No. 864,344. PATENTED AUG. 27, 1907.

S. B. STEWART, JR.

FLUID PRESSURE SYSTEM.

APPLICATION FILED MAY 20, 1903.

Fig. 1.

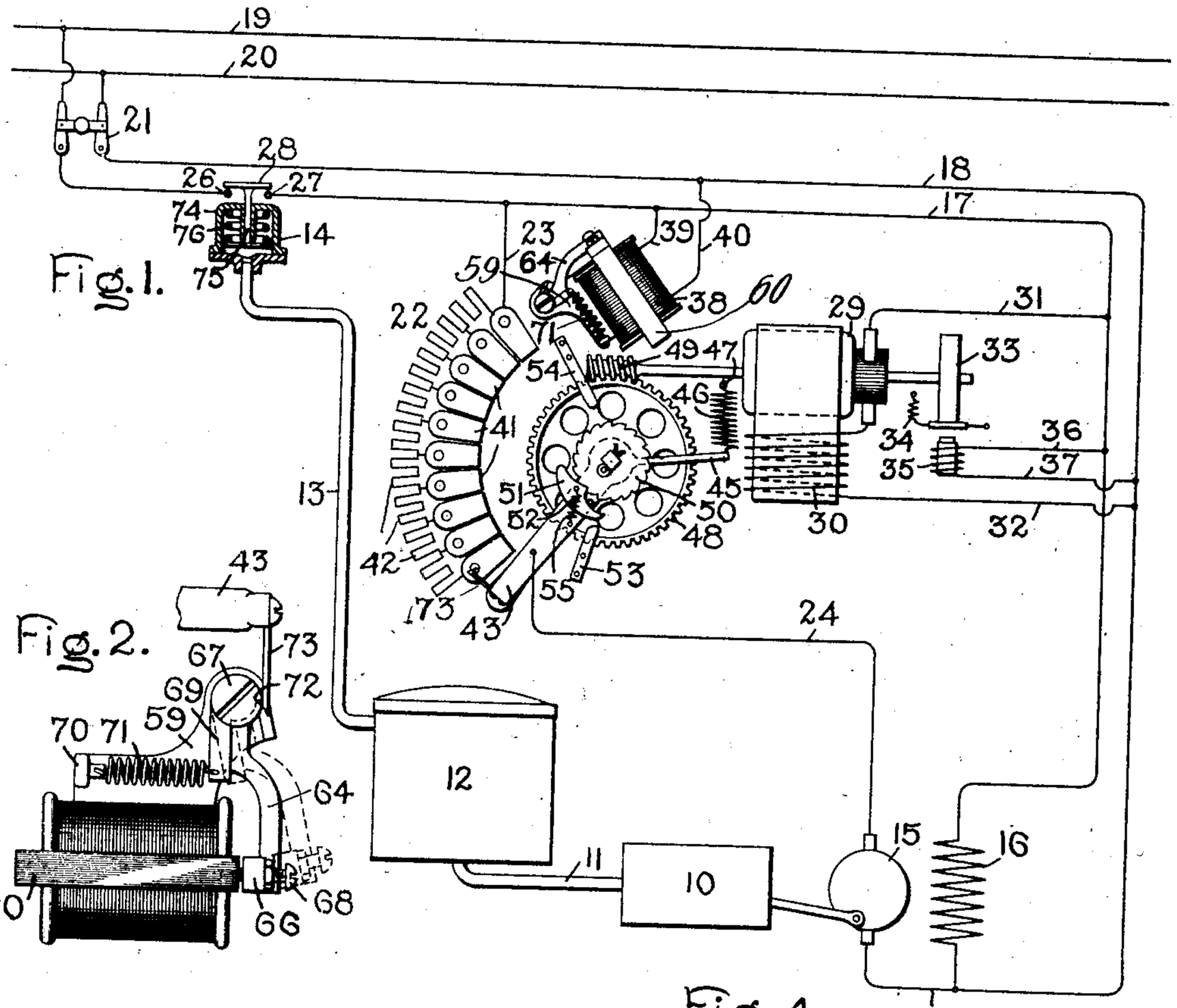


Fig. 2.

Fig. 3.

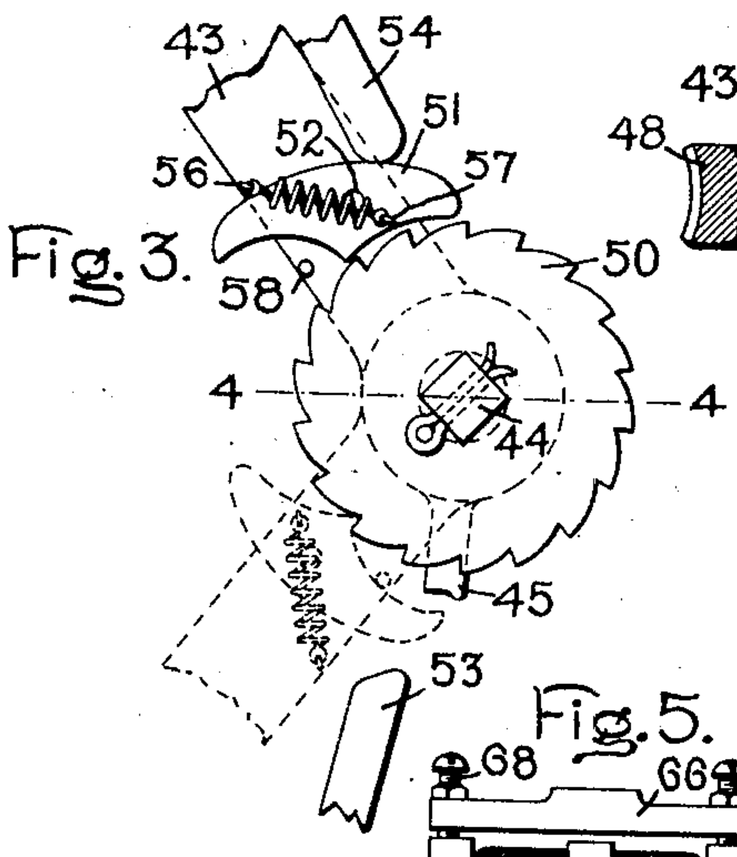


Fig. 4.

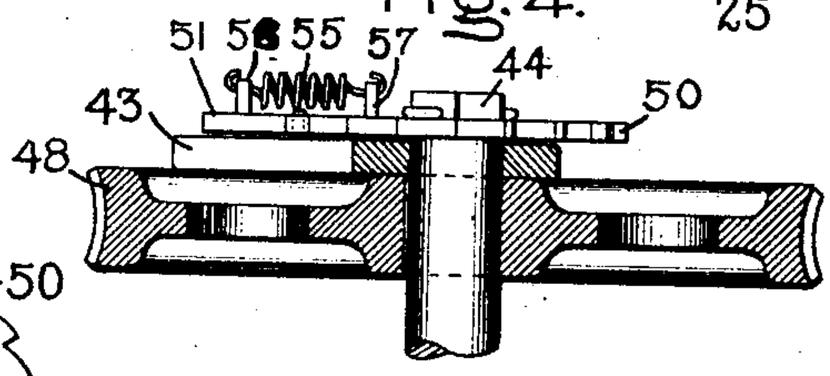


Fig. 5.

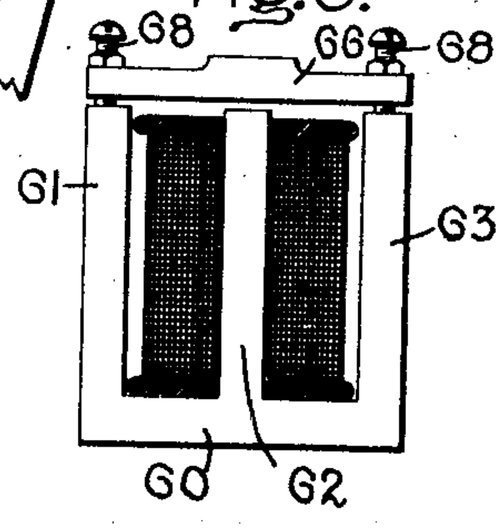
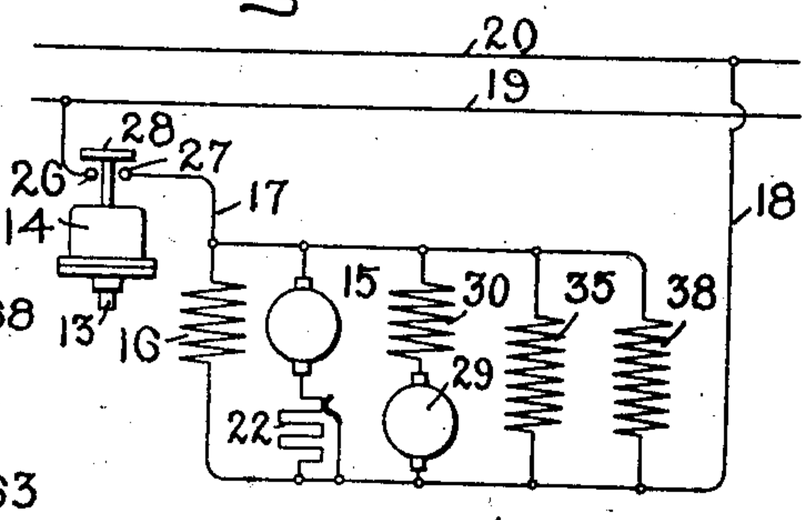


Fig. 6.



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UNITED STATES PATENT OFFICE.

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FLUID-PRESSURE SYSTEM.

No. 864,344. Specification of Letters Patent. Patented Aug. 27, 1907.

Application filed May 20, 1903. Serial No. 157,908.

To all whom it may concern:

Be it known that I, SAMUEL B. STEWART, Jr., a citizen of the United States, residing at Schenectady, in the county of Schenectady and State of New York, have invented certain new and useful Improvements in Fluid-Pressure Systems, of which the following is a specification.

My invention relates to improvements in fluid-pressure systems, such as air-brake systems, in which the fluid is compressed by a compressor actuated by an electric motor and is maintained in a stored-up condition at practically constant pressure by means which operate automatically to start the compressor-driving motor when the fluid pressure in the system falls below a predetermined point and which automatically stop said motor when a predetermined pressure is reached and it has reference particularly to the general combination of the parts and to a novel form of power-driven rheostat which is used in connection with the compressor-driving motor.

The features and advantages of my invention will be best understood by reference to the following description taken in connection with the accompanying drawing in which

Figure 1 is a general diagram of a system constructed and arranged in accordance with my invention; Fig. 2 is a side elevation of the rheostat arm retaining magnet; Fig. 3 is a plan of the rheostat arm, pawl and ratchet clutch mechanism; Fig. 4 is a section of such mechanism taken on the line 4—4 of Fig. 3 and showing in addition the gear wheel which operates in conjunction therewith; Fig. 5 is an end view of the retaining magnet shown in Fig. 2; and Fig. 6 is a simple diagram illustrating the electrical connections of the parts.

Referring more in detail to this drawing, in which like characters refer to like parts throughout the several views, 10 designates a compressor which is suitably connected by a pipe 11 to a main reservoir 12 which is adapted to hold a supply of air under pressure. The pipe 13 leads from the reservoir 12 to a governor 14. The compressor 10 is geared to the armature 15 of a shunt motor whose field 16 is bridged directly across the supply leads 17, 18 which connect with the supply mains 19 and 20 respectively through the switch 21. The armature 15 and the resistance of a starting rheostat 22 which are adapted to be connected in series, are bridged between the supply leads 17 and 18 through the agency of the connecting wires 23, 24 and 25. The lead 17 is broken at a point between the switch 21 and the point at which the wire 23 is connected thereto and at such break is provided with contacts 26 and 27 which are adapted to be electrically connected by the contact 28 of the governor 14 when the fluid pressure in the system falls below that for which the governor has been set. The rheostat 22 is driven by a pilot motor whose armature 29 and field 30 are connected in series between the supply leads 17 and 18 through the connecting wires 31 and 32. A brake 33 is mounted on one end of the pilot motor shaft and, through the agency of the spring 34 and the magnet 35, is adapted to stop the rotation of said shaft when the motor current is cut off. The coil of the magnet 35 is connected between the leads 17 and 18 by the wires 36 and 37. The coil 38 of the arm retaining magnet of the rheostat 22 is also connected between said leads 17 and 18 by the wires 39 and 40.

The rheostat 22 consists essentially of a range of resistance-varying contacts 41 connected to suitable resistances 42, an arm 43 adapted to sweep over said contacts and progressively engage the same, gearing including clutch mechanism for moving said arm over the contacts, means for unclutching said arm when it is moved to the last of said contacts, and a retaining magnet for holding the arm in this position. The contact engaging arm 43 is rotatably mounted upon the shaft 44 and is held in the "off" position as illustrated in Fig. 1 through the agency of an arm 45 and a coiled spring 46 which has one end secured to said arm and the other end to the fixed pin 47. Keyed to the shaft directly below the brush 43 is a worm-gear wheel 48 with which the worm 49 on the pilot motor shaft is adapted to engage. The pilot motor is connected so as to give said gear wheel 48 a clockwise rotation. Directly above the brush 43 and firmly secured to the squared end of the shaft 44 is a ratchet wheel 50 with which the pawl 51 pivoted at the point 52 is adapted to engage. This pawl and ratchet wheel serve as a clutch for connecting the arm 43 with the gear-wheel 48. Suitable stops 53 and 54 project into the path of the pawl 51 and by engagement with it throw it into or out of engagement with the ratchet wheel 50. The pawl 51 is held in either of its extreme positions by a spring 55 which has one end secured to a pin 56 in the arm 43 and its other end to a pin 57 in the pawl. The location of the pins 56 and 57 with reference to the pivot 52 of the pawl is such that the center line of the spring 55 is moved from one side of said pivot to the other over dead center when the pawl is moved from either extreme position to the other. A stop 58 upon the arm 43 coöperates with the pin 56 to limit the movement of the pawl 51 in either direction. When the arm 43 is brought to the position illustrated in Fig. 1 and in dotted lines in Fig. 3, the lower end of the pawl 51 engages the stop 53 and the pawl is thrown into engagement with the ratchet wheel 50. If this operation takes place while the gear wheel 48 is rotating, the arm 43 will be carried over the contacts 41 until the pawl comes into engagement with the stop 54. This engagement of

the pawl 51 and stop 54 disengages the pawl from the ratchet wheel and unless otherwise restrained the arm 43 would immediately return to its initial position because of the tension of the spring 46. In order to prevent the arm 43 from returning to this position a retaining magnet is employed. This magnet consists essentially of the coil 38, a frame 59, and a yoke 60 secured to said frame and having suitable pole-pieces 61, 62 and 63. A latch 64 is secured to the armature 66 at one end and is mounted on a pivot 67 in the frame 59 at its outer end. The armature 66 is provided with screws 68 at its opposite ends which are adapted to engage with the pole-pieces 61 and 63 to prevent sticking of the armature. The latch 64 is provided with a projection 69 between which and the projection 70 on the frame 60 is a coiled spring 71. A groove in the latch 64 concentirc with the pivot 67 terminates in a shoulder 72 which is adapted to be engaged by a spring catch 73 mounted on the outer end of the arm 43. The location of the spring 71 is such as to assist the magnet, and its tension is sufficient, together with the magnet pull, to hold the latch 64 in the full line position of Fig. 2 against the pull exerted upon the arm 43 by the spring 46; but when the magnet is deënergized the tension of the spring is insufficient to hold the latch in said full line position.

The governor 14 previously referred to consists essentially of an inclosing casing 74, a piston 75 located therein, a contact 28 secured to said piston 75, fixed contacts 26 and 27 adapted to be engaged by said contact 28, and a spring 76 compressed between the piston 75 and the casing 74. The pipe 13, connected to the lower end of said casing, affords communication between the reservoir and the under side of the piston 75 so that compressed air from said reservoir may act on the piston to move it against the force of the spring 76. Said spring, when not opposed, forces the piston 75 so as to bring its contact 28 into engagement with the contacts 26 and 27. An increase in the pressure of the air in the reservoir sufficient to overcome the spring 76 will break the circuit at the contacts 26 and 27 by forcing the piston 75 and its contact arm 28 upward.

Assuming that the pressure in the reservoir 12 is that of atmosphere and that it is desired to set the system in operation, the switch 21 will first be thrown so as to connect the leads 17 and 18 to supply mains 19 and 20. For this condition of pressure in the reservoir 12, the contacts 26 and 27 will be connected by the contact 28 of the governor 14 and current will immediately pass through the retaining magnet coil 38, the pilot motor, the coil of the brake magnet 35 and the field 16 of the compressor-driving motor. The effect of the current in the coil 38 will be to draw the armature 66 down against the pole-pieces 61, 62, 63 into the full line position of Fig. 2. The passage of the current through the coil of the magnet 35 will release the brake 33 and the passage of the current through the pilot motor will start it to operate the rheostat. Since at the beginning of the operation the rheostat arm 43 is in the position illustrated in Fig. 1, the rotation of the shaft 44 through the agency of the worm gearing will cause the ratchet wheel 50 to rotate and carry the arm 43 with it so as to first close the circuit between the leads 17 and 18 through the armature 15 and the resistance 42 of the rheostat and gradually cut out said resistance until the arm reaches its extreme upward movement. When the arm 43 reaches its extreme upward position, which is that illustrated in full lines in Fig. 3, the pawl 51 is automatically disengaged from the ratchet wheel 50 which continues to rotate, but said arm is prevented from returning to its starting position by the engagement of the spring catch 73 with the shoulder 72 of the latch 64 of the retaining magnet. Thus the compressor-driving motor is started and continues to rotate until the pressure in the main reservoir is sufficient to actuate the governor 14 to break the circuit through the lead 17 at the contacts 26 and 27. As soon as the current is cut off by this action, the coil 38 of the retaining magnet is immediately deënergized and the spring 46 being held under strain exerts a pull through the arm 43 and catch 73 upon the shoulder 72 sufficient to overcome the opposing pull of the spring 71 and to move the latch 64 to the dotted line position of Fig. 2 and thereby release said catch 73. As soon as the catch 73 slips off of the shoulder 72, the latch 64 is relieved of the strain brought upon it by the spring 46 and therefore is returned to the full line position of Fig. 2 by the spring 71 as indicated in Fig. 1. The action of the spring 46 being then unrestrained, the arm 43 is drawn back over the contacts 41 to its starting position. This movement of the arm is brought to a sudden stop by the engagement of the pawl 51 with the ratchet wheel 50 through the agency of the stop 53 in the manner previously described. The cutting off of the current also deënergizes the coil of the brake magnet 35 so that the brake 33 is applied through the agency of the spring 34 to stop the rotation of the pilot motor shaft before the arm 43 has reached its initial position. This is necessary, since if the ratchet wheel 50 were rotating at the time the arm 43 reached its initial position, said arm would be immediately carried back so as to close the armature circuit through more or less of the resistance 42. The position of the parts at this point of the operation is that illustrated in Fig. 1 of the drawing. As soon as the pressure in the reservoir falls off for any reason, the governor 14 is immediately actuated to close again the circuit at the contacts 26, 27 and the operation just described is repeated.

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

1. In a fluid-pressure system, the combination of a motor, a rheostat for starting said motor, a pilot motor for operating said rheostat, an electromagnetic catch for locking said rheostat independently of the motor, supply circuits for said motors and said catch, and automatic means for controlling said supply circuits upon a variation of fluid pressure in the system.

2. In a fluid-pressure system, the combination of a compressor for supplying compressed fluid to said system, a motor for driving said compressor, a rheostat for starting said motor, a pilot motor for operating said rheostat, an electromagnetic catch for locking said rheostat independently of the motor, supply circuits for said motors and said catch, and a governor controlled by variations of fluid pressure in said system for controlling the supply circuits.

3. The combination of a motor, a rheostat for starting said motor, a pilot motor for operating said rheostat, an electromagnetic catch for locking said rheostat independently of the motor, supply circuits for said motors and said catch, and a governor controlled by variations of fluid pressure in said system for controlling the supply circuits, said rheostat comprising a series of resistance-varying contacts, an arm adapted to progressively engage

the same, means geared to said pilot motor for moving said arm in one direction, and additional means for moving said arm in the opposite direction.

4. In a rheostat, the combination of a range of resistance-varying contacts, an arm adapted to progressively engage the same, a rotatable member, mechanical clutching means for connecting and disconnecting said arm and rotatable member, and means dependent upon the location of said arm for automatically operating said clutching means.

5. In a rheostat, the combination of a range of resistance-varying contacts, an arm adapted to progressively engage the same, a rotatable member, mechanical means for clutching the arm to said member to carry said arm in one direction, a spring for moving the arm in the opposite direction, and means dependent upon the location of said arm for automatically operating the clutching means.

6. In a rheostat, the combination of a range of resistance-varying contacts, an arm adapted to progressively engage the same, a rotatable member, a pawl and ratchet mechanism for connecting and disconnecting said arm and rotatable member, means for moving the pawl of said mechanism into and out of engagement with its ratchet when said arm reaches certain predetermined positions, and means for returning said arm when the pawl is out of engagement with said ratchet.

7. In a rheostat, the combination of a range of resistance-varying contacts, an arm adapted to progressively engage the same, a ratchet wheel, a pawl mounted on said arm and adapted to engage said ratchet wheel to carry said arm in one direction, means for moving said pawl into engaging and disengaging positions, and means for returning said arm when said pawl is in disengaging position.

8. In a fluid-pressure system, the combination of a shunt-wound motor, a starting rheostat for said motor having its resistance arranged to be connected in series with the motor armature, a retaining magnet for said rheostat, a series motor for driving said rheostat; the shunt motor field, the shunt motor armature and rheostat resistance, the retaining magnet coil, and the series motor being connected in parallel; and a fluid-pressure governor in series with said parallel branches.

9. In a fluid-pressure system, the combination of a compressor, a shunt wound motor for driving said compressor, a rheostat having its resistance arranged to be connected in series with said motor armature, a retaining magnet for said rheostat, a series motor for operating said rheostat; the shunt motor field, the shunt motor armature and the rheostat resistance, the retaining magnet coil, and the series motor being connected in parallel; and a fluid-pressure governor connected in series with said parallel branches and responsive to variations of fluid pressure in said system to open and close the circuit therethrough.

10. In combination, a series of resistance-varying contacts, an arm adapted to progressively engage the same, a motor, mechanical clutching means for connecting and disconnecting said arm and motor, means for closing said clutch at one extreme position of said arm and for opening it at the other extreme position, means for returning said arm to starting position when free, an electrically-actuated catch for holding said arm in the position in which it is when first unclutched, and means for immediately stopping the motor when the electrically-actuated catch is released.

In witness whereof, I have hereunto set my hand this 18th day of May, 1903.

SAMUEL B. STEWART, JR.

Witnesses:
BENJAMIN B. HULL,
HELEN ORFORD.