

G. B. GRAY.
TIME VALVE AND CIRCUIT BREAKER.
APPLICATION FILED NOV. 1, 1911.

1,204,759.

Patented Nov. 14, 1916.
4 SHEETS—SHEET 1.

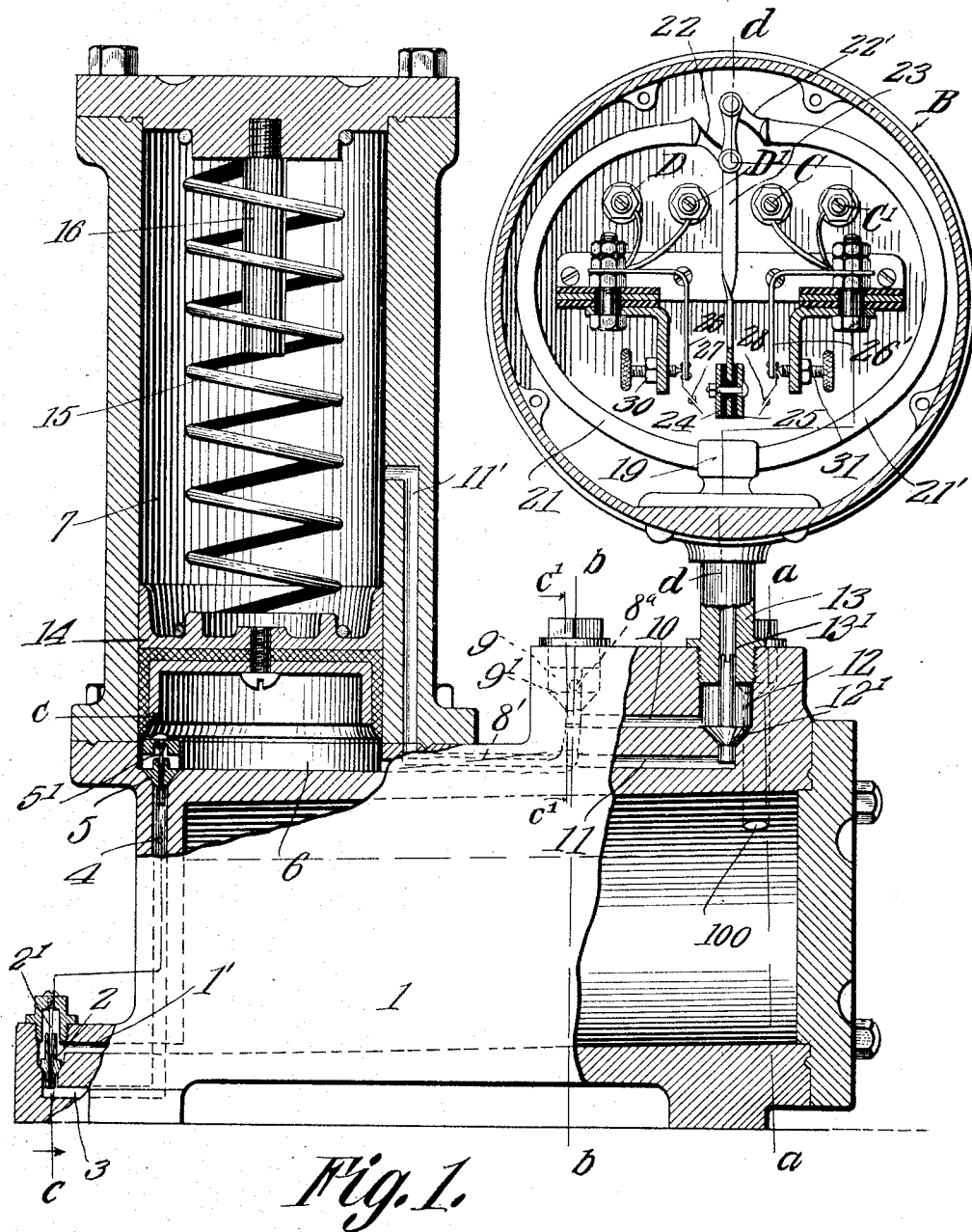


Fig. 1.

Witnesses

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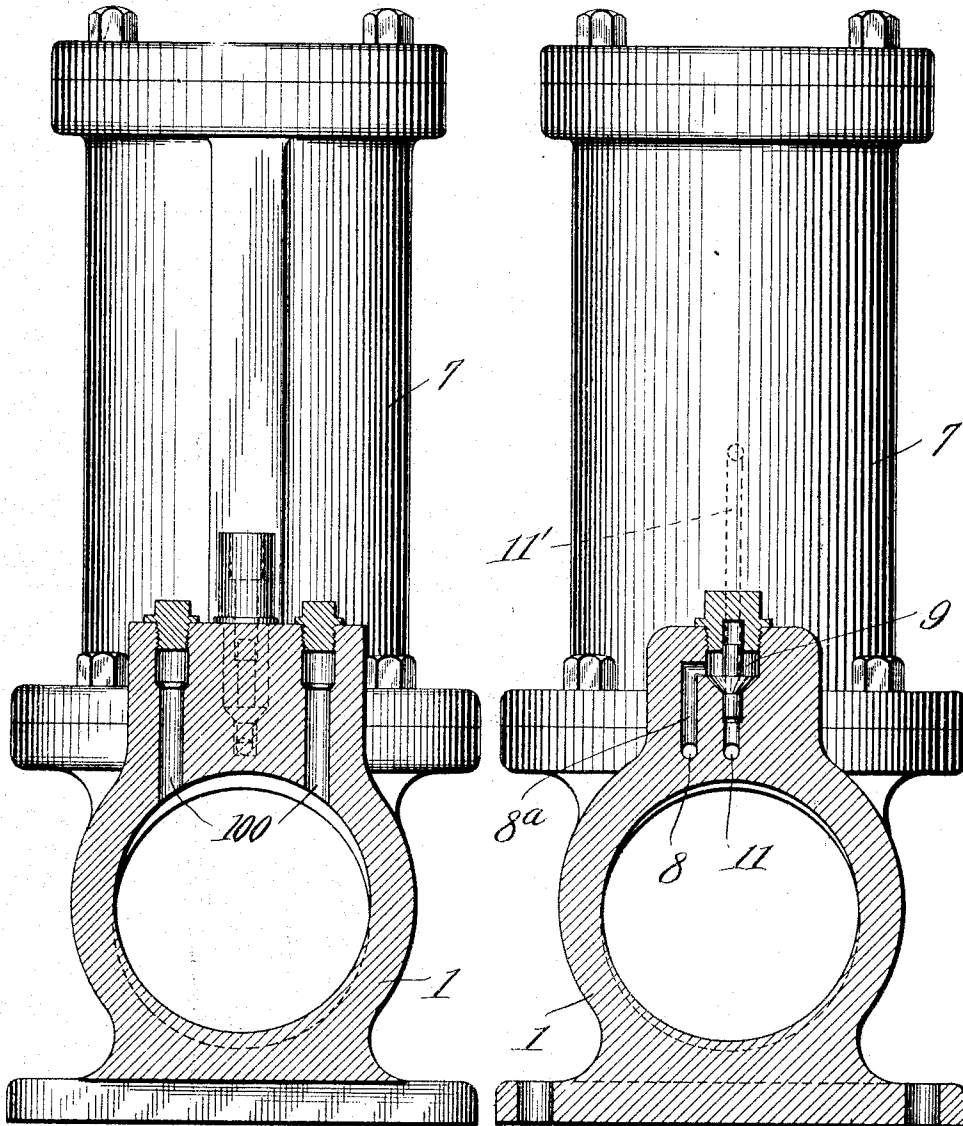


Fig. 2.

Fig. 3.

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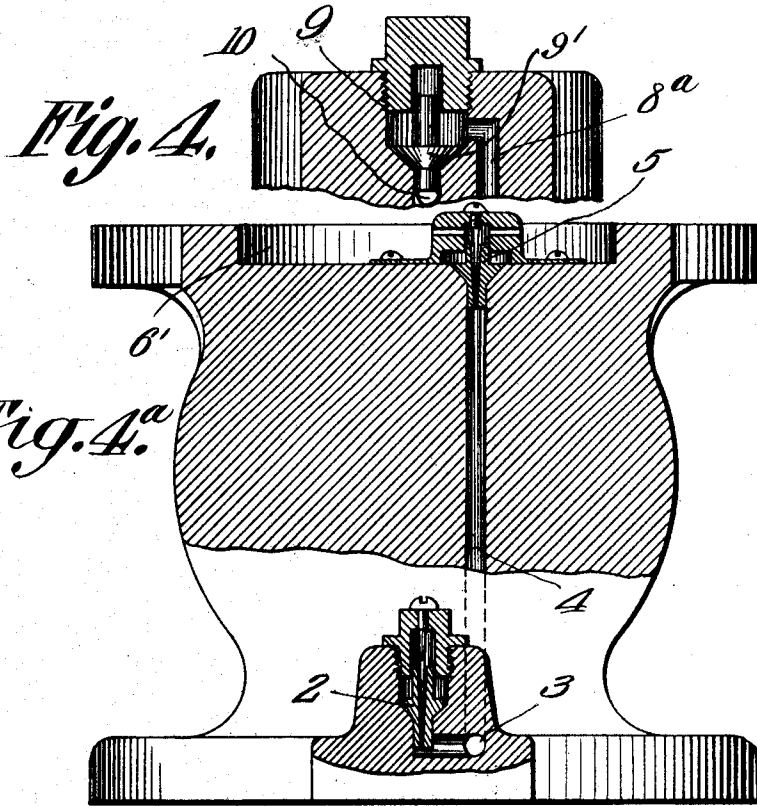
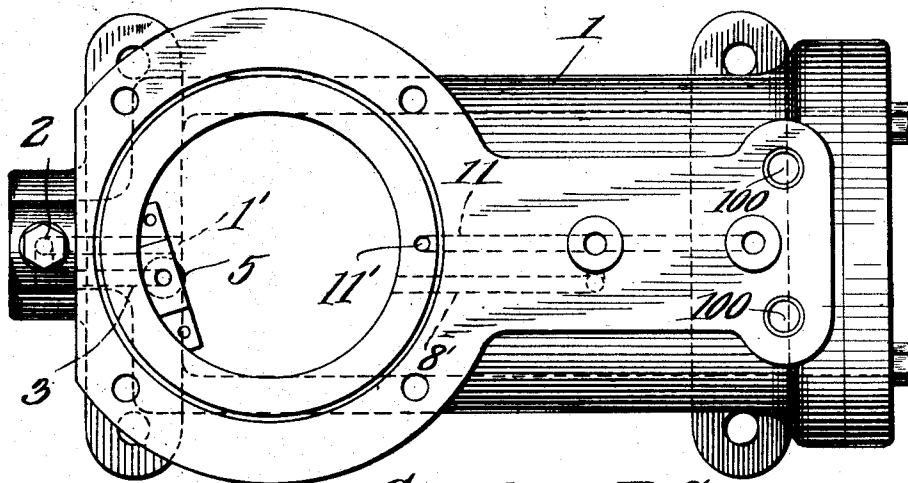
Witnesses

J. P. Tomlinson
E. H. Mahon

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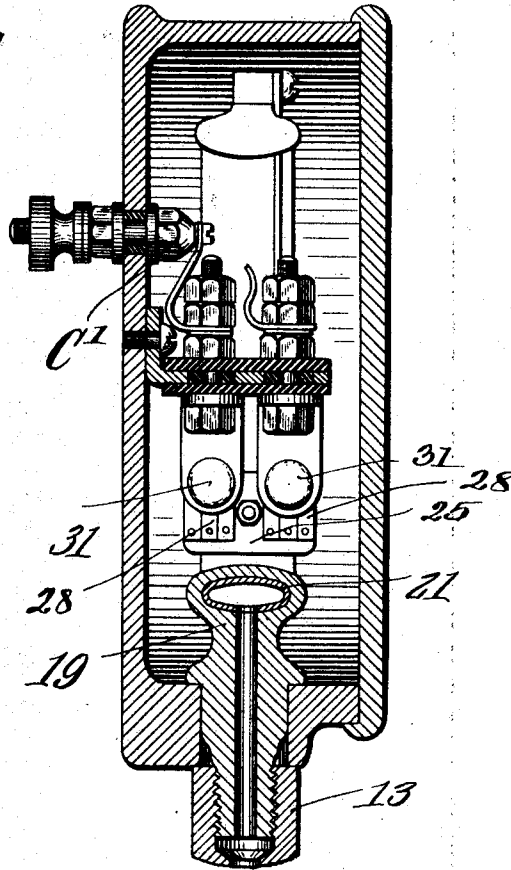
Witnesses *J. R. Smith* *L. H. Walker.* *Fig. 5. Gardner B. Gray* Inventor,
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4 SHEETS—SHEET 4.

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.

TIME-VALVE AND CIRCUIT-BREAKER.

1,204,759.

Specification of Letters Patent.

Patented Nov. 14, 1916.

Application filed November 1, 1911. Serial No. 658,053.

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 Time-Valve and Circuit-Breaker, of which the following is a specification.

This invention relates to an improvement in time valves and circuit breakers, the primary object of the invention being the provision of a time valve connected with the service application of an air-brake system, which is controlled either manually or automatically through an electrical safety signaling system, and a Bourdon tube circuit breaker operably connected with said time valve.

A further object of the invention is the provision of a Bourdon tube switch which when the tubes are deflated closes one circuit, and opens said circuit to close a second circuit when inflated, and vice versa, the normal position of the tubes being deflated with one circuit closed.

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 of the invention herein disclosed 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 through the complete time valve and circuit breaker, the member 23 being shown in an intermediate position as it travels from engagement with the terminals 28 into engagement with the terminals 27, or vice versa. Fig. 2 is a cross section taken on line *a—*a** of Fig. 1. Fig. 3 is a cross section taken on line *b—*b** of Fig. 1. Fig. 4 is a transverse sectional view on the line *c'—*c'** of Fig. 1. Fig. 4^a is a transverse sectional view on the irregular line *c—*c** of Fig. 1. Fig. 5 is a top plan view of the complete time valve without the Bourdon tube casing. Fig. 6 is an end view with a part in section taken on the line *d—*d** of Fig. 1.

Referring to the drawings, the numeral 1 designates the main and horizontal cylinder of the time valve, said casing being

adapted to be connected with the train pipe of an air-brake system through either port 100. Leading from the lower end of the chamber of the cylinder is a channel 1', communicating with the check valve 2 having a normally open port controlled by an adjustable pin valve 2', and through which fluid may pass from said channel 1' when the valve is seated. The check valve 2 is so disposed as to prevent only slight back pressure. Leading from this valve is a channel 3, terminating in the vertical channel 4, formed in one end of the cylinder 1. This channel 4 has mounted in its upper end the check valve 5 provided with a normally open port controlled by the adjustable pin valve 5'. Through this valve the pressure fluid may enter the chamber 6, at the lower end of the cylinder 7, in which is mounted the reciprocatory piston valve 14, normally held downwardly by the coiled spring 15, whose upper end is guided upon the valve stopping pin 16, carried in the top of the cylinder.

Formed in the wall of the cylinder 7, and entering the same at approximately one-third of the way from the lower end thereof or in a position to be uncovered by the valve 14, when the valve 14 is up and limited in its movement by the pin 16, is a port 11', which through the medium of the channel 11, leads to the check valved chamber 12, and through the channel 13', to the Bourdon tubes 21—21'.

The circuit breaker casing B, is connected through the medium of its tubular support 19, to the bushing 13, and leading from the head of the support 19, within the casing B, are the doubled terminal Bourdon tubes 21—21', having the terminals 22 and 22', both of which receive pressure fluid from the valve cylinder 7. Connected, as shown to the terminals 22 and 22' of the Bourdon tubes, is the lever or arm 23, which is adapted to be moved by the contraction and expansion of the said tubes 21 and 21', so that its contact points 24 and 25, insulated from each other and carried by the lower end of said lever 23, will be thrown into contact to bridge respectively set 27 or 28 of the platinum contact plates, carried by the respective spring plates or arms 26—26' arranged in pairs.

Disposed in the path to be engaged by

the respective plates or arms 26—26', are adjustable contact screws, mounted in the ends of the metal brackets 30—31, respectively. The bracket 30 is insulated from its plate 26, while the bracket 31 is insulated from its plate 26', so that with the plate 26 out of contact with the post 30', the circuit including the two wires led to the posts D—D', is open, the circuit including the plate 26' and the post 31' and the conductors led to the posts C—C' being closed, or vice versa.

Although any form of pressure receiving and releasing device, that will produce the proper time action upon the Bourdon tubes 21—21', may be employed, the herein described and shown device is preferred, and operates as follows: The air enters the chamber 1 through the port 100 and passes out of the channel 1' on top of the puppet valve 2, said puppet valve being provided with a small pin valve 2' to control the flow of the air therethrough, and by means of which the area of the part may be regulated to permit of the proper passage of the air therethrough. Thus the air is forced down through the pin valve opening in the valve 2 to the channels 3 and 4, which lead to the bottom of the chamber occupied by the puppet valve 5, which is also provided with an adjustable pin valve 5', similar in construction to the pin valve 2' of the valve 2. The air pressure raises the valve 5 and the air is permitted to pass beneath the plunger valve 14 disposed in the chamber 9 and normally held down as before described by the spring 15. The air thus entering below the plunger valve 14 lifts said valve against the tension of the spring 15 and moves it until limited in its vertical movement by means of the stopping pin 16, at which point the piston valve 14 will have uncovered the port 11' and thus permit the displaced air to enter the port 11' into the channel 11. The air is now forced through said port 11' into the channel 11 and leads to the under side of the puppet valve 12', which due to the pressure of such air is raised and thus permits the air compressed to enter the port 13 and the Bourdon tubes, which due to such pressure, expands to force the lower free end of the contact lever 23 to engage the contact 27 and thus close the circuit through the plate 26, post 30' and the wires leading to the binding posts D—D'. Circuits leading from these binding posts D—D' are such circuits as are found in the patent to the applicant No. 909,083, dated January 5, 1909, and are for controlling automatically brake and throttle devices. By this means, the air pressure in the air-brake system is employed to control the operation of the electrical switches controlled through the lever 23 connected to the terminals 22—22' of the Bourdon tubes.

When the brakes are to be applied, and pressure in the train line is reduced by escape of air to the atmosphere, the air pressure in the chamber 1 will be reduced. Likewise pressure in the chamber 7 below piston 14 will be reduced, and will permit the piston to be forced downwardly due to its spring 15. This movement immediately permits the plunger valve 14 to close the port 11', thus preventing the pressure being released from the Bourdon tubes 21—21', until after the piston 14 has fully seated. When the piston 14 has reached the lower end of the cylinder 17, due to the release of the air pressure in the chamber 1, the pressure then is released from the tubes 21—21', which then begin to collapse. The air leaving the tubes 21—21' will pass through the port 13 over the puppet valve 12', which immediately seating prevents the air from passing out of the port 11 but permits it to pass through the channel 10 to the bottom of the puppet valve 9' which in turn being raised from its seat, the air passes out through the port 8^a located above said puppet valve 9'. This channel 8^a leads to a channel 8' in communication with the lower end of the chamber 7 beneath the piston valve 14, where the air is permitted to gradually leak through the port controlled by the pin valve 5' and into the passages 4 and 3, which lead to the lower side of the puppet valve 2. The valve 2 thus leaves its seat and allows the air to flow freely through the passage way 1' and into the chamber 1. It will thus be seen, that the time necessary for the air to be forced from the lower chamber 1, into the chamber 6 will depend upon the size of the port controlled by the pin valve 2' while the time necessary for the air to be forced from the chamber 7 into the chamber 1 will depend upon the size of the port controlled by the pin valve 5'. In this manner, that is the adjustment of the pin valves 2' and 5', the relative time for operation of the Bourdon tubes 21—21' may be controlled to an exactness. When the tubes 21—21' are collapsed due to the release of pressure therein, the lever 23 moves back until in contact with the electric switch 28, which closes the electrical circuit leading to the terminals C—C'.

From the foregoing description, it is evident that the operation of the air controlled electric switch or relay, that is the lever 23 actuated by the tubes 21—21' and the electrical contacts made thereby are placed directly under the operation of the pressure fluid which is admitted to and released from the chamber 1, and which due to the size of the ports controlled by the pin valves 2'—5' may be regulated to act sluggishly in one direction and rapidly in another, or be retarded in moving from the contacts 27 to 28. Should, however, a slow movement be desired in one direction and a rapid movement

desired in the other, the valves 2' or 5' may be adjusted to almost close its respective port, while one or the other may be removed entirely.

- 5 This particular form of valve as before stated, has been shown in this particular case to clearly show the operation of the two tubes 21—21' and the switch points controlled thereby, but it is to be understood
10 that any form of pressure actuated valve that will produce the desired action in the tubes 21—21' may be employed.

What is claimed, is:—

1. In a device of this character, the combination of a spring returned and pressure
15 fluid operated valve, of a double terminal Bourdon tube adapted to be expanded and contracted through the action of the valve, and a plurality of circuits adapted to be
20 alternately closed and opened by such action of the terminals of the Bourdon tube.

2. In a device of this character, the combination of a spring returned valve, means for conducting pressure fluid to operate the
25 valve against the spring, a double terminal Bourdon tube adapted to be operated upon as the valve is reciprocated by the alternate operation of the pressure fluid and spring,
30 two electrical circuit connections, and a circuit maker actuated by said terminals of the Bourdon tube to alternately make a circuit with each set of connections.

3. In a device of this character, the combination of a spring returned valve, means
35 for conducting pressure fluid to operate the valve against the spring, a double terminal Bourdon tube in communication with the valve and adapted to be expanded and contracted by the action of pressure fluid
40 through the valve, two electrical circuits, a lever connected to the terminals of the Bourdon tube and adapted to be oscillated thereby, two bridging contacts carried by
45 said lever and insulated from each other, and two sets of contact plates in the path of the bridging contacts of the lever to be alternately engaged as the terminals of the tube expand and contract to make and break the two electrical circuits.

- 50 4. In a device of this character, the combination of a valve casing and a pressure and spring operated valve, a double terminal Bourdon tube having its terminals in communication with the valve casing to be
55 expanded and contracted due to the pressure

fluid conveyed from the casing, and two electrical circuit making and breaking means operably connected with the terminals of the Bourdon tube, to be alternately opened and closed.

5. A pressure responsive circuit controller comprising a casing forming a pressure chamber, a cylinder mounted on said casing, a spring pressed piston slidably mounted in said cylinder, a passage connecting said
65 main chamber and an end of said cylinder whereby pressure fluid will flow from said main chamber to move said piston and compress said spring, a second casing mounted on said first-named casing, a Bourdon tube
70 controlled circuit controller mounted in said casing, a supply passage for said Bourdon tube leading from said cylinder and having an end arranged to be uncovered when said piston is moved to compress said spring, a
75 check valve in said supply passage, an exhaust passage leading from said Bourdon tube to the end of said cylinder which is supplied with pressure fluid from said main chamber, and a check valve in said exhaust
80 passage.

6. In combination, a pressure responsive circuit controller, a casing comprising a pressure chamber, a piston chamber mounted on the casing at one end thereof, a second
85 casing mounted on said first-named casing at the other end thereof, a Bourdon tube circuit controller in said second-named casing, a spring pressed piston slidable in said piston chamber, a passage connecting said
90 pressure chamber and one end of said piston chamber whereby pressure fluid may flow from said pressure chamber to move said piston and compress said spring, a valve in each end of said passage, a supply
95 passage for said circuit controller one end of which is uncovered when said piston is moved to compress said spring, a check valve in said supply passage, an exhaust passage leading from said controller to the end of
100 said cylinder which is supplied with pressure fluid, and a check valve in said exhaust passage.

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:

MARGE M. DANAHY,
CATHERINE LYNCH.