No. 798,270. PATENTED AUG. 29, 1905.

E. H. DEWSON.

PRESSURE OPERATED ELECTRIC SWITCH.

APPLICATION FILED NOV. 2, 1901.

2 SHEETS—SHEET 1.

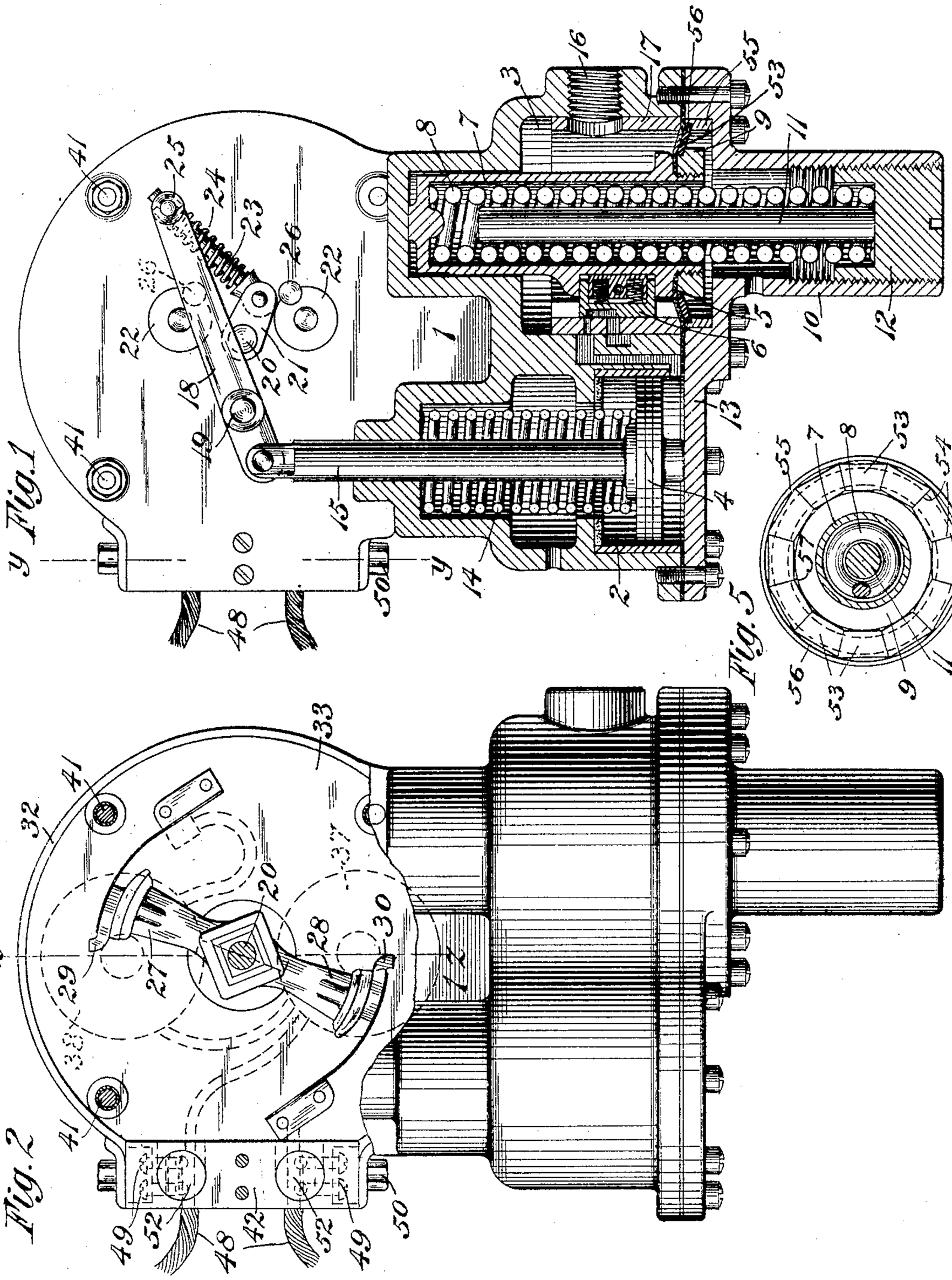

Fig. 1

Fig. 5

Fig. 2

WITNESSES:

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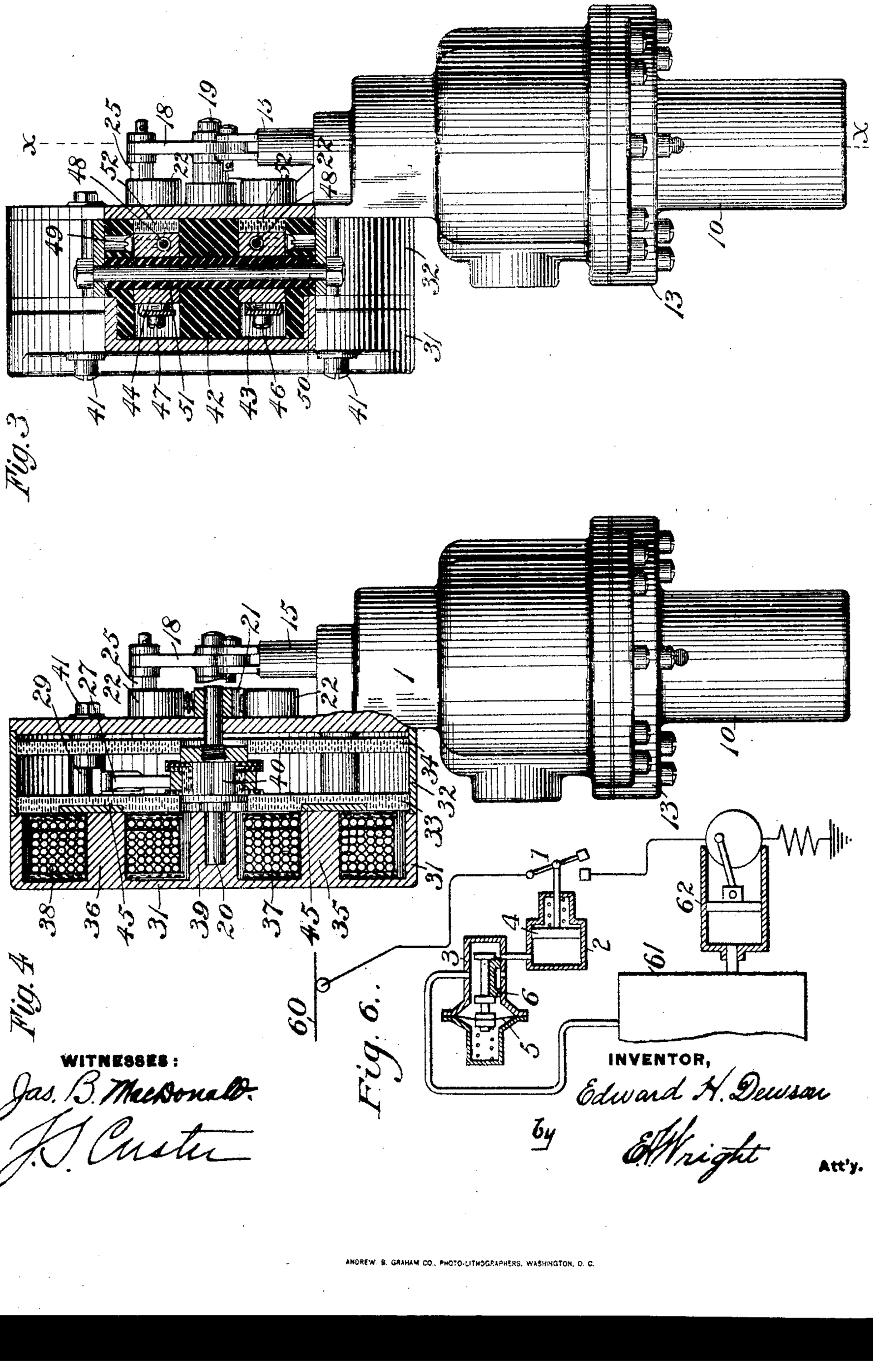

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UNITED STATES PATENT OFFICE.

EDWARD H. DEWSON, OF EDGEWOOD PARK, PENNSYLVANIA, ASSIGNOR TO STANDARD TRACTION BRAKE COMPANY, A CORPORATION OF NEW JERSEY.

PRESSURE-OPERATED ELECTRIC SWITCH.

No. 798,270. Specification of Letters Patent. Patented Aug. 29, 1905.

Application filed November 2, 1901. Serial No. 80,907.

To all whom it may concern:

Be it known that I, EDWARD H. DEWSON, a citizen of the United States, residing at Edgewood Park, county of Allegheny, State of Pennsylvania, have invented or discovered a certain new and useful Improvement in Pressure-Operated Electric Switches, of which improvement the following is a specification.

My invention relates to an electric switch which is adapted to be operated by fluid-pressure and is particularly designed to be used as a governor for an electric-motor-operated air-compressor, whereby the switch is actuated to close the circuit and start the motor when the air-pressure produced by the compressor is below a certain minimum and to automatically open the circuit and stop the motor when the air-pressure rises to a predetermined maximum.

The invention comprises an improved construction of switch and connections in which the parts are compactly arranged and thoroughly protected from dirt and the weather, so that the device may be employed in more or less exposed locations, such as electric cars, for governing electrically-operated air-pumps used in an air-brake system or for other purposes.

The invention also consists in an improved construction for preventing sparking at the switch contact-points at the time of opening or closing the circuit, comprising a novel arrangement of blow-out magnets and a connection between the pressure mechanism and the switch whereby the latter is thrown to either of its positions with a positive snap-like action.

Other novel features of the invention will hereinafter more fully appear from the following description.

In the accompanying drawings, which illustrate an embodiment of my invention, Figure 1 is a longitudinal section taken on the line *x x* of Fig. 3; Fig. 2, a side elevation, a part of the switch-casing being broken away to more fully show the contact-points of the switch and their connections; Fig. 3, a transverse section taken on the line *y y* of Fig. 1; Fig. 4, a transverse section of the switch-casing, taken on the line *z z* of Fig. 2, the pressure-cylinders being shown in elevation; Fig. 5, a detail view showing the means for supporting the pressure-diaphragm between its stem and the casing; and Fig. 6, a diagram showing a motor-driven air-compressor, main reservoir, and governor connected.

Referring to the drawings, the main casting 1 has formed therein two cylindrical chambers 2 and 3, one containing the operating-piston 4 and the other the pressure-actuated abutment, such as diaphragm 5, and its valve 6 for admitting pressure to and exhausting the same from beneath the piston 4. The cylinder 3 is adapted to be connected at the opening 16 with a pipe 60, leading from the reservoir 61 of the air-compressor 62, (see Fig. 6,) and also has a bushing 17, in which the slide-valve 6 is seated and adapted to be actuated by the hollow stem 7, secured to the diaphragm by means of the nut 9. The adjustable spring 8 bears at one end on the inner end of the hollow stem 7 and at its other end against the adjustable screw 12, threaded in a cylindrical extension 10 of the head or cover 13, which closes the ends of the cylinders 2 and 3. By adjusting the position of the screw 12 the tension of the spring 8 may be regulated, and when the stem 7 is at its inner position it rests against the end of the chamber 3, which acts as a stop for the spring and diaphragm. When the parts are in this position, the slide-valve covers the inlet-port from the diaphragm-chamber 3 to the cylinder 2, while the exhaust-cavity in the slide-valve connects said inlet-port with the exhaust-outlet, so that the spring 14 maintains the piston 4 at the lower end of its stroke. A rod 11 may be employed to guide and stiffen the coiled spring 8, if desired.

In order to support the diaphragm 5 on the side opposite the fluid-pressure and over the annular space between the nut 9 and the wall of the casing or cover, a bridge is provided, which is preferably composed of a series of thin metal strips 53, arranged, as shown in Fig. 5, with their outer edges resting in a groove 56 in bushing 55 and their inner edges supported on a flange or groove 57 of the nut 9, the meeting edges 54 of said strips being formed on radial lines. This arrangement does not interfere with the flexibility of the diaphragm, as the sections of the bridge are

loosely supported on the flanges or grooves and readily follow the movement of the diaphragm, while at the same time supporting the same against the high fluid-pressure on the opposite side, which might otherwise rupture the diaphragm at this point. This construction also provides for a considerable range of movement of the diaphragm and is particularly adapted to be used in connection with a slide-valve which requires a longer traverse to fully open and close its ports.

The upper end of the piston-stem 15 is pivotally connected to the lever 18, which is fulcrumed at 19 on the casting forming the back plate of the switch-casing, the said casing comprising the dish-shaped cover 31 for the blow-out magnet-coils and the separated insulating fiber disks 33 and 34, all of which are secured to the back plate by means of bolts 41 and the spring-band 32, which surrounds the space between the insulating-disks, in which space the switch contact-points are located. Separators of insulating material are sleeved upon the bolts 41 between the disks to rigidly support the same.

Secured to or cast integrally with the cover 31 are the inwardly-projecting cores 35 and 36 for the magnet-coils 37 and 38, respectively, and in the central boss 39 is journaled the rock-shaft 20, the other end of which passes through the back plate and is provided with the crank-arm 21. On the hub 40 of the shaft 20 is suitably mounted the movable member of the switch, having arms 27 and 28, adapted to make contact with the stationary fingers 29 and 30, respectively.

In order to secure a quick snap-like movement of the switch in making and breaking the circuit, the arm 21 is pivotally connected to a rod 23, the other end of which extends loosely through a ring or collar 25, pivotally connected to the end of the operating-lever 18, thus forming a toggle arrangement in which the main lever is adapted to move the end of the rod 23 over the line of the crank-arm 21. A coiled spring 24 is mounted on the rod 23 between the collar 25 and the head of the rod, and stops 22 are secured on the back plate of the casing to limit the movement of the crank-arm. Pins 26 are arranged on the stops 22 so as to act as fulcrums for the rod 23 and assist in starting the movement of the switch.

In a rectangular projection on the edge of the switch-casing is secured the terminal block 42, formed of vulcabeston or other insulating material, and having set in openings therein the brass plugs or binding-posts 43 and 44, one of these plugs being electrically connected at the binding-screw 46 with the switch contact-finger 30 and the other from binding-screw 45, through the electromagnet-coils, with the contact-finger 29, as clearly indicated in dotted lines in Fig. 2. The poles 35 and 36 of the electromagnet are arranged substantially opposite the contact-points 30 and 29, respectively, of the switch on the other side of the insulating-disk 33, and, if desired, small metal plates 45 may be employed at the ends of the poles to more advantageously direct the magnetic lines of force, the path of which will be from one pole across the intervening space to the back plate and from the back plate across to the other pole of the magnet.

The ends of the wires 48 of the motor-circuit are connected to the brass plugs by means of binding-screws 49, the heads of which are sunk in recesses in the ends of the block 42 and are covered by the flanged ends of the spring-band 32 when the same is clamped in position by the bolt 50, which passes through said flanges and the terminal block 42. As shown in Fig. 3, this rod also passes through the brass plugs 43 and 44, being insulated therefrom by the sleeve 51, of insulating material, which also holds the plugs securely in position. Other small insulating-disks, such as 52, may be placed over the ends of the brass plugs in the openings in the terminal block for the purpose of thoroughly insulating said plugs from the metal casing. By means of this construction a very tight and compact form of switch-casing is secured, and the only exposed openings into the terminal block are the two small holes into which are inserted the ends of the circuit-wires 48, while at the same time the binding-screws 49 and the main switch-contacts between the insulating-disks 33 and 34 are easily accessible by merely removing the bolt 50 and the spring-band 32.

The operation of my improved device is as follows: Supposing the switch to be closed and the parts in the positions shown in the drawings, then the motor will continue to operate the air-pump 62 until the pressure in the reservoir 61 and upon the diaphragm in the chamber 3 rises to a point sufficiently high to overcome the pressure of the regulating-spring 8. Then the slide-valve will be moved to uncover the inlet-port, admitting air under pressure to cylinder 2 and forcing up the piston 4 and stem 15 and compressing spring 14. This action causes the operating-lever 18 to turn on its fulcrum 19, carrying with it the end of the rod 23 and compressing the spring 24 until said rod comes in line with the arm 21 and bears on the fulcrum-pin 26, when the spring 24 immediately expands, throwing crank 21 over against the other stop 22 and the switch to its open position with a quick snap-like movement, whereby the tendency of sparking at the contact-points is greatly diminished and any small sparks that may occur are readily extinguished by the blow-out magnets. The circuit being thus broken the motor stops working until the air-pressure on the diaphragm has been

sufficiently reduced to allow the spring 8 to move the slide-valve to connect cylinder 2 with the exhaust. The spring 14 then moves the piston downward and turns the lever 18 back toward its first position, the spring 24 operating as before to quickly throw the switch to its closed position as soon as the rod 23 passes the line of the crank-arm 21 and bears against the fulcrum-pin on the corresponding stop 22. The current is then supplied to the motor and the air-compressor is again started working.

From this description it will be seen that I have provided a durable and compact pressure-operated governing-switch which has a positive and reliable action and is thoroughly protected from injurious effects of dirt and moisture.

While I have described the integral casting 1 as comprising the cylinders and the back plate of the switch-casing, it is obvious that these parts may be made separate, if desired, and secured together in any suitable manner. It will also be evident that various other changes in details and arrangement of parts may be made without departing from the spirit of my invention.

What I claim as new, and desire to secure by Letters Patent, is—

1. A pressure-operated switch, comprising an abutment exposed to fluid-pressure, a cylinder and piston, a slide-valve separate from but actuated by said abutment and adapted to admit fluid under pressure to and exhaust the same from said cylinder, a switch operated by the piston for opening an electric circuit, and a spring for returning the piston and closing said switch.

2. A pressure-operated switch, comprising a casing having two separated insulating-disks, a rock-shaft passing through said disks, movable switch-arms mounted on said shaft and stationary contact-fingers located between said disks, and pressure-operated means for oscillating the rock-shaft to open and close the circuit.

3. In a pressure-operated switch, the combination with the casing containing two separated insulating disks or partitions, of a rock-shaft mounted in the casing and extending through the said disks, radial contact-arms mounted on said shaft and stationary contact-fingers located between said insulating-disks, and a pressure-cylinder and piston for oscillating the shaft to open and close the circuit.

4. In an electric switch, the combination of a casing having separated insulating-disks, a switch located between said disks, and a removable spring-band inclosing the space between the disks.

5. The combination with a switch for controlling an electric circuit and a cylinder and piston for operating the same, of a valve for regulating the supply of fluid under pressure to said piston, a diaphragm for actuating the valve, a hollow stem secured to said diaphragm and an adjustable spring extending within the hollow stem.

6. In a pressure-operated switch, the combination with a casing comprising a back plate, two separated insulating-disks and a cover rigidly bolted together, and a removable spring-band surrounding the space between the disks, of a switch with contact-points located between the said disks, and pressure-operated means for throwing the switch.

7. In an electric switch, the combination of a casing having an insulating-disk, switch-contacts mounted on the disk, and a dish-shaped cover carrying electromagnets secured to the opposite side of the disk.

8. In an electric switch, the combination of a casing having an insulating-disk, contact-fingers mounted on the disk, a rock-shaft having switch-arms adapted to make contact with said fingers, an electromagnet having poles located opposite the switch contact-points, and a metal plate on the opposite side of the switch and extending over the poles of the magnet.

9. In an electric switch, the combination of the casing including the switch-contacts, a terminal insulating-block secured at the edge of the casing, terminal plugs or binding-posts entirely embedded in the insulating-block and connected with the switch contact-points within the casing, and binding-screws having their heads sunk in openings in said block for connecting the plugs with the outer circuit.

10. In an electric switch, the combination of a casing, a movable switch-arm and contact-points inclosed therein, a terminal block of insulating material secured to the casing and having binding-posts for the circuit connections, and a removable spring-band inclosing the space in which the contact-points are located and secured at its ends to the insulating-block.

11. In an electric switch, the combination of a rock-shaft, a movable switch member operated thereby, an arm secured to the shaft, a rod pivoted to the crank-arm, and carrying a coiled spring, a lever having a pivoted and sliding connection with said rod, stops for limiting the movement of the rock-shaft, and pressure-operated means for moving the lever.

12. In an electric switch, the combination of a pivoted arm and movable switch-contacts operated thereby, a rod pivoted to said arm, a spring mounted on said rod, a lever having a pivoted and sliding connection with the said rod, a fulcrum-pin adapted to be engaged by said rod, stops for limiting the movement of the switch and pressure-operated means for moving said lever.

13. In a fluid-pressure device, the combination of a casing, a diaphragm secured in the

casing and adapted to be exposed on one side to fluid-pressure, a stem secured to the diaphragm, and a bridge connecting the casing and stem for supporting the diaphragm.

14. In a fluid-pressure device, the combination with a diaphragm-casing having a diaphragm and a stem operated thereby, of a bridge formed of a series of movable strips connecting the casing and the stem for supporting the diaphragm.

In testimony whereof I have hereunto set my hand.

EDWARD H. DEWSON.

Witnesses:
R. F. EMERY,
JAS. B. MACDONALD.