No. 884,130. PATENTED APR. 7, 1908.

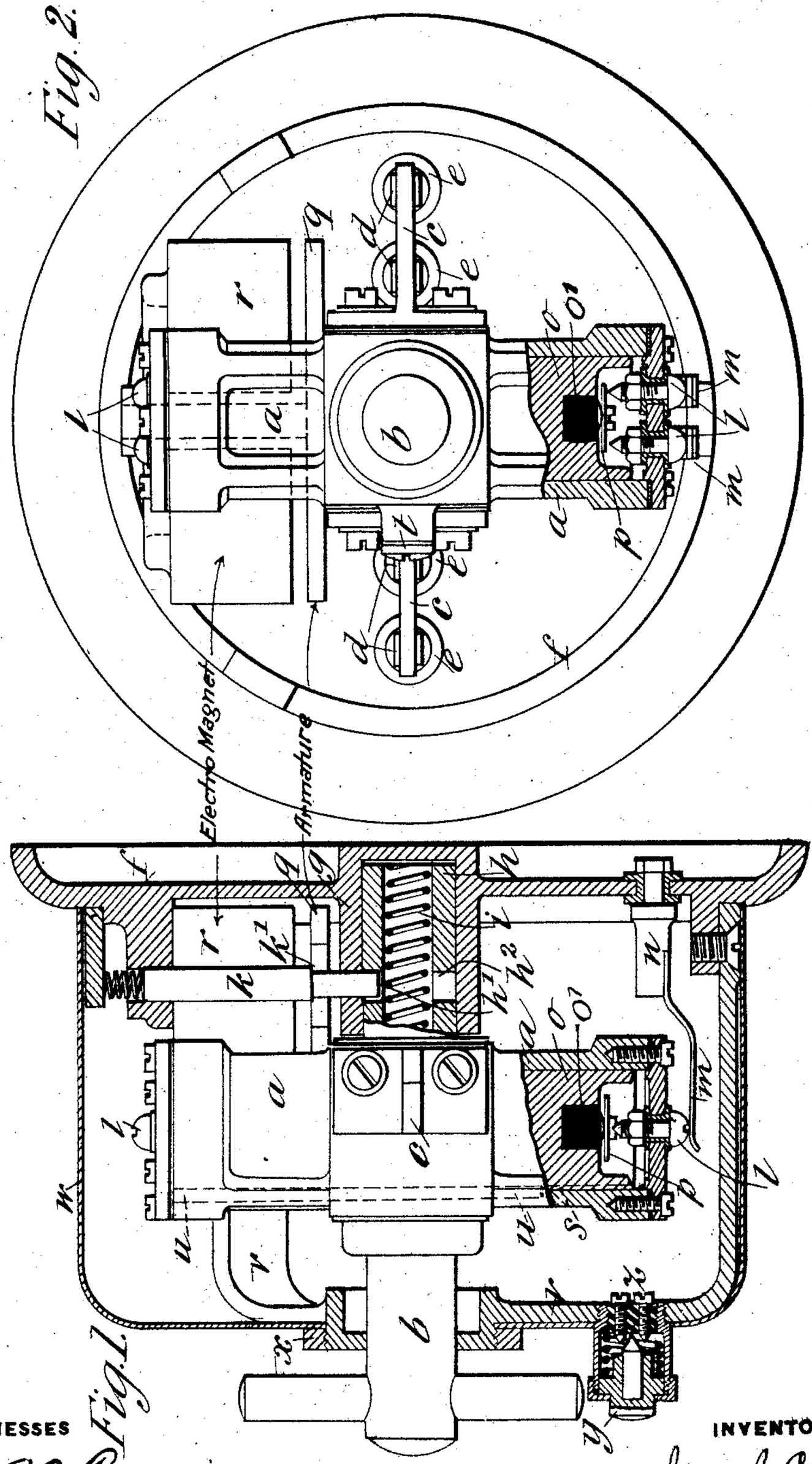
J. J. COACHMAN.

ELECTRIC TIME SWITCH.

APPLICATION FILED JULY 18, 1906.

4 SHEETS—SHEET 1.

Fig. 2.



WITNESSES

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his attys

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J. J. COACHMAN.

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4 SHEETS—SHEET 2.

Fig. 6.

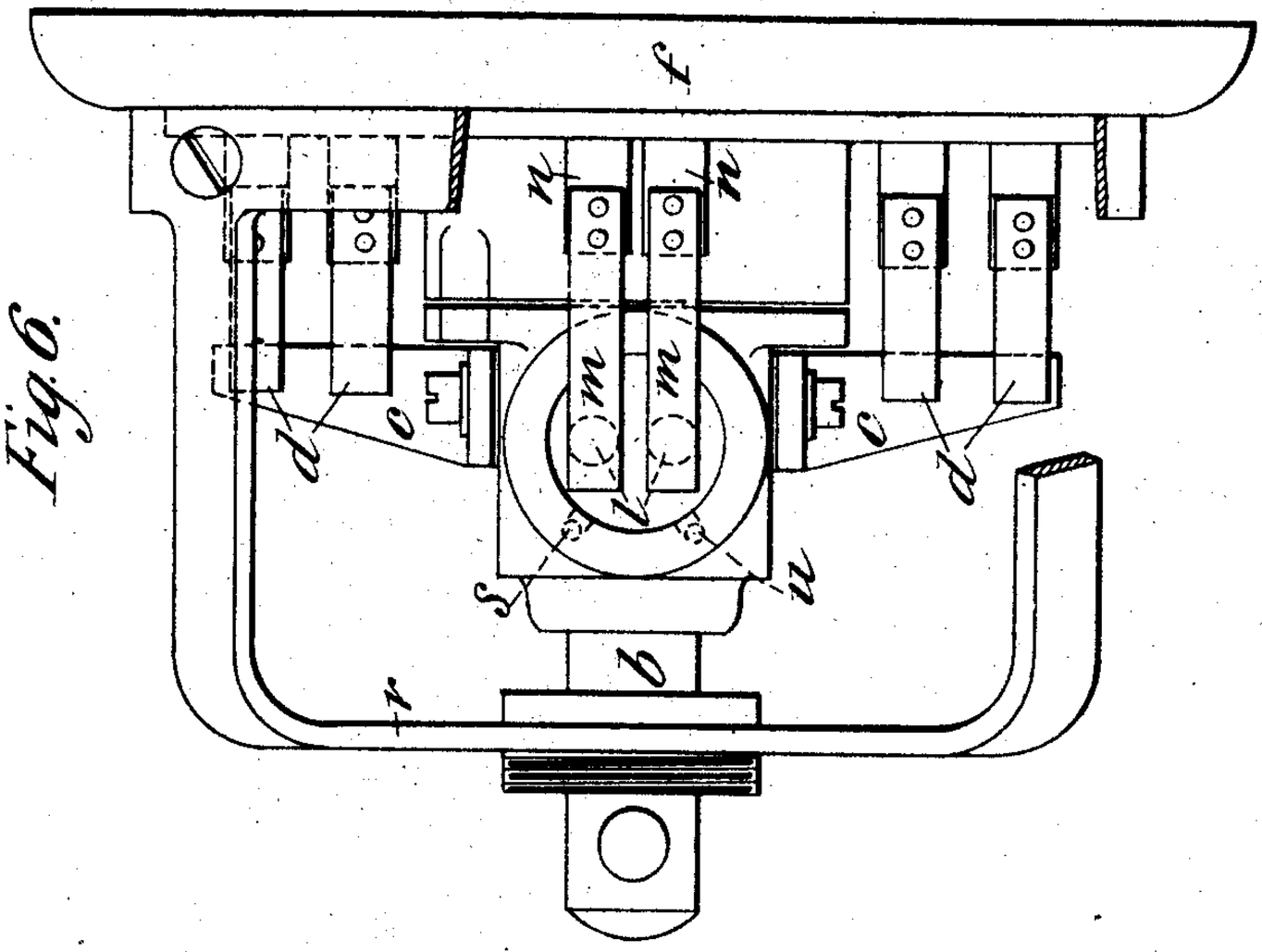
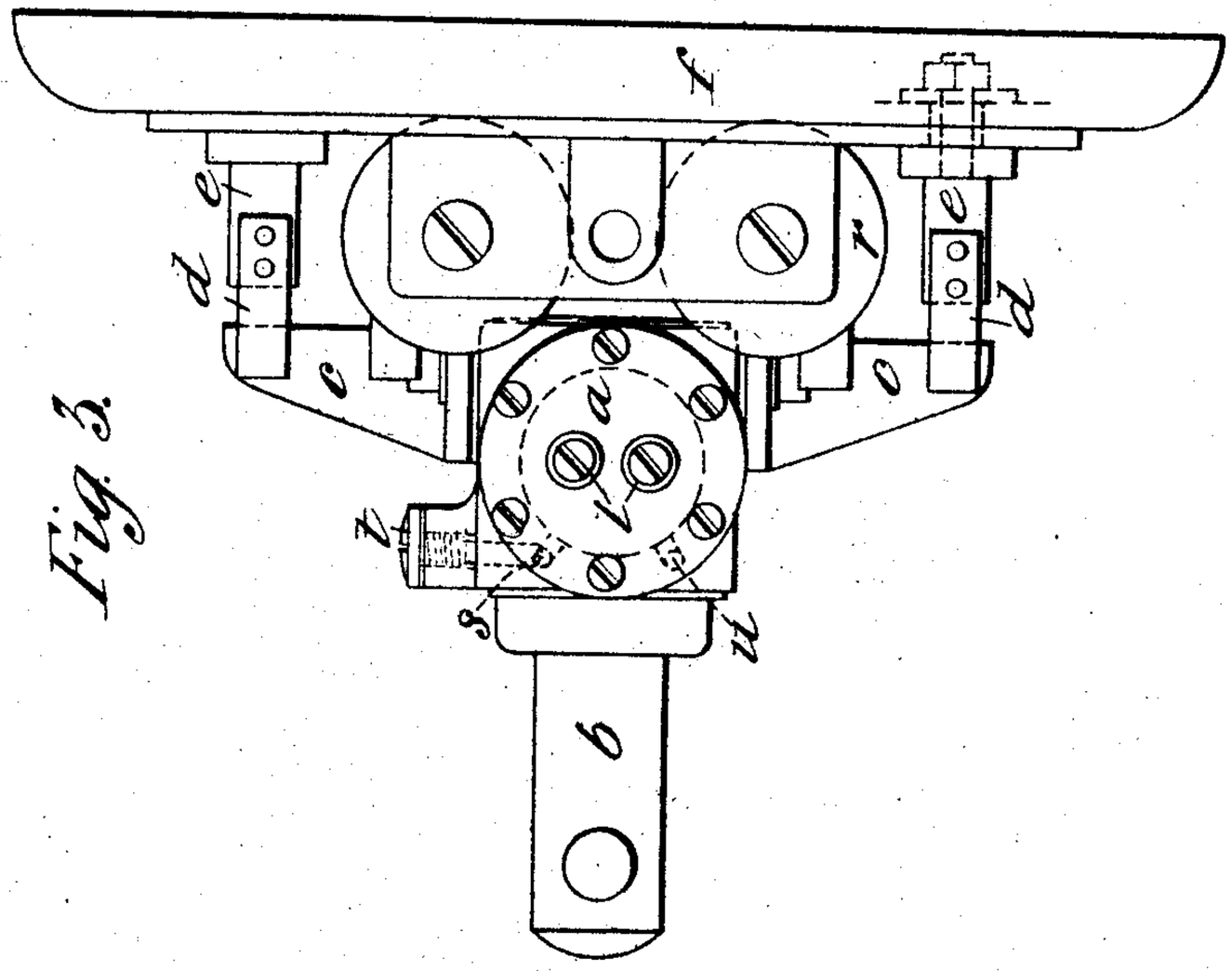


Fig. 3.



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No. 884,130. PATENTED APR. 7, 1908.

J. J. COACHMAN.

ELECTRIC TIME SWITCH.

APPLICATION FILED JULY 18, 1905.

4 SHEETS—SHEET 3.

Fig. 3

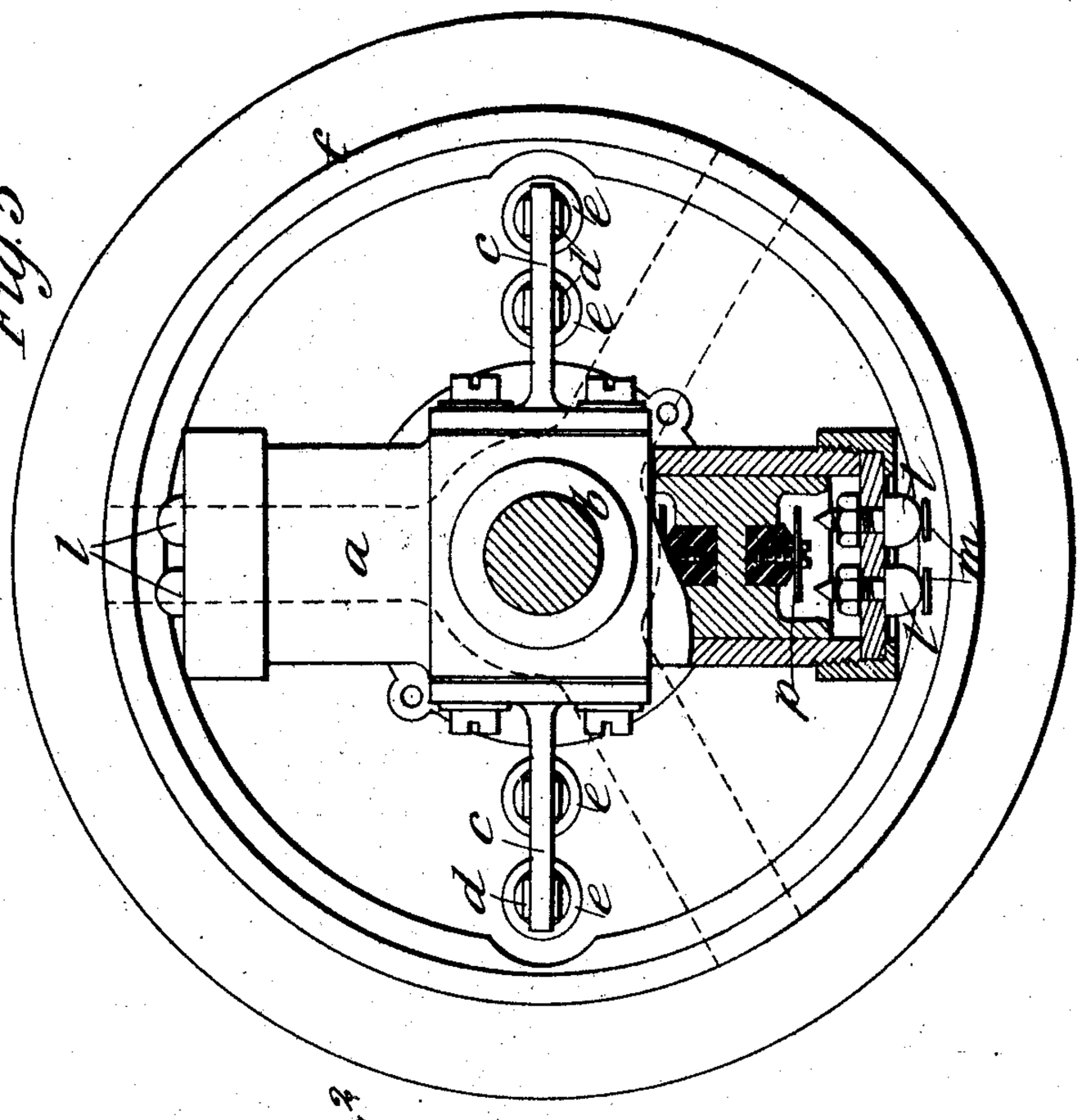
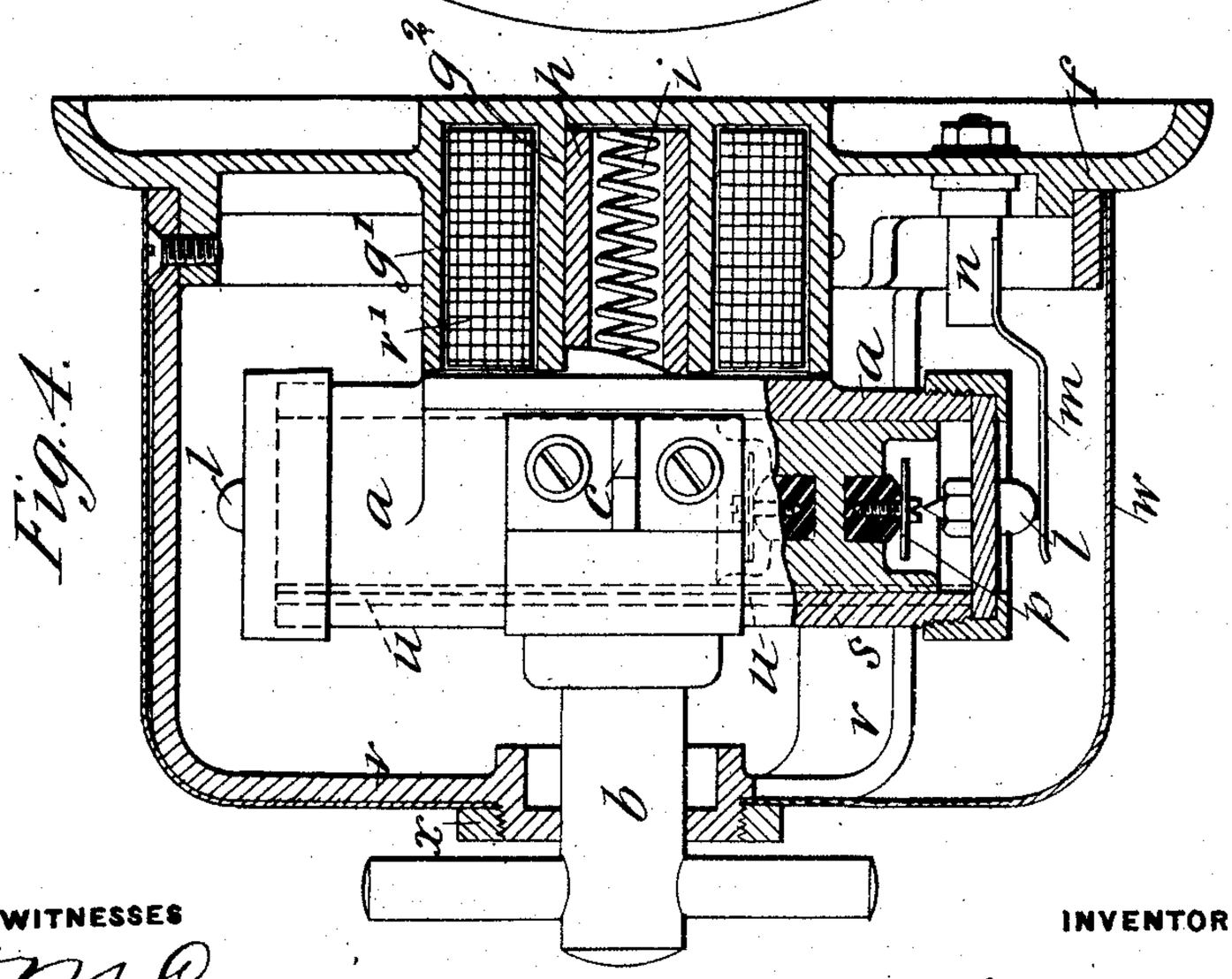


Fig. 4.



WITNESSES

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No. 884,130. PATENTED APR. 7, 1908.

J. J. COACHMAN.

ELECTRIC TIME SWITCH.

APPLICATION FILED JULY 18, 1905.

4 SHEETS—SHEET 4.

Fig. 7.

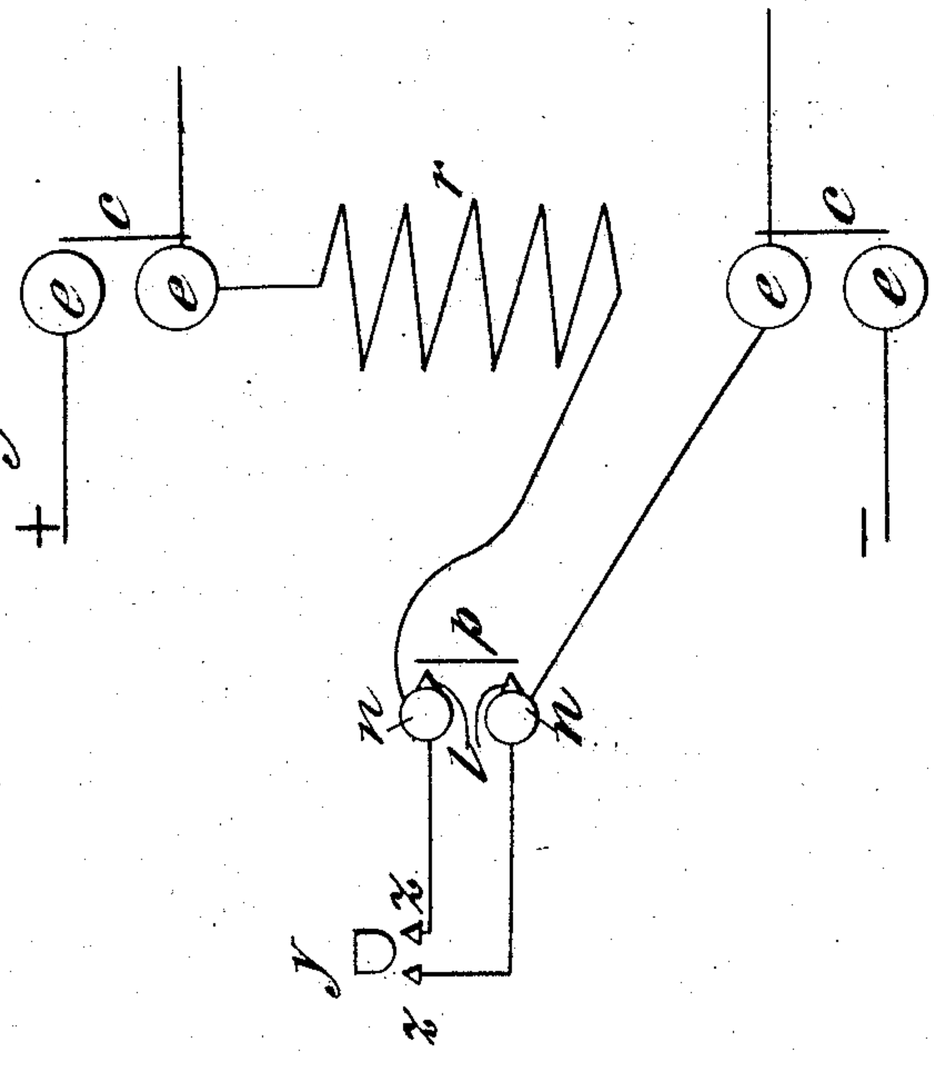
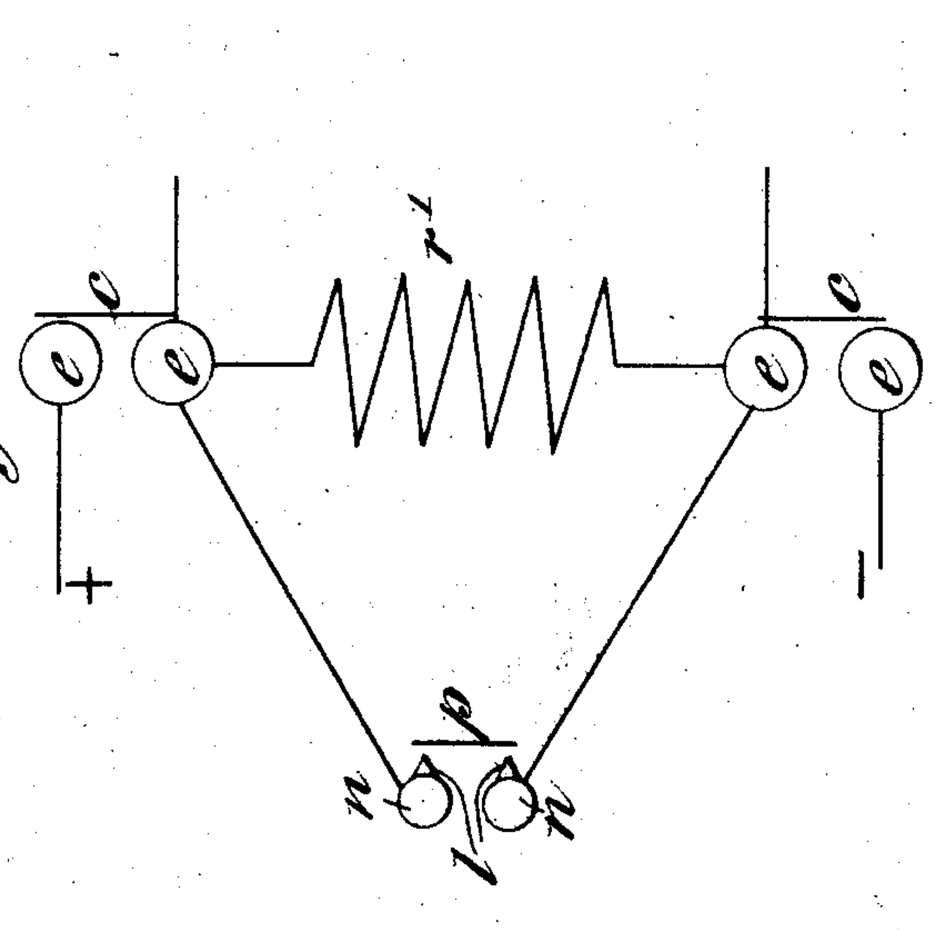


Fig. 8.



WITNESSES

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UNITED STATES PATENT OFFICE.

JAMES JOSEPH COACHMAN, OF LONDON, ENGLAND.

ELECTRIC TIME-SWITCH.

No. 884,130. Specification of Letters Patent. Patented April 7, 1908.

Application filed July 18, 1905. Serial No. 270,182.

To all whom it may concern:

Be it known that I, JAMES JOSEPH COACHMAN, a citizen of the United States of America, residing at London, in the county of London, England, whose post-office address is 57ª Wimpole street, Cavendish Square, in the county of London, England, dentist, have invented certain new and useful Improvements in Electric Time-Switches, of which the following is a specification.

My invention relates to a device whereby an electric contact is made or broken after the lapse of a given time and depends for its action on the descent of a piston, weight or the like in a cylinder containing fluid.

When the weight or piston arrives at the bottom of its path it either makes or breaks a contact by its weight or itself completes a circuit by bridging the space between two terminals.

In any case the contact made or broken may be for any desired purpose and may merely operate a relay, and the timing of the device may be effected in any manner suitable for timing a dash-pot. For example, there may be a by-pass consisting of a passage outside the cylinder or in the wall thereof, connecting the two ends of the interior of the cylinder. As the weight or piston descends in the cylinder, fluid passes through the passage at a rate controlled by a suitable valve in the latter.

When the cylinder has a contact to be made or broken at each end, it is only necessary to invert it in order to render the device again operative; if the contact is at one end only the device must be inverted twice, in which case the said passage may be opened widely at the first inversion to hasten the descent of the piston during its return to the end at which there is no contact.

In order that my invention may be clearly understood I will describe it as adapted to serve as a time switch for electric lights, although it is not limited to this purpose.

In the accompanying drawings Figure 1 is a sectional side elevation of the switch having the device according to my invention. Fig. 2 is a front view partly in section, the cover and handle having been removed, and Fig. 3 is a plan, the cover having been removed. Figs. 4, 5 and 6 are like views respectively of a modification. Fig. 7 is a diagram of the electrical connections for the form shown in Figs. 1—3 and Fig. 8 is a like diagram for the form shown in Figs. 4—6.

Referring to Figs. 1—3, the switch consists of a cylinder *a* fixed to or integral with the handle *b* and carrying in insulated manner the blades *c* which, when the switch is thrust home as shown in the figures are inserted between springs *d* attached to terminals *e*, and thus complete the main circuit as indicated in Fig. 7, the switch having double-poles. The base *f* which carries the said terminals *e* in insulated manner has at its center a cylindrical socket *g* in which can slide and turn a hollow stem *h* fixed to or integral with the cylinder *a*. A spring *i* within this stem is, in the position of the parts shown in the figures, compressed between the cylinder *a* and the bottom of the socket *g* and thus urges the switch away from the base *f*. The switch is prevented from making this movement by the bolt *k* which passes through the side of the socket *g* and enters a hole *h'* in the stem *h*. Through each end of the cylinder *a* pass two conducting screws *l* insulated from the cylinder and adapted to bear against the springs *m* respectively the said springs being fixed to terminals *n* respectively carried by the base *f*.

Within the cylinder, which is otherwise filled with a suitable fluid such as air, oil or glycerin, is a piston *o* having an insulating piece *o'* in each end to which is attached by a screw a conductor *p* adapted, when the piston is at the end of the cylinder, to connect electrically the two screws *l*.

The bolt *k* has a shoulder *k'* which rests on the armature *q* of an electromagnet *r* one end of whose winding is connected with one of the terminals of the main circuit while the other end is connected with one of the terminals *n*, the other terminal *n* being connected with the other terminal of the main circuit as is indicated in Fig. 7. When the conductor *p* connects the screws *l* the current flows from one terminal of the main circuit through the winding of the magnet *r* to the other terminal, by way of terminals *n* as will be apparent on reference to Fig. 7. The magnet *r* being thus excited the armature *q* is attracted and the bolt *k* raised.

As soon as the latter is clear of the stem *h*, the spring *i* forces the cylinder *a* away from the base *f*, thus removing the blades *c* from the springs *d* and breaking the main circuit. The bolt *k* however rests on the surface of the stem *h* as the hole *h'* now no longer registers with the perforation in the socket *g*. So long as the conductor *p* remains in contact

with screws l the bolt k cannot retain the switch in the position in which it completes the main circuit and in order to remove the conductor p from the screws l it is essential to invert the cylinder by turning the handle through 180°. This having been done and the switch having been pushed home to complete the main circuit the bolt k enters the hole h^2, and the main circuit now remains established until the piston o, which at once begins to descend, arrives at the bottom of the cylinder a and again connects the screws l by the conductor p whereupon the main circuit is broken once more in the manner just described. The time during which the main circuit remains closed depends on the time that is occupied by the descent of the piston o in the cylinder a, in other words on the time occupied by the passage of the fluid in the cylinder through the by-pass s shown in the dotted lines in Fig. 1. This by-pass is a perforation through the wall of the cylinder parallel to the axis of the cylinder; the ends of the perforation are closed by the end of the covers of the cylinder and a groove cut in the face of the wall of the cylinder at each end allows the perforation to communicate with the interior of the cylinder as indicated in dotted lines in Fig. 3. The rate of passage of the fluid through the perforation s is controlled by adjusting a screw t the point of which passes transversely through the perforation.

To allow change of volume of the oil in the cylinder owing to change of temperature a bore u is drilled in the wall of the cylinder from one end and is made to communicate with the interior of the cylinder in the manner described for the perforation s. This bore is full of air when the cylinder is filled with fluid prior to screwing on its end cover; should the oil expand the air thus entrapped is compressed and the fluid does not force its way through the joints between the ends of the cylinder and its cover plates.

The movement of the switch away from the base f is limited by a spider v which is attached by screws to lugs on the base, and a suitable cover w is kept in place by a ring x screwing on to the boss of the spider.

To provide for opening the main circuit before the piston o opens it automatically in the manner described, the spider v may carry a spring push y adapted to connect two screws z which are insulated from each other and from the spider. These screws are connected respectively with the terminals n as indicated in Fig. 7 so that when the push y is pressed home current flows from one terminal of the main circuit through the winding of the magnet r to one of the terminals n then through screws z and other terminal n to the other terminal of the main circuit. The magnet r is thus energized and the main circuit opened as already described.

Referring now to Figs. 4—6, the general construction is similar to that described with reference to Figs. 1—3 and like letters are used to designate similar parts. In this form however, the base f has concentric sockets g' g^2 made of soft iron and the space between these contains a coil r'; and the stem h fits in the inner socket. The coil r' is connected at one end with one terminal of the main circuit, and at the other with the other terminal, and these two terminals are connected respectively with the terminals n as indicated in Fig. 8.

In the position of the parts shown in Figs. 4—6 the blades c are completing the main circuit and the coil r' is receiving current.

The sockets g' g^2 are thus the poles of an electromagnet and hold the iron cylinder a as an armature, against the force of spring i. When the piston o arrives at the end of the cylinder a the conductor p electrically connects the screws l and therefore the terminals n, thus short-circuiting the coil r' as clearly shown in Fig. 8. As soon as this happens the sockets g' g^2 are no longer able to hold cylinder a against the force of the spring i and the main circuit is opened; it cannot again be kept closed until the switch has been turned through an angle of 180° as in the previous case.

Having thus described the nature of my said invention and the best means I know of carrying the same into practical effect, I claim:—

1. A device for controlling an electric circuit comprising an electric circuit, a cylinder mounted to revolve with its axis in a plane perpendicular to the axis of rotation, a fluid therein, a detached body adapted to descend by its own weight in the cylinder and means whereby at the end of its descent the said body controls the said circuit.

2. A device for controlling an electric circuit comprising an electric circuit, a cylinder mounted to revolve with its axis in a plane perpendicular to the axis of rotation, a fluid therein, a detached piston adapted to descend by its own weight in the cylinder, means for timing the descent of the said piston and means whereby at the end of its descent the said piston controls the said circuit.

3. A device for controlling an electric circuit comprising an electric circuit, a cylinder mounted to revolve with its axis in a plane perpendicular to the axis of rotation, a fluid therein, a detached piston adapted to descend of its own weight in the cylinder, a by-pass to the said piston, terminals of the said circuit situated within the said cylinder, and a conductor carried by the said piston adapted to connect electrically the said terminals when the said piston arrives at the end of its descent.

4. In combination with an electric switch and a main circuit controlled thereby, a cyl-

inder mounted to revolve with its axis in a plane perpendicular to the axis of rotation, a fluid in the said cylinder, a piston adapted to descend in the cylinder, electromagnetic means for retaining the said switch in the closed position, a circuit derived from the main circuit and adapted to energize the said electro-magnetic means, and means whereby the said piston when it arrives at the end of its descent controls the said derived circuit to open the switch.

5. In combination with an electric switch and a main circuit controlled thereby, a cylinder mounted to revolve with its axis in a plane perpendicular to the axis of rotation, a fluid in the said cylinder, a piston adapted to descend in the said cylinder, an adjustable by-pass to the said piston, electro-magnetic means for retaining the said switch in the closed position, a circuit derived from the main circuit and adapted to energize the said electromagnetic means terminals of the said derived circuit situated within the said cylinder at the end of the path of the said piston and a conductor carried by the said piston and adapted to connect electrically the said terminals.

6. In combination with an electric switch and a main circuit controlled thereby, a cylinder mounted to revolve with its axis in a plane perpendicular to the axis of rotation, a fluid in the said cylinder, a piston adapted to descend in the said cylinder, an adjustable by-pass to the said piston, electro-magnetic means for retaining the said switch in the closed position, a circuit derived from the main circuit and adapted to energize the said electromagnetic means spring terminals to the said derived circuit, two contacts passing through and insulated from each end of the said cylinder, the ends of the said contacts which project without the end of the said cylinder which is the lower being adapted to bear respectively against the said spring terminals and a conductor carried by and insulated from the said piston and adapted to connect electrically the ends of the said contacts which project within the end of the said cylinder which is the lower.

7. In combination with an electric switch and a main circuit controlled thereby, a cylinder mounted to revolve with its axis in a plane perpendicular to the axis of rotation, a fluid in the said cylinder, a piston adapted to descend in the said cylinder, an adjustable by-pass to the said piston, electro-magnetic means for retaining the said switch in the closed position, a circuit derived from the main circuit and adapted to energize the said electromagnetic means, spring terminals to the said derived circuit, two contacts passing through and insulated from each end of the said cylinder the ends of the said contacts which project without the end of the said cylinder which is the lower being adapted to bear respectively against the said spring terminals, a conductor carried by and insulated from the said piston and adapted to connect electrically the ends of the said contacts which project within the end of the said cylinder which is the lower, and a switch whose terminals are connected by conductors with the said spring terminals.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JAMES JOSEPH COACHMAN.

Witnesses:

JOSEPH MILLARD,

WALTER J. SKERTEN.