an enlarged scale, Fig. 2 showing an electric contact device, Fig. 3 an antifriction device, and Fig. 4 a means for limiting the movements of one of the sliding parts.

As hereinbefore stated, the embodiment selected for illustration comprises a prime mover 1 shown as an electric motor, said motor being arranged to drive a pump 2 which for convenience is shown as of the rotary type. The power circuit comprises the wires 3 and 4, a suitable source of electrical energy 5 herein represented as a battery but which in practice would be a dynamo, and a rheostat 6 comprising, in this instance, a resistance 7 connected at one end with the wire 3, and a pivoted contact arm 8 connected at 9 with the wire 4 and adapted to oscillate between the fixed stops 10. The arm 8 is arranged to swing from a point out of electrical connection with the resistance 7, over said resistance to the terminal 11 of the wire 3. The arm 8 is provided with suitable means for retarding its circuit-closing movement, as, for example, a dash-pot 12. The contact arm 8 is arranged to be moved by suitable means herein shown as a solenoid 13, the core 14 of which is connected to the arm 8. When the solenoid 13 is energized, the arm 8 is moved from its circuit-opening position, over the resistance 7 to the terminal 11. When the solenoid 13 is de-energized the contact arm 8 moves to circuit-opening position by suitable means such as its own weight and the weight of the core 14. The circuit of the solenoid 13 comprises a wire 15 connected with a contact lever 16 which is represented as being pivotally mounted at 17, a source of electrical energy 18, and a wire 19 extending to a terminal 20. The lever 16 is arranged to oscillate into and out of contact with the terminal 20 to open and close the circuit of the solenoid 13.

The means herein illustrated for operating the contact lever 16 comprises two solenoids 21 and 22 provided with cores 23 and 24, each adapted to strike one end of the lever 16. The windings of the solenoids 21 and 22 are connected with a contact 25 through the medium of a wire 26, in which wire may be included a source of electrical energy 27. One end of the winding of the solenoid 21 is connected with a contact 28 by means of a wire 29, and one end of the winding of the solenoid 22 is connected with a contact 30 through a wire 31. The means for alternately opening and closing the circuits of the solenoids 21 and 22 is responsive to variations in the pressure or quantity of the fluid delivered by the pump 2. Said means will now be described.

32 32 represent portions of the system to which fluid is supplied by the pump 2. Connected with said system at any suitable point through the medium of a pipe 33 is a cylinder 34 provided with a piston 35, one face of said piston being exposed to the fluid pressure existing in the system. Preferably the piston 35 is arranged to move within the cylinder 34 with a minimum amount of friction. The piston 35 may be efficiently packed by means such as a cup leather (not shown), the peripheral edge of the leather being trimmed short so as to cause but little friction. A small amount of leakage past the piston 35 is not objectionable, and may be conducted away through the drain pipe 36. In view of the fact that such leakage will occur in practice and, by reason of its weight, will offer resistance to the upward movement of the piston 35, I preferably provide means for filling the cylinder 34 to the level of the drain pipe 36 when starting the apparatus in operation, such as a tube 37.

The piston rod 38 extends freely through a tubular adjusting screw 39 seated in one end of the cylinder 34. Surrounding the piston rod 38 is a coiled spring 40 interposed between the piston 35 and a collar 41 upon said rod. To obviate friction between the collar 41 and the screw 39 when the latter

is rotated to adjust the tension of the spring 40, I may provide a ball bearing 42 between said parts, as shown in Fig. 3. The movements of the piston rod 38 are preferably limited by suitable means such as a shoulder 43 and an adjusting nut 44 upon said rod, said shoulder and said nut being disposed at opposite sides of the cross-bar 45 of a frame 46 fixed to the cylinder 34. The frame 46 carries the contacts 25, 28 and 30 hereinbefore referred to. Upon the piston rod 38 is a contact 47 in constant electrical connection with the contact 25 and adapted to engage the contacts 28 and 30. As herein shown, the contact 47 consists of a ring of conducting material, such as silver, said ring being loosely mounted, so as to be free to turn, in an insulating member 48 fixed upon the piston rod 38. In the present construction the contacts 25 and 47 are maintained in electrical connection by means of a pin 49 slidably mounted in an opening in the one end of the contact 25, one end of said pin being held in contact with the ring 47 by means of a coiled spring 50 surrounding said pin and bearing at one end upon the contact 25 and at its other end upon a collar or equivalent device 51 upon the pin 49. The ring 47 may be turned at intervals by the attendant to prevent corrosion.

The piston 35 is moved in one direction by the pressure of the fluid in the system, and in the opposite direction by the spring 40. In Fig. 1, the contact 47 is represented in the position it occupies when the fluid pressure is at or near the predetermined maximum point, the power circuit is open and the motor 1 idle. As the fluid pressure in the system decreases, the spring 40 moves the contact 47 away from the contact 30, thereby opening the circuit of the solenoid 22, the core 24 of which moves out of engagement with the contact lever 16. When the fluid pressure has subsided to the predetermined minimum point the contact 47 engages the contact 28, closing the circuit through the solenoid 21, the core 23 of which is projected against the contact lever 16, tilting the latter into contact with the terminal 20, and thereby closing a circuit through the solenoid 13. The latter, attracting its core 14, swings the contact arm 8 across the resistance 7 to the terminal 11, thereby closing the circuit of the motor 1. The circuit-closing movement of the contact arm 8 is retarded by the dash-pot 12 in order to prevent the full strength of the current from being thrown upon the motor at once. The pump 2 is now actuated until the increasing pressure in the system causes the contact 47 to rise into engagement with the contact 30, whereupon the circuit is closed through the solenoid 22, the core of which operates the contact lever 16 to open the circuit of the solenoid 13, and thereby open the power circuit.

I claim as my invention:

1. In a controller, a frame, a longitudinally slidable rod in said frame, a contact on said frame, a contact on said rod, a spring interposed between said contacts for maintaining electrical connection between them, and two contacts on said frame adapted to be alternately engaged by the contact on the rod.

2. The combination of a prime mover, means for cutting off and permitting the flow of energy to said prime mover, electrical means for actuating the last mentioned means, two devices for operating said electrical actuating means, each of said devices comprising a solenoid, a pivoted lever arranged to be struck alternately by the cores of said solenoids, said lever being arranged to open and close the circuit for said electrical actuating means, and means for alternately opening and closing the circuits for said solenoids.

3. In a regulator, a cylinder, a piston, a piston rod, a spring, a tubular adjusting screw inclosing the piston rod, and an anti-friction connection between the screw and the spring.

4. In a fluid-pressure-actuated controller, in combination, a cylinder; a piston; a piston rod attached to said piston; a tubular adjusting screw supported in one end of said cylinder, said rod extending through said screw; a collar loosely mounted on said rod; a spring interposed between said piston and said collar; and a ball bearing between said screw and said collar.

Signed at Chicago in the county of Cook and State of Illinois this 7th day of Sept. A. D. 1906.

FREDERICK J. PEARSON.

Witnesses:

C. D. MARSHALL,

G. W. HUBBARD.