G. B. GRAY.

ELECTRIC SWITCH.

APPLICATION FILED NOV. 1, 1911. RENEWED AUG. 16, 1916.

1,217,440.

Patented Feb. 27, 1917.

2 SHEETS—SHEET 1.

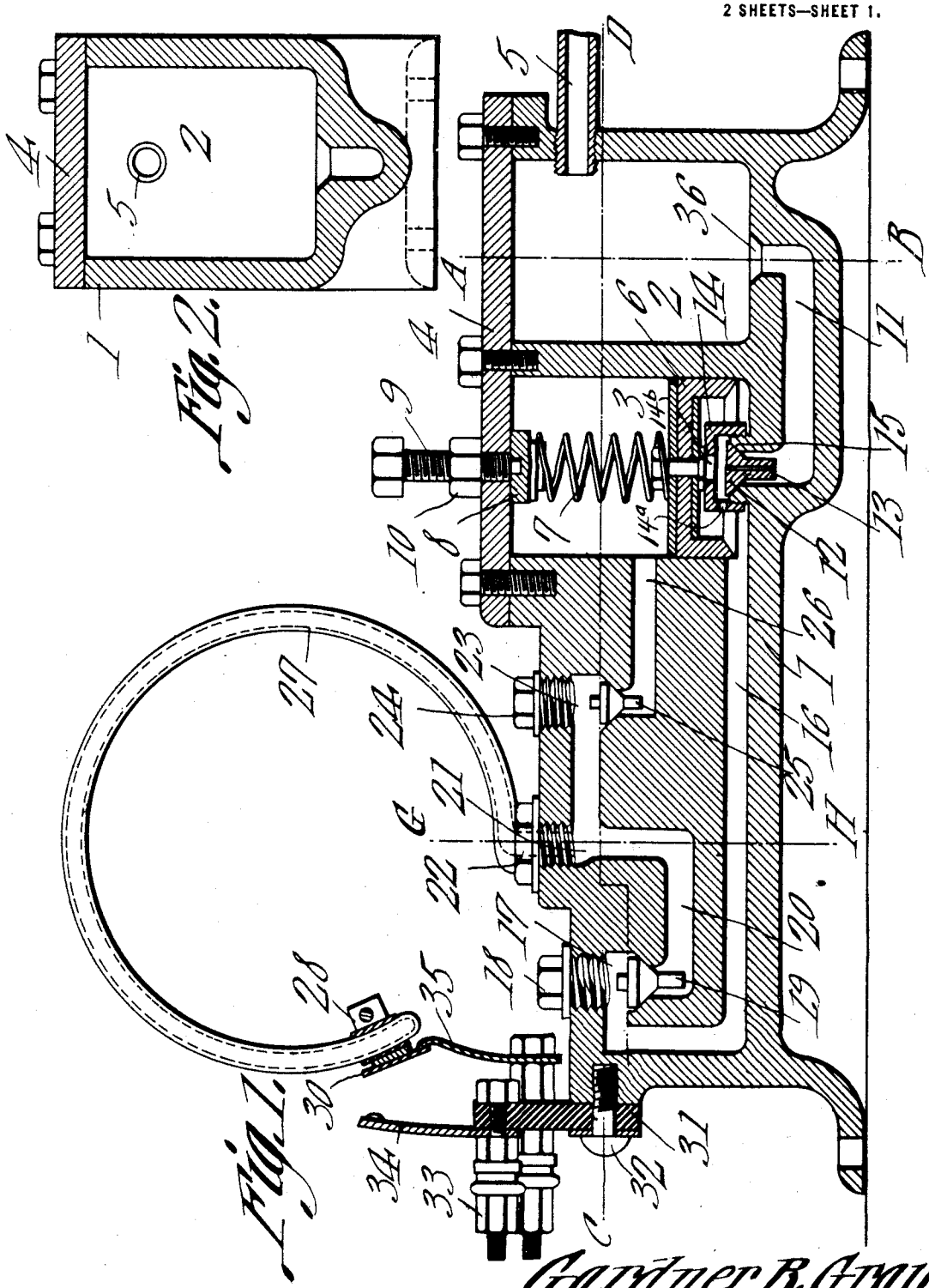


Fig. 2.

Fig. 1.

Witnesses

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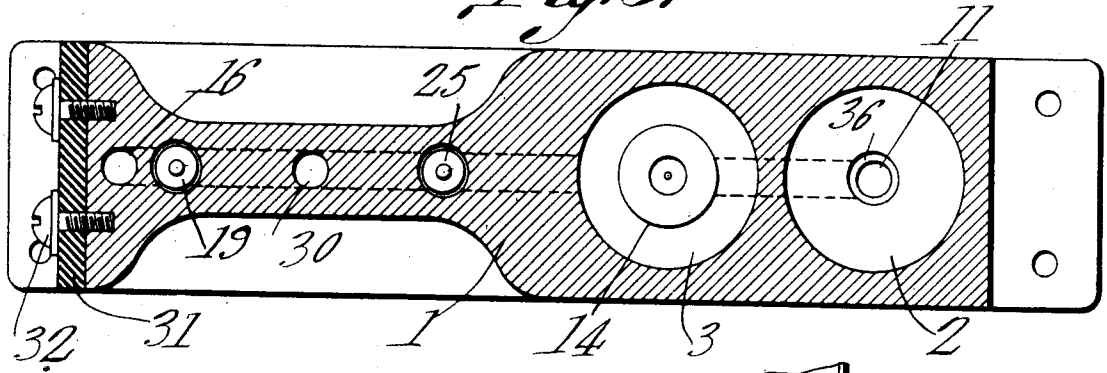
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2 SHEETS—SHEET 2.

Fig. 3.



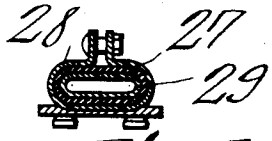


Fig. 5.

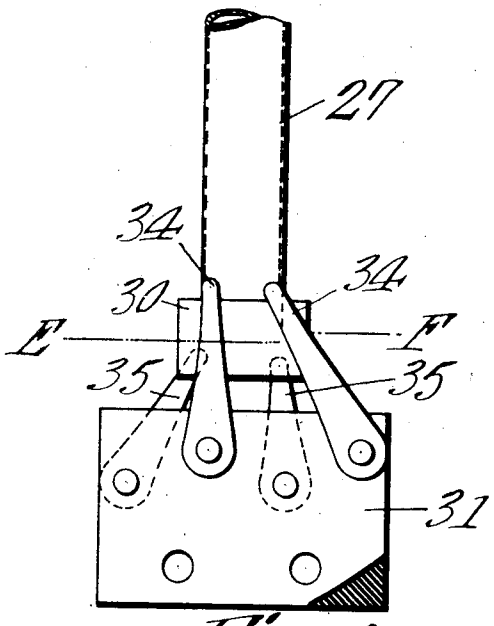


Fig. 4.

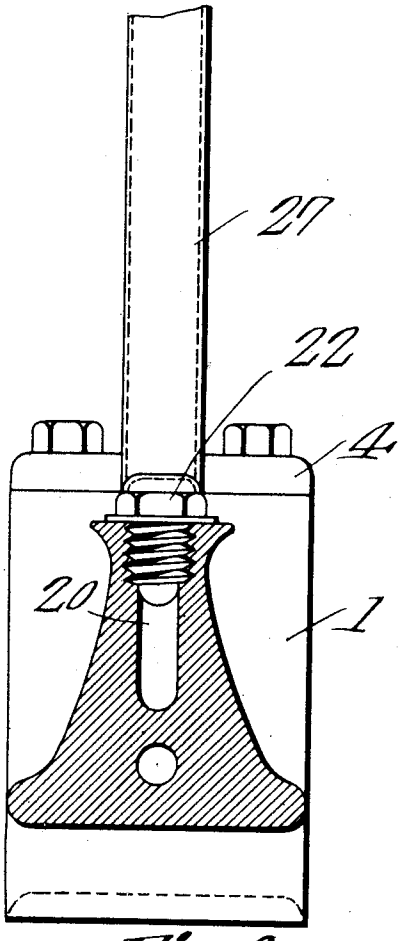


Fig. 6.

Witnesses.

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UNITED STATES PATENT OFFICE.

GARDNER B. GRAY, OF PITTSBURGH, PENNSYLVANIA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO AUTOMATIC TRAIN CONTROL & SIGNAL COMPANY, OF PITTSBURGH, PENNSYLVANIA, A CORPORATION OF DELAWARE.

ELECTRIC SWITCH.

1,217,440. Specification of Letters Patent. Patented Feb. 27, 1917.

Original application filed August 30, 1909, Serial No. 515,259. Divided and this application filed November 1, 1911, Serial No. 658,054. Renewed August 16, 1916. Serial No. 115,333.

To all whom it may concern:

Be it known that I, GARDNER B. GRAY, a citizen of the United States, residing at Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Electric Switch, of which the following is a specification.

This invention has reference to improvements in electric switches, and is designed to provide an electric switch of general application, but which at the same time is particularly useful in connection with an automatic safety signal system for railways for which a Patent No. 909,083, was issued January 5, 1909. This particular application is a division of application Serial No. 515,259 filed August 30, 1909.

The primary object of this invention, is the provision of an electric switch having a circuit-controller responsive to fluid under pressure and means for governing and regulating the action of said controller.

By the means hereinafter fully described, is provided an electric switch capable of being controlled by fluid under pressure to move it from its initial position to close a circuit, the extent of the pressure for operating the switch being controlled by a pressure actuated device, and upon release of said pressure the switch will return to its normal or initial position and the fluid required for operating the switch will be returned to its initial source by means of a by-pass around said pressure actuated means.

With the foregoing and other objects in view which will appear as the description proceeds, the invention resides in the combination and arrangement of parts and in the details of construction hereinafter described and claimed, it being understood that changes in the precise embodiment can be made within the scope of what is claimed, without departing from the spirit of the invention.

In the drawings:—

Figure 1 is a longitudinal section, with parts in elevation, of an electric switch embodying the present invention.

Fig. 2 is a section on line A—B of Fig. 1.

Fig. 3 is a section on line C—D of Fig. 1, the piston in the chamber 3 being omitted in this view for the purpose of showing the valve cage 14.

Fig. 4 is an end elevation of the structure of Fig. 1 from the switch end, with parts omitted.

Fig. 5 is a section on line E—F of Fig. 4.

Fig. 6 is a section on line G—H of Fig. 1, the Bourdon tube and the mounting for the same being shown in elevation.

Referring to the drawings, the numeral 1 designates the body, having formed at one end thereof, the pressure chamber 2 and piston chamber 3, which are closed at the top by the cap plate 4. The chamber 2 is entered by a pipe 5 coming from any suitable source of compressed fluid, such for instance as from the pressure side of an air-brake system on a train. Mounted in the chamber 3 is a piston 6, normally held toward the bottom of the chamber 3 by a spring 7. This spring 7 engages at one end the piston 6 and at the other end is engaged by the block 8 which may be adjusted by a set screw 9, passing through a threaded opening in the cap plate 4, the nut 10 locking said screw at the desired adjustment.

The supply conduit 11 forms a communicating means between the two chambers 2 and 3, the valve 12, provided with the passage 13, being here shown as controlling the conduit at the bottom of chamber 3. The movement of the leak valve 12 from its seat is limited by means of the cage 14, which may be screwed to a nipple 15 formed on the end wall of the chamber 3 where the valve is located.

Leading from the chamber 3 is a conduit 16 which extends to a small valve chamber 17, opposite the end of the body occupied by chambers 2 and 3. Access to chamber 17 is had through an opening normally closed by the screw plug 18. The valve chamber 17 is formed with a seat for the valve 19, and from this valve seat there leads another conduit 20 in a direction toward chamber 3, and ultimately terminating at a small chamber 21 entered by a screw plug 22.

Adjacent to the chamber 21, is another chamber to which access may be had through a passage normally closed by a screw plug 24, and in this chamber there is formed a seat for a valve 25, from which valve seat there leads a passage or conduit 26, opening into the chamber 3, at a distance above the conduit 16, that is the opening of the conduit 26 into the chamber is closer to the cap plate 4 than is the opening of the conduit 16 into the same chamber.

Carried by the screw plug 22, is a Bourdon tube 27, which may be flattened, as best indicated in Fig. 5, and at the free end of this tube there is secured a clip 28, which may be separated from the tube 27, so far as any electric connection therewith is concerned by a layer 29 of insulation.

The clip 28 carries a conducting plate 30, which, as will hereinafter appear, is designed to operate as a bridging conductor.

Secured to the end of the body portion 1, remote from the chambers 2 and 3, is a plate or block 31 of insulation, made fast to the body by screws 32. The block or plate 31 carries a suitable number of binding posts 33, each acting as a clamp screw for an electrical terminal finger 34 or 35, as the case may be.

The fingers 34—35 are carried on opposite sides of the block 31, and are in the path of the bridging plate or block 30, in one extreme or other of its travel under the action of the Bourdon tube 27. The two fingers 34 may constitute the terminals of a suitable electric circuit and the two fingers 35 may constitute the terminals of another electric circuit.

Let it be assumed, that the chamber 2 has within it a quantity of some liquid, preferably a mobile liquid, which will not freeze under existing temperatures, and let it be further assumed that the normal level of the liquid is below the pipe 5.

Should air under pressure be introduced into the chamber 2, through the pipe 5, the pressure thereof on the surface of the liquid within the chamber will force the liquid through the conduit 11 which will unseat the valve 12 and permit the liquid to flow through the opening 14^a of the cage 14, into the passage 16. The valve 19 checks the flow of fluid into this passage and the fluid under pressure will therefore now flow up into the chamber 3, and will there act to lift the piston 6 against the tension of the spring 7. After the piston 6 has been raised slightly by the fluid another and more direct stream of the fluid will flow through the passage 13 of the valve and the opening 14^b of the cage under the piston and which will aid to a certain extent in causing the piston to respond to the pressure in the conduit 11 in that an additional port is provided through which liquid may pass from passage 16 through chamber 3. The liquid under pressure passing to the chamber 3, will find ready access thereto because the opening of the valve 12 and the piston 6 will yield to pressure against the spring 7, the degree of pressure necessary to move the piston being regulated by the tension of the spring 7. Assuming that the pressure in chamber 2 rises quickly, piston 6 will rise quickly and traverses the passage 26 until the latter is in communication with the chamber 3 below the piston 6, when the pressure will cause the fluid to pass through this supply conduit 26, and by the valve 25 into the chamber 21 and so into the Bourdon tube 27 causing the latter to straighten. Normally the bridging plate 30 is in electrical contact with the fingers 35, and the electric circuit of which the fingers 35 form the terminals is completed at this point. As soon as the Bourdon tube is straightened by the pressure, the bridging piece 30 is moved out of contact with the fingers 35 and ultimately makes a contact with the fingers 34, thus completing the circuit of which the fingers 34 are the terminals, at said fingers 34.

As long as the pressure is maintained in the pipe 5, the contact is continued at fingers 34, but as soon as the pressure is relieved at the pipe 5, the spring 7 will cause the piston 6, to move toward the lower end of the chamber 3, and the valve 12 will at once close. But because of the leak passage 13 in the valve 12, the fluid beneath the piston in chamber 3 will slowly return to the chamber 2. This liquid can not pass through the return passage 16 to the Bourdon tube because the valve 19 prevents it, but the valve 19 will open to superior pressure on the Bourdon side thereof when the piston 6 has come to rest, so that the pressure within the Bourdon tube may reduce as rapidly as the liquid may pass through the leak passage 13. This port or passage 13 is very small—slightly larger than a cambric needle, and the cap or cage 14 is provided merely to retain the valve 12 in an operative relation with respect to its seat and may be of any suitable construction. On the reduction of pressure in the Bourdon tube, its natural tendency to move toward the fingers 35 is exerted, and the circuit at the fingers 34 is broken, and the circuit at fingers 35 is ultimately again completed.

By this means the circuit may be quickly broken at the fingers 35 after the establishment of pressure in the chamber 2, and the circuit at the fingers 34 may be rapidly completed, it being understood that when fluid passes into chamber 2 it will be of sufficient pressure to quickly move the circuit controller. However a considerable time will elapse after the pressure in the pipe 5 has been reduced before the Bourdon tube will return bridge 30 and return to its normal

position, in view of the fact that the valve 12 is seated and the fluid must pass through the needle passage 13 therein.

What is claimed, is:—

1. In combination, a pressure-responsive circuit controller, a conduit for the supply of fluid under pressure thereto, branch passages leading from the supply conduit to the circuit controller, a pressure-actuated device between said conduit and one of said branch passages and to be actuated by pressure from the conduit, means in said last-mentioned branch passage for checking flow from the controller to the conduit but permitting flow to the controller, and means in the other branch passage for checking flow from the conduit to the controller but permitting flow from the controller back to the supply conduit.

2. In combination, a pressure-responsive circuit controller, a conduit for the supply of fluid under pressure thereto, a supply passage extending from the conduit to the controller, means between said conduit and passage for controlling communication between the conduit and said passage, a return passage extending from the controller to the conduit and leading around the controlling means between said supply passage and conduit, means in said supply passage to prevent a reverse flow back through the passage to the conduit, and means in said return passage to prevent direct flow therethrough from the conduit to the controller.

3. In combination, a pressure-responsive circuit controller, a conduit for the supply of fluid under pressure, two passages for communication between the conduit and the controller, a pressure-actuated device controlling communication between the conduit and one of said passages to be operated by fluid of different pressures, two oppositely working valves, one in each passage, whereby fluid under pressure from the conduit will hold one valve closed and will operate the pressure actuated device and hold the other valve open so as to cause the fluid under pressure to flow to the circuit controller through one of said passages, and whereby upon insufficiency of fluid under pressure in the conduit the pressure-actuated device will cut off communication between the conduit and one of said passages and the first of said valves will open while the second will close to cause return of the fluid from the controller to flow around pressure actuated device through the other of said passages to the conduit.

4. A pressure-actuated switch comprising a body member having a chamber formed therein, a pressure-responsive circuit controller mounted upon the body, a supply conduit communicating with the chamber, said body having a passage therein connecting said chamber and circuit controller, a pressure-actuated device normally cutting off fluid between the passage and chamber and determining the pressure at which fluid shall enter said passage, said body having a second passage therein providing a return bypass around said pressure-actuated device for the fluid from the controller to the conduit, means in said second passage to prevent direct flow from the conduit to the controller, and means in the first passage to prevent back flow from the passage to the chamber.

5. In combination, a pressure responsive circuit controller, a conduit for the supply of fluid under pressure, a supply passage leading from said conduit to said controller, an exhaust passage leading from said controller to said supply conduit, a resilient pressure actuated device for controlling said supply passage and operable by pressure in said conduit, an exhaust valve opening outwardly in said exhaust passage, said passages opening into each other near the point of communication with said conduit, whereby the resilient pressure actuated device will close said supply passage and tend to maintain pressure in said exhaust passage to hold the exhaust valve closed when the pressure actuated device is not in normal position.

6. In combination, a pressure responsive circuit controller, a conduit through which pressure fluid may flow to and from said circuit controller, a chamber with which said conduit communicates at one end, an exhaust passage leading from said circuit controller to said end of said chamber, a supply passage leading from a point intermediate the ends of said chamber to said circuit controller, a piston valve slidable in said chamber and adapted to be moved by pressure in said conduit to a position to open said supply passage, said piston valve normally tending to close said supply passage and approach the conduit end of said chamber, and an outwardly opening valve in said exhaust passage, whereby said piston valve will maintain pressure in said exhaust passage to hold said valve closed when the piston valve is approaching the end of said chamber after a fall of pressure in said conduit.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

GARDNER B. GRAY.

Witnesses:
GUY P. THURBER,
MARGE M. DANAHY.