

No. 850,081.

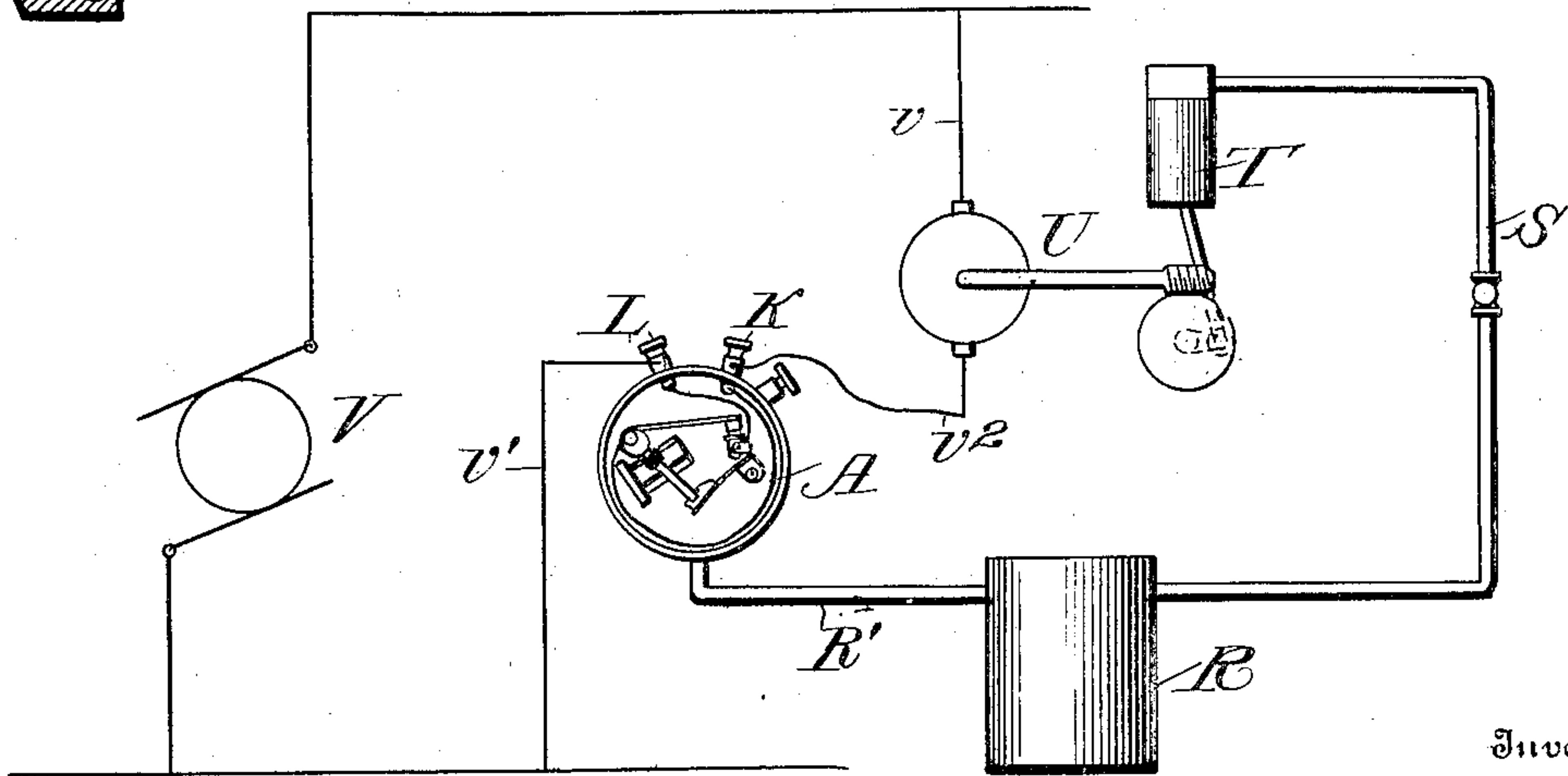
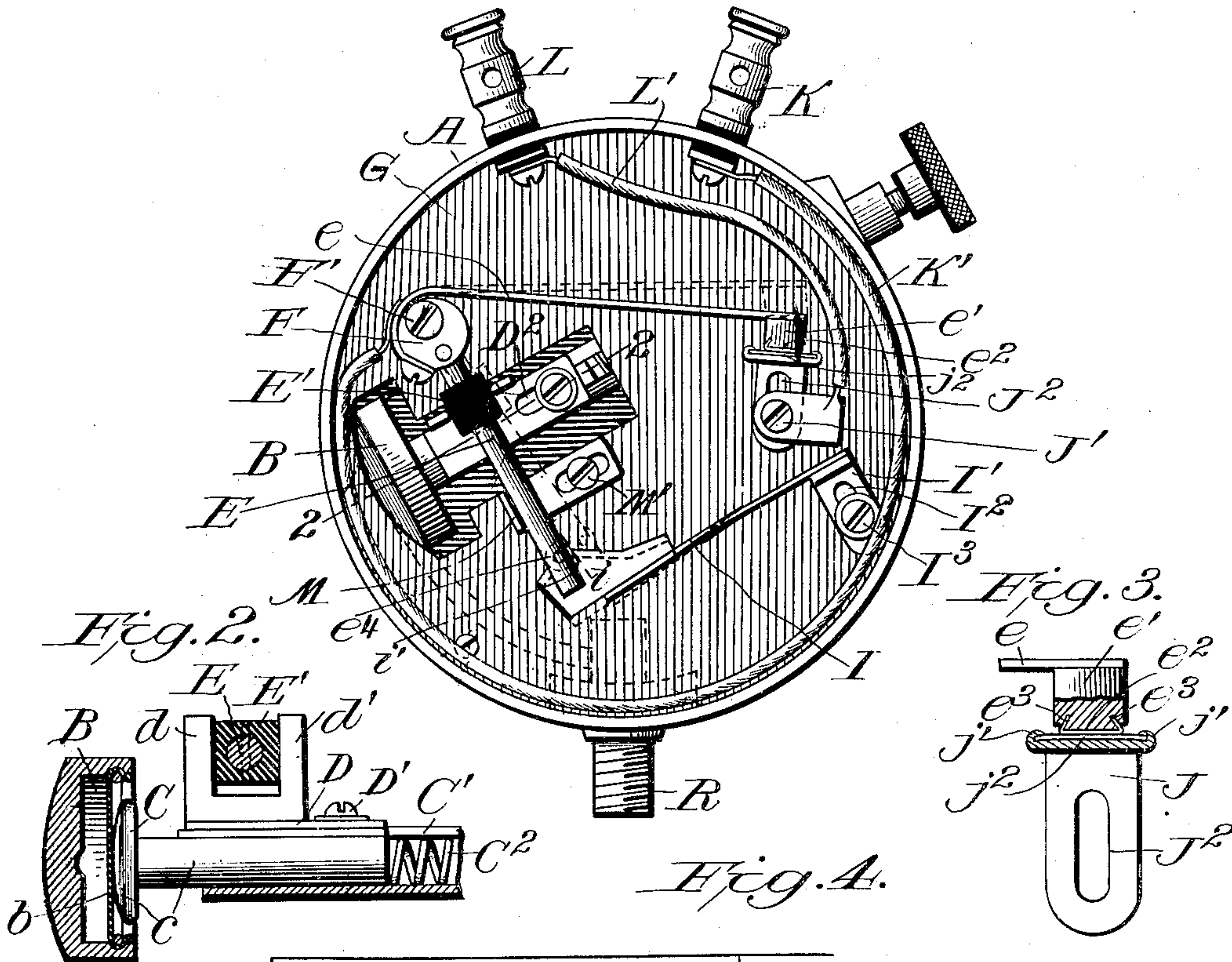
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L. H. WESTPHAL.

AUTOMATIC PRESSURE CONTROLLED ELECTRIC SWITCH AND AIR GAGE.

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Fig. 1.



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By

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# UNITED STATES PATENT OFFICE.

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AUTOMATIC PRESSURE-CONTROLLED ELECTRIC SWITCH AND AIR-GAGE.

No. 850,081.

Specification of Letters Patent.

Patented April 9, 1907.

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*To all whom it may concern:*

Be it known that I, LOUIS H. WESTPHAL, of Davenport, in the county of Scott and State of Iowa, have invented certain new and useful Improvements in Automatic Pressure-Controlled Electric Switch and Air-Gages; and I hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, which form part of this specification.

This invention is an improvement in automatic pressure-controlled electric switches and air-gages of the type shown in the patent to Pugh, No. 765,040, of July 12, 1904.

The device is particularly adapted for use in connection with electrical pumps for compressing air or other fluids under pressure and is designed to throw the pumps into or out of action, according as the pressure falls below or rises above the desired point, thus maintaining a practically uniform or constant pressure at all times and economizing power by only operating the pumps when the supply of compressed fluid falls below the desired minimum.

The objects of the present invention are to make the switch more sensitive and certain in action, to render it less liable to arc, and to have it close or open the circuit with a snap motion, so that when the pressure rises above the desired point the circuit will be broken instantaneously and if the pressure falls below the desired point the circuit will be closed instantaneously, thus preventing erratic and uncertain actions of the electrical apparatus which controls the air-pressure and also to prevent the air-gage from becoming charged with electricity when the current is on.

The invention will be thoroughly understood from the following description of the apparatus, illustrated in the drawings, and the novel features are summarized in the claims.

In said drawings, Figure 1 is a rear view of the gage with cover removed, showing the operative parts controlling the electrical switch and showing said switch closed in full lines and open in dotted lines. Fig. 2 is a detail section on line 2-2, Fig. 1. Fig. 3 is a detail sectional view, enlarged, showing the construction of the contacts. Fig. 4 is a diagram

of the complete apparatus, showing the electrical and pneumatic connections.

In the drawings, A designates a pneumatic or fluid-pressure indicator of the ordinary type, communicating with an air-reservoir R through a pipe R' in the usual manner, so as to be subject to the pressure in the reservoir. In this indicator is a chamber B, which is in communication with the air-pipe R', and in chamber B is a diaphragm *b*, pressed upon by a plunger C, attached to a stem *c*, working in a slotted cylinder C' and pressed inward by a spring C<sup>2</sup>. As these parts are substantially like those described in the aforesaid patent to Pugh and operated as described in said patent, a detailed description and illustration thereof is not required herein.

To the stem *c* of the plunger is attached a plate D by means of a screw D', which passes through a slot D<sup>2</sup> in plate D, so as to allow a certain adjustment of the plate on the stem. Plate D has two upstanding fingers *d* and *d'*, which embrace between them a block E', of insulating material, fast on an arm E, secured at one end on a block F, which is pivotally attached to an insulated plate G (secured in the casing of the gage) by means of a screw F'. The arm E at its free end is slotted to embrace the beveled edge of an enlargement or block *i*, attached to a spring I, fixed to a bracket I', which bracket is adjustably attached to the plate G by means of a slot I<sup>2</sup> and screw I<sup>3</sup>, as shown. The enlargement *i* has a notch *i'* in it, which is adapted to be engaged by a friction-roller *e*<sup>4</sup> in the slotted end of arm E when the switch is closed and hold the switch closed until the roller is forced out of the notch, as hereinafter described. The rearward swing of the arm E is limited by a bracket M, attached to the plate G by a screw M', as shown.

To the block F is also attached a brass spring *e*, which swings with the arm and has on its outer end a head *e'*, to which is attached a platinum contact-strip *e*<sup>2</sup>, which is secured by placing its ends in oppositely-inclined slots *e*<sup>3</sup> in opposite sides of the head and then squeezing the sides of the head, so as to close the slots on the strip, thus fastening the strip to the head without necessarily using solder and forming a large contact-surface. The opposite contact-strip *j*<sup>2</sup> is also preferably made of platinum and is attached



to a bracket J, adjustably secured to plate G by means of a bolt J', passing through a slot J<sup>2</sup> in the bracket. This bracket J is preferably of brass and is provided with lugs j on its upper surface, between which the contact j<sup>2</sup> is placed and secured by bending down or closing over the lugs j' thereon, as shown more clearly in Fig. 3 of the drawings.

One of the binding-posts K is connected by a wire K' to the spring e, the wire being preferably soldered to the spring; so that the current will not pass to or through the pivot-block. The other binding-post L is connected by a wire L' to the bracket J', as shown. The circuit therefore would be from post K through wire K' to spring e and contacts e<sup>2</sup> j<sup>2</sup>, brackets J, and wire L' to post L, provided the contacts are closed; but if they be separated of course the circuit is broken, and no current would pass.

When the pressure in the reservoir R falls below the desired point, the spring C<sup>2</sup> will force the plunger C inward, and in so doing finger d' will engage block E' and force arm E toward bracket M. The beveled edge of block i at this time, however, stands in the path of the arm E and will obstruct the free swing of the latter, so that not until spring C<sup>2</sup> through finger d exerts sufficient pressure on arm E to cause it to overcome the resistance of spring I and force arm E outward until roller e<sup>4</sup> enters notch i' will the contacts e<sup>2</sup> j<sup>2</sup> be brought together; but when spring C<sup>2</sup> does exert sufficient force to move roller e<sup>4</sup> into notch i' the movement occurs with a snap action, as is evident, and this movement causes spring-arm e to move contact e<sup>2</sup> quickly against contact j<sup>2</sup> and hold said contacts together, thus closing the circuit and keeping it closed until the pressure in the reservoir and cylinder B rises sufficiently to overcome the resistance of spring C<sup>2</sup> and moves the plunger outward until finger d engages block E' and tries to move the latter outward. The outward movement of the arm E, however, is opposed by spring I through the notch i, which is engaged by roller e<sup>4</sup> on arm E, and therefore pressure will accumulate against block E' through finger d' until it is sufficient to snap roller e<sup>4</sup> out of notch i', and when this occurs the contact e<sup>2</sup> is instantly thrown away from contact j<sup>2</sup> and kept away from the latter by reason of the beveled edge of block i' engaging roller e<sup>4</sup>. Thus the circuit may be instantaneously broken and held open until the pressure in the reservoir falls so much that spring C<sup>2</sup> swings arm E back into engagement with notch i', as above described.

From the foregoing it will be seen that the switch is opened and closed instantly with a snap action, thus avoiding the possibility of arcing; that the motors are caused to operate positively, if at all, and one only thrown into

action when there is a sensible decrease in the pressure.

The spring I can be regulated by adjusting bracket I' so that the amount of pressure necessary to snap arm E into or out of notch i' can be measurably regulated thereby, as well as by adjusting plate D on the stem and by adjusting the tension of spring C<sup>2</sup>. The bracket M prevents too great outward movement of the arm E.

The connection and operation of the parts with the motor-pumps and compressors are shown diagrammatically in Fig. 4, in which R is the reservoir, connected by pipe S with the air-compressor T, which is operated by an electric motor U, connected by wire v to one pole of the electrical supply or generator V and by wire v<sup>2</sup> to one pole K of the gage, the other pole L of which is connected by wire v' to the other pole of the generator V, thus completing the electrical circuit. The particular construction of the reservoir, pump, and generator are not claimed herein, and they may and will be varied to suit the particular user.

It will of course be understood that the invention is not limited to use in connection with air-compressors, but may be employed wherever it is desired to control an electric circuit by a fluid-pressure gage.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a fluid-controlled electric switch, the combination of a swinging arm, a contact connected with said arm, a fixed contact, a retaining device engaging the free end of said arm and adapted to hold it in closed position, and means for positively actuating said arm in both directions against the resistance of the retaining device, said means being controlled in one direction by fluid-pressure and in the opposite direction by a spring.

2. In a pneumatically-controlled electric switch, the combination of a pivoted swinging arm, a contact yieldingly connected with the pivoted end of said arm, a fixed contact, a notched spring engaging the free end of said arm and adapted to retain it in closed position, means controlled in one direction by pneumatic pressure and in the opposite direction by a spring for positively actuating said arm in both directions and overcoming the resistance of the spring, substantially as described.

3. In combination, a pivoted block, an arm attached thereto, a spring engaging the free end of said arm having a notch for locking said arm in closed position, a movable contact connected to said block; a fixed contact, a rod adapted to be moved in one direction by fluid-pressure and in the opposite direction by a spring; and fingers attached to said rod and projecting on opposite sides of



said arm, and adapted to move it against the resistance of said spring, substantially as described.

4. In combination, a swinging arm, a detainer-spring engaging said arm, a block on the detainer-spring for holding said arm in closed position, a spring attached to said arm; a movable contact carried by said spring, and a fixed contact; with a reciprocating rod adapted to be moved in one direction by fluid-pressure and in the opposite direction by a spring; and fingers attached to said rod and projecting on opposite sides of said arm, and adapted to move the arm against the resistance of the detainer-spring, substantially as described.

5. In a fluid-pressure electric switch, a pivoted arm, a movable contact yieldingly connected therewith; a fixed contact opposite said movable contact; and a spring having a block thereon engaging the free end of said arm to retain it in closed position; with a fluid-pressure chamber, a plunger operated in one direction by the fluid-pressure, a spring for retracting said plunger, fingers attached to said plunger, an insulated block on said arm between said fingers whereby the switch is snapped open when the pressure on the plunger forces the arm out of the notch and is snapped closed when the pressure forces the arm into the notch.

6. In a pressure-controlled electric switch, the combination of a relatively fixed contact, a movable contact mounted on a spring, a pivoted block to which said spring is attached, an arm attached to said block; a notched block adapted to engage the free end of said arm; a spring carrying said block; a reciprocating rod engaging an insulating block on said arm; a pneumatically-controlled plunger adapted to move said rod in one direction against the resistance of the notched block, and a spring for moving the rod in the opposite direction.

7. In a pressure-controlled electric switch, the combination of a relatively fixed contact, a movable contact mounted on a spring, a pivoted arm to which said spring is attached; an adjustable spring carrying a notched block adapted to engage the free end of said arm; a reciprocating rod, a pneumatically-controlled plunger adapted to move said rod in one direction, a spring for moving the rod in the opposite direction; an insulated block attached to said arm, and fingers attached to said rod and projecting on opposite sides of said insulated block, substantially as and for the purpose described.

8. The combination of a swinging arm having a slotted end, a detainer-spring engaging the slotted end of the arm, a fixed contact, a movable contact connected with said arm, and means controlled in one direction by fluid-pressure, and in the opposite direction by a

spring for actuating said arm against the resistance of the detainer-spring, substantially as described.

9. The combination of a swinging arm having a slotted end, a notched detainer-spring engaging the slotted end of the arm, an insulated block on the arm, a contact connected to said arm, a fixed contact; means for connecting said contacts to an electric circuit; with a movable stem adjacent the arm, a plate attached to said stem engaging the block thereon; means for moving said stem by pneumatic pressure in one direction, and a spring for moving the stem in the opposite direction whereby the resistance of the detainer-spring may be overcome and the switch opened and closed, substantially as set forth.

10. In an electric-switch contact, the combination of a metal head with a platinum contact-piece having its ends fastened in slots or incisions in the sides of the head, substantially as shown and described.

11. In an electric-switch, a contact-piece consisting of a brass head having oppositely-inclined slots in its opposite sides, with a contact-piece of platinum underlying the head and having its ends fastened in said slots by swaging, substantially as described.

12. In a fluid-controlled electric switch, the combination of a movable arm, a contact connected with said arm, a contact fixed relatively to the arm, a spring engaging the free end of said arm and adapted to retain it in closed position, and means for positively actuating said arm in both directions, said means being actuated in one direction by fluid-pressure and in the opposite direction by a spring.

13. In a pneumatically-controlled electric switch, the combination of a pivoted arm, a contact connected with said arm, a contact fixed relatively to the arm, a notched spring engaging the free end of said arm and adapted to retain it in closed position, and means actuated in one direction by pneumatic pressure and in the opposite direction by a spring for positively actuating said arm in both directions.

14. In combination, a swinging arm, a spring engaging said arm having a notch for locking said arm in closed position, a movable contact carried by said arm; a contact fixed relatively to the arm, a rod adapted to be moved in one direction by fluid-pressure and in the opposite direction by a spring; and fingers attached to said rod and projecting on opposite sides of said arm, for the purpose and substantially as described.

15. In combination, a swinging arm, a spring engaging said arm, a notched block on the spring for locking said arm in closed position, a spring attached to said arm and a movable contact carried by said spring; a contact fixed relatively to said arm, a reciprocating



rod adapted to be moved in one direction by fluid-pressure and in the opposite direction by a spring; and fingers attached to said rod and projecting on opposite sides of said arm, for the purpose and substantially as described.

16. In a fluid-pressure electric switch, a pivoted arm, a movable contact connected therewith; a fixed contact opposite said movable contact; a spring having a notched block thereon engaging the free end of said arm to hold it in closed position; a fluid-pressure chamber, a plunger adapted to be operated in one direction by the fluid-pressure, a spring for retracting said plunger, and devices attached to said plunger adapted to engage said arm on opposite sides, whereby the switch is snapped open when the pressure forces the arms out of the notch and is snapped closed when the spring forces the arm into the notch.

17. In a pressure-controlled electric switch, the combination of a fixed contact, a movable contact mounted on a spring, a swinging arm to which said spring is attached; a notched block adapted to engage the free

end of said arm; a spring carrying said block; a reciprocating rod adapted to actuate said arm, a pneumatically-controlled plunger adapted to move said rod in one direction, and a spring for moving the rod in the opposite direction.

18. In combination, a swinging arm, a spring engaging said arm, a notched block on the spring for locking said arm in closed position, a spring attached to said arm and a movable contact carried by said spring, a contact fixed relatively to said arm, a reciprocating rod adapted to be moved in one direction by fluid-pressure and in the opposite direction by a spring, a stop for limiting the spring-actuated movement of the rod, and fingers attached to said arm and projecting on opposite sides of said arm, for the purpose and substantially as described.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

LOUIS H. WESTPHAL.

In presence of—

H. A. CARSTENS,

OTTO ELMEGREEN.