

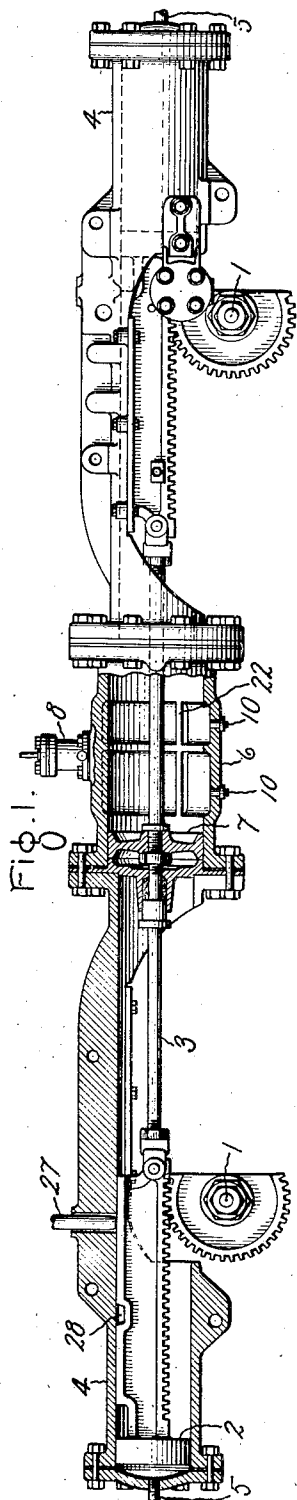
Aug. 25, 1925.

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C. T. CROCKER

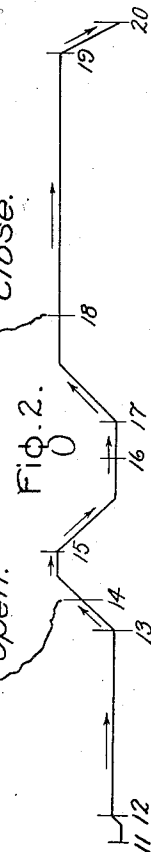
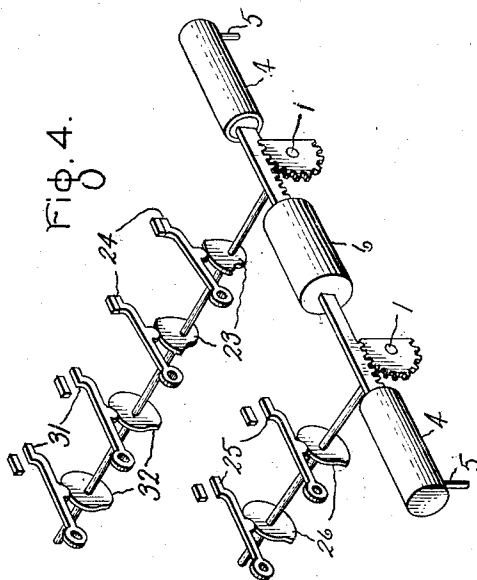
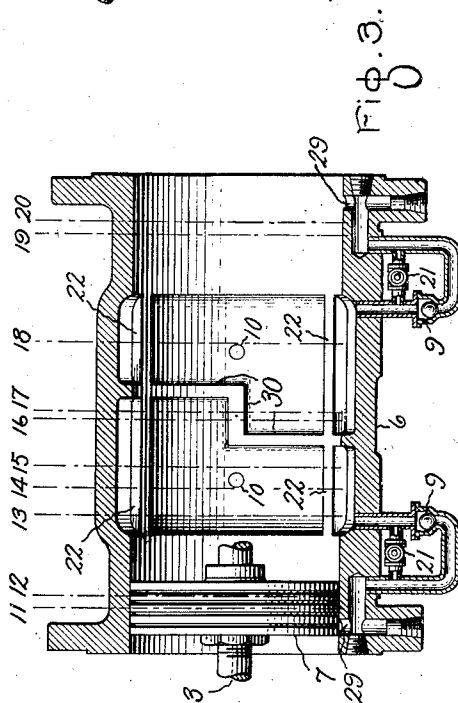
CONTROL OF ELECTRIC SWITCHES

Filed July 3, 1923



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Inventor:
Clarence T. Crocker,
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UNITED STATES PATENT OFFICE.

CLARENCE T. CROCKER, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

CONTROL OF ELECTRIC SWITCHES.

Application filed July 3, 1923. Serial No. 649,362.

To all whom it may concern:

Be it known that I, CLARENCE T. CROCKER, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Control of Electric Switches, of which the following is a specification.

My invention relates to the control of electric switches and especially to the provision of an operating mechanism whereby one or more switches may be operated and controlled in a simple and reliable manner.

In the operation of power systems it is frequently desirable to perform various switching operations in a certain sequence and to introduce a time interval between the various operations. Thus, for example, in the case of generators supplying large currents to circuits having their connections controlled through the manipulation of air break switches, it is desirable to introduce a time interval between the opening of the generator field circuit and the interruption of main circuit for the purpose of permitting the current in the main circuit to drop before the air break switches are operated. Likewise, where a single switch is utilized both to break and reverse the connections between two circuits, it is advantageous to introduce a time interval between the opening of the switch in one position and the closing of it in another, and to provide means for decelerating the movement of the operating mechanism during this interval for the purpose of permitting the switch to be locked in the open position if desired.

An object of my invention is to provide an improved switch operating mechanism arranged to control the operation of one or more switches in a simple and reliable manner.

A further object is to provide a switch operating mechanism arranged to produce a time interval between the various switching operations and to decelerate the movement of the operating mechanism during this interval for the purpose of permitting it to be locked against further movement.

My invention will be better understood from the following description taken in connection with the accompanying drawing and its scope will be pointed out in the appended claims.

Referring now to the drawing, Fig. 1 shows a pneumatic engine adapted to operate a switch cam shaft; Fig. 2 is a curve showing the speed of the engine at various points in its stroke; Fig. 3 is a sectional view of a hydraulic timer, by means of which the movement of the engine is regulated; and Fig. 4 is a perspective view showing the interrelation of the operating mechanism and switch contacts.

Fig. 1 shows a pneumatic engine adapted to operate switch cam shafts 1 through movement of pistons 2 interconnected through piston rod 3 and each arranged to reciprocate within a separate cylinder 4 provided with an opening 5 through which air or other suitable operating fluid under pressure may be admitted to the cylinders. For controlling movement of the pistons 2, a hydraulic timer comprising a cylinder 6 and a piston 7 fixed to the piston rod 3 is provided. This timer is provided with a suitable valve 8 through which a supply of oil or other suitable liquid is maintained within the cylinder 6 and is further provided with check valves 9 (see Fig. 3) for producing a dash-pot or cushioning effect at the beginning of the piston travel in either direction and for permitting egress of the operating fluid from the back of the piston near the end of its stroke. Suitable taps 10 are provided for draining the cylinder 6. The bore of the cylinder 6 is not uniform throughout but is varied at different points for the purpose of controlling the engine speed in a manner which will appear upon consideration of Figures 2 and 3.

In Figures 2 and 3 corresponding points in the piston travel are indicated by numerals 11 to 20 inclusive and in Fig. 2 the relative speeds for these different piston positions are roughly indicated. For purposes of explanation it will be assumed that the piston 7 is just starting to move to the right. Between points 11 and 12 the piston 7 moves at a comparatively slow speed due to the low rate at which the liquid leaks past the piston surfaces. Between points 12 and 13 the rate of piston movement is determined both by the piston leakage and by the adjustment of the valve 21 which is arranged to by-pass the check valve 9. The speed of the piston during this part of the stroke may be regulated by adjusting the setting of the valves

21. Between the points 13 and 15 the piston speed is greatly increased due to the fact that the piston 7 is riding on the ribs 22 thereby permitting the liquid readily to move past it. With the apparatus arranged as shown in Fig. 4, the switch operating cams 23 may be arranged to separate the contacts 24 during this period of the movement, as at point 14, for example. Between the points 15 and 17 the piston speed is reduced due to a projection 30 on the inner periphery of the cylinder 6 which impedes the flow of liquid past the cylinder 7. This projection may consist of a rib extending around the inner periphery of the cylinder at an angle of less than 90° with the horizontal axis or may be of any other suitable shape, but in order to facilitate construction is made in the form of two off-set semi-circular fins or ribs interconnected at the top and bottom of the cylinder by a horizontal rib portion. It is provided for the purpose of slowing down the movement of the piston either to delay a subsequent switching operation, as for example the closing of the contacts 25 by the cams 26 and contacts 31 by the cams 32, or to permit locking the switches in open position by means of bar 27 and slot 28 in the piston rod 3 (see Fig. 1) as may be desired. Numeral 16 indicates the mid position of the piston and is the point at which the bar 27 will be caused to move into the slot 28 if it is desired to lock the switch in open position. This bar may be actuated in any suitable manner as by gravity, manually, or fluid pressure means. Between points 17 and 19 the piston speed increases to and is maintained at a comparatively high value due to the fact that the piston has passed the projection 30 thereby permitting free movement of the liquid. During this period of the piston travel, as at point 18 for example, the contacts 25 and 31 may be closed. Between points 19 and 20 the piston is quickly decelerated due to the cushioning effect which results from closure of the outlet 29 by the piston 7 as it approaches the end of its travel, thus preventing escape of the liquid back of the piston through the check valve 9. The travel of the piston in the reverse direction is regulated in a manner similar to that just described. In either direction of travel the switching operations are performed while operating at a comparatively high rate of speed and there is also provided a time interval between these operations which may be utilized either to lock the switch in open position or to permit decay of the current in a circuit to be subsequently interrupted depending on the use made of the apparatus.

While I have described but one embodiment of my invention, it is not limited to the particular form shown and described, as

it will be apparent that many modifications therein may be made without departing from its scope as set forth in the appended claims.

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

1. A device of the class described wherein cams adapted to actuate a plurality of switches in sequence are mounted upon a cam shaft arranged to cooperate with means for driving said shaft in opposite directions, characterized by the fact that a hydraulic timer comprising a cylinder of irregular bore is provided for controlling the speed of said driving means to produce relatively rapid movement during the operation of said switches and relatively slow movement between the operation of said switches.

2. In a timer for controlling the operation of electric switches, the combination of a cylinder having an irregular bore, a piston arranged to cooperate with said cylinder, a check valve near the end of said cylinder for retarding the movement of said piston at the beginning of its stroke, and means for regulating the retarding force exerted by said check valve.

3. A device of the class described wherein cams adapted to actuate a plurality of switches in sequence are mounted upon a cam shaft arranged to cooperate with means for rotating said shaft in opposite directions comprising a hydraulic timer for controlling the speed of said driving means to produce relatively rapid movement during the operation of said switches and relatively slow movement between the operation of said switches, and means for locking said driving means against further movement between the operation of said switches.

4. In a timer for controlling the operation of electric switches, the combination of a cylinder having an irregular bore, a piston arranged to cooperate with said cylinder, said cylinder having longitudinal fins projecting from its inner surface for guiding said piston through its enlarged portions, means for retarding the movement of said piston at the beginning of its stroke, and means for controlling the force exerted by said retarding means.

5. In a timer for controlling the operation of electric switches, the combination of a cylinder having an irregular bore, a piston arranged to cooperate with said cylinder, said cylinder having a transverse fin projecting from its inner surface for retarding the movement of said piston near the center of its stroke, means for retarding the movement of said piston at the beginning of its stroke, and means for controlling the force exerted by said retarding means.

6. In a timer for controlling the operation of electric switches, the combination of a cylinder having an irregular bore, a pis-

ton arranged to cooperate with said cylinder, said cylinder having a transverse fin projecting from its inner surface for retarding the movement of said piston near the center of its stroke and longitudinal fins projecting from said surface for guiding said piston through its enlarged portions, and means for retarding said piston at the beginning of its stroke.

10 7. In a timer for controlling the operation of electric switches, the combination of a cylinder having an irregular bore, a piston arranged to cooperate with said cylinder, said cylinder having projecting from its inner surface offset semicircular fins for retarding the movement of said piston near the center of its stroke, a check valve for retarding the movement of said piston at the beginning of its stroke, and an adjust-

able valve for regulating the retarding effect of said check valve. 20

8. A switching mechanism wherein cams adapted to actuate a plurality of switches in sequence are mounted upon a cam shaft arranged to cooperate with means for driving said shaft in opposite directions comprising a timer for controlling the speed of said driving means, said timer including a piston attached to said driving means and arranged to cooperate with a cylinder having an irregular bore and provided with means for retarding the movement of said piston at the beginning and at a point intermediate the ends of its stroke, and means for locking said piston in mid position. 25 30 35

In witness whereof, I have hereunto set my hand this 2d day of July, 1923.

CLARENCE T. CROCKER.