L. W. DOWNES AND W. S. MAYER.

FLOAT CONTROLLED SWITCH.

APPLICATION FILED JUNE 22, 1915.

1,307,189.

Patented June 17, 1919.

3 SHEETS—SHEET 1.

Fig. 1

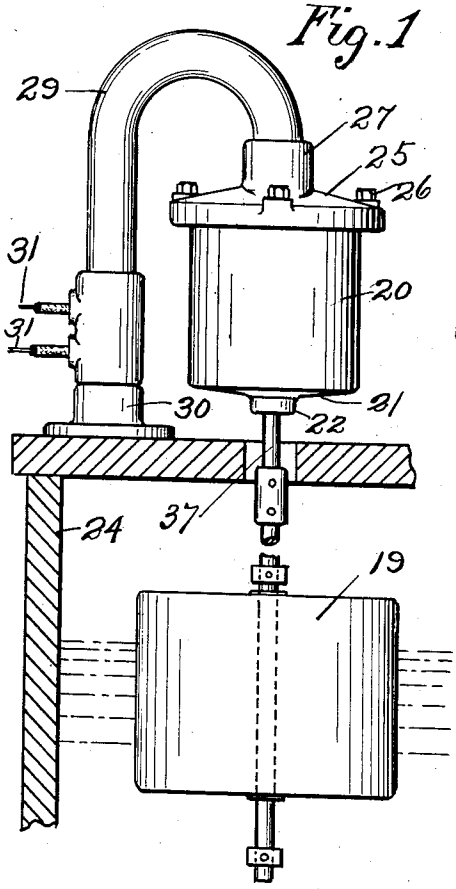

Fig. 2

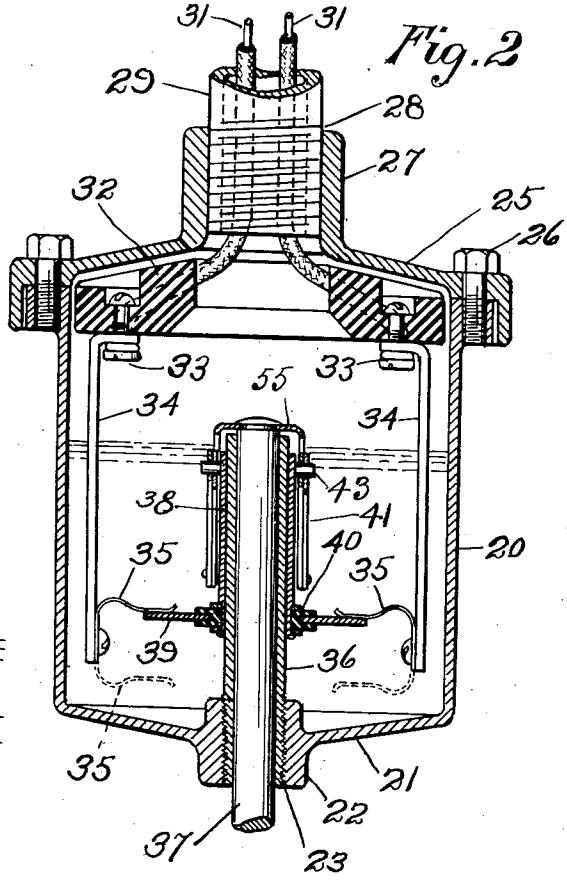

Fig. 3

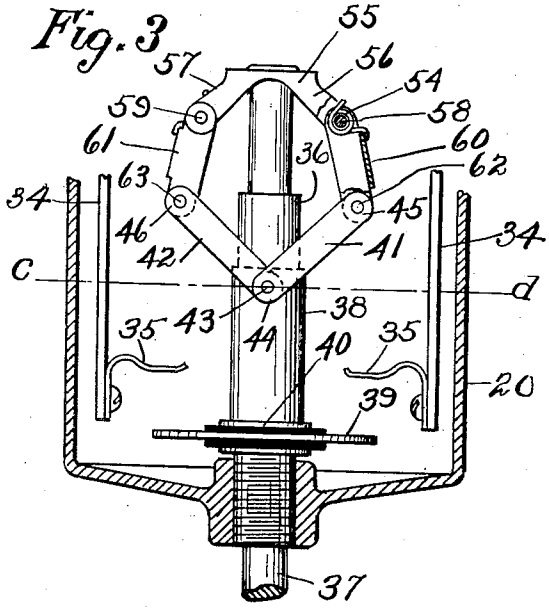

Fig. 4

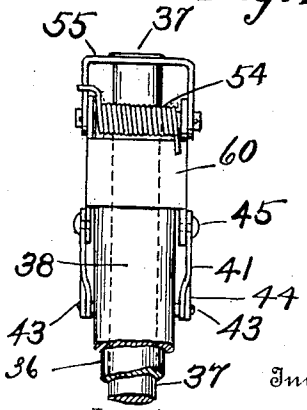

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Fig. 5

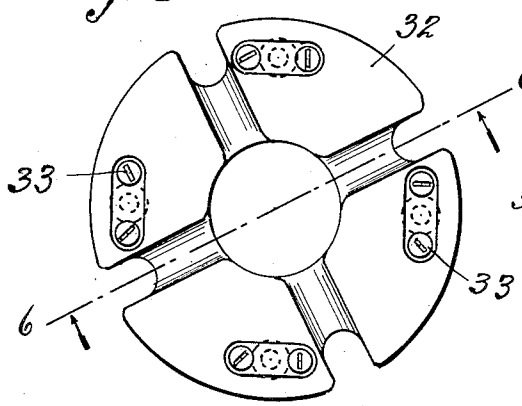


Fig. 6

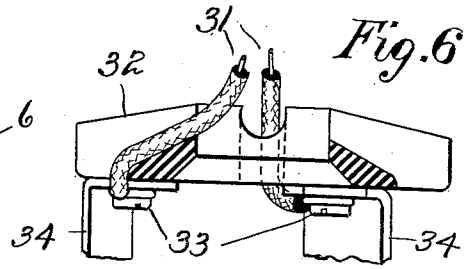


Fig. 7

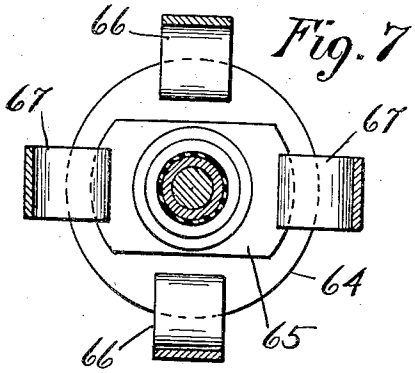


Fig. 8

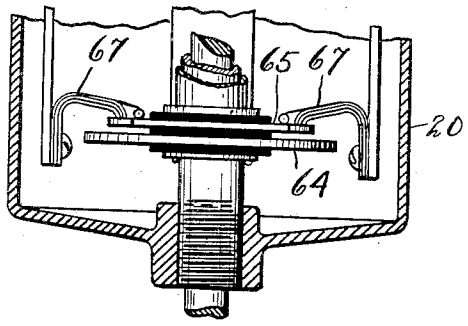


Fig. 10

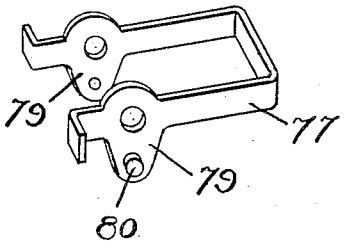
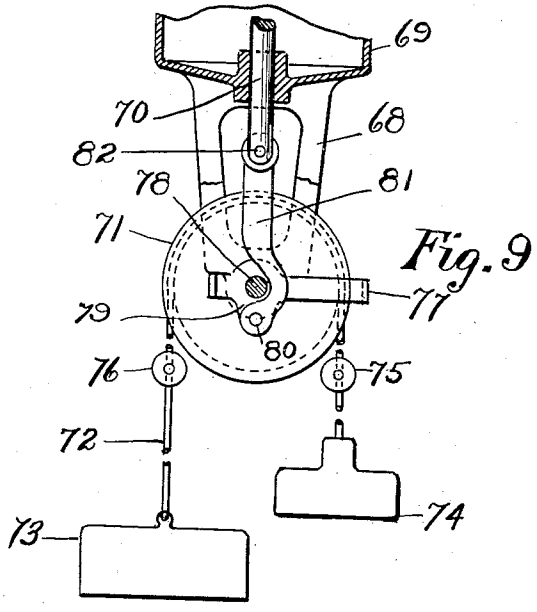


Fig. 9



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3 SHEETS—SHEET 3.

Fig. 11

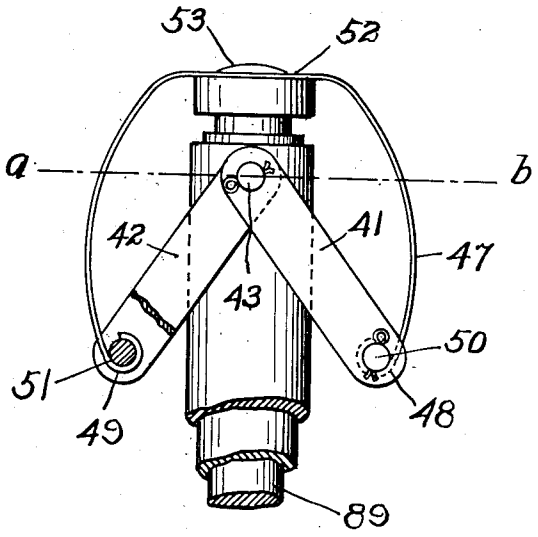


Fig. 12

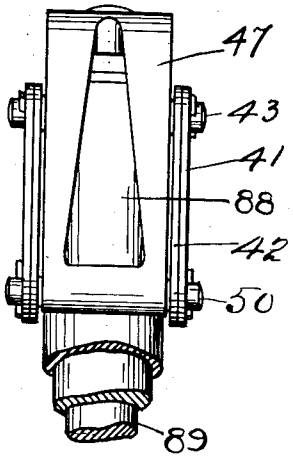


Fig. 14

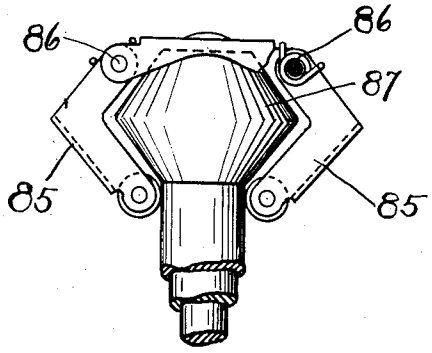
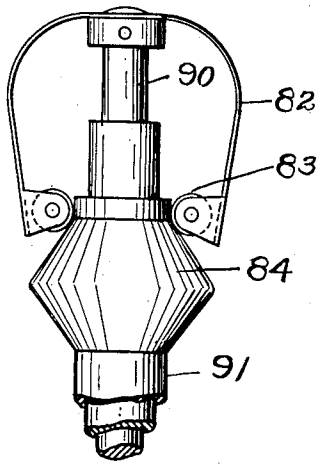


Fig. 13



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UNITED STATES PATENT OFFICE.

LOUIS W. DOWNES AND WALTER S. MAYER, OF PROVIDENCE, RHODE ISLAND, ASSIGNORS TO D & W FUSE COMPANY, OF PROVIDENCE, RHODE ISLAND, A CORPORATION OF RHODE ISLAND.

FLOAT-CONTROLLED SWITCH.

1,307,189. Specification of Letters Patent. Patented June 17, 1919.

Application filed June 22, 1915. Serial No. 35,673.

To all whom it may concern:

Be it known that we, LOUIS W. DOWNES and WALTER S. MAYER, citizens of the United States, and residents of the city of Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Float-Controlled Switches, of which the following is a specification.

This invention relates to electric switches of the float controlled type more particularly adapted for use in connection with tanks, reservoirs and the like for the purpose of controlling the operation of a motor driven pump, electric signal, or other electrical device, either directly or indirectly, by a change of liquid levels in the receptacle, but the switch may be employed for any other purpose for which it may be adapted and operated by any suitable means.

The object of this invention is to provide a switch of this character that is compact in construction, positive and quick of action, and is one in which the actuator by its first movement stores up power and then releases the contact element to be moved by this power at a speed entirely independent of the movement of the actuator, to break or make the electric circuit by a quick snap or movement.

A further object of the invention is to interpose pivoted links between the actuating member and contact element, whereby a predetermined movement of the actuator first stores up the operating power and then releases the same to throw the contact element.

The invention further consists in the provision of a weather proof, water tight and oil tight casing, and to support this casing in the desired position by means of the conduit through which the circuit wires are conducted to this casing.

A further object of the invention is to arrange the mechanism within the casing so that the power applied to throw the contact will be perfectly balanced to reduce the operating friction of the moving parts to the minimum.

A still further object of the invention is to provide means whereby the float may act upon the circuit breaking mechanism through the movement of a lever if desired which construction is more particularly adapted for use in what is known as deep well type of apparatus.

With these and other objects in view, the invention consists of certain novel features of construction, as will be more fully described, and particularly pointed out in the appended claims.

In the accompanying drawings.

Figure 1— is a side elevation illustrating a portion of a tank in section with our improved switch casing supported in operative position thereover on the end of the wire carrying conduit also representing a float as acting directly upon the operating mechanism.

Fig. 2— is a central sectional view showing the contact plate in raised or operative position and an edge view of the links connecting the actuating float rod and the contact carrying tube.

Fig. 3— is a sectional view of the casing showing a side view of another form of operating links with the contact plate dropped or in inoperative position.

Fig. 4— is an edge view of the form of operating links illustrated in Fig. 3 showing the same as connecting the float rod with the contact plate tube.

Fig. 5— is a top view of the insulating block normally located on the inner side of the casing cap.

Fig. 6— is a section on line 6—6 of Fig. 5.

Fig. 7— is a plan view illustrating a double pole form of switch in which two pairs of contact fingers are arranged, each to engage separate contact plates.

Fig. 8— shows the casing in section and one arrangement of the two plates in the double pole form of switch.

Fig. 9— is a side elevation showing a portion of the deep well type of device in which the casing is in section and a rope operated lever is shown as controlled in its action by the movement of a float and weight by which the circuit making and breaking mechanism is operated indirectly by the float movement.

Fig. 10— is a perspective view of the float rope operated lever through which the circuit making and breaking mechanism is operated.

Fig. 11— shows an edge view of the bow

type of spring acting on links arranged to operate as a toggle joint.

Fig. 12— is a side view of the mechanism shown in Fig. 11.

Fig. 13— is a modification showing a double cone shaped member connected to the contact element which is snapped either upward or downward by the action of a bow type of spring carried by the actuating member.

Fig. 14— is another modification showing the same form of double cone but acted upon by pivotally mounted spring pressed arms.

Referring to the drawings 20 designates the switch casing in which the operating mechanism is mounted. This casing has a bottom portion 21 provided with a boss 22 having a threaded opening 23. A cap 25 is secured to the top of the casing by bolts 26 and is provided with an upwardly extending central boss 27 having a large threaded opening 28 into which a conduit 29 is screwed. This conduit is provided at one end with a base member 30 which may be connected by screws or otherwise to the tank 24, wall or other suitable place for the purpose of supporting the switch casing in the desired position.

This conduit in addition to supporting the casing, also serves as a convenient and necessary means for carrying the circuit wires 31 to and from the mechanism within the casing. On the inner side of this cap 25 is secured an insulating block 32 into which the wires 31 are led and connected to the binding posts 33 which latter connects the downwardly extending conductors 34, the lower end of which carry the contact fingers 35.

A tube 36 threaded at its lower end is screwed into the opening in the boss 22 and projects upward for some distance into the casing for three purposes; first, to provide a suitable guide for the float rod or actuating member 37; second, to prevent the oil or other liquid with which the casing may be partially filled, from running out, and third it serves as a convenient guide bearing for the vertically sliding sleeve 38 which carries the contact plate 39 insulated therefrom by the insulation 40.

This float rod or actuating member may in some cases extend downwardly and connect directly with the operating float 19 as illustrated in Fig. 1, or this actuating member may be operated indirectly by the movement of the float through a lever as illustrated in Fig. 9 or any other suitable means or mechanism may be employed for actuating this rod for the purpose of tripping the operating mechanism presently described.

An essential feature of this construction is the provision of means whereby a quick, sharp stroke may be obtained to move the contact plate to break the circuit and to accomplish this, we have provided two pairs of link members 41 and 42 having their ends 44 pivotally connected to opposite sides of the sleeve 38 by the pins 43 and their outer ends 45 and 46 are pivotally connected to spring actuated members. In Figs. 11 and 12, we have illustrated the simplest form of such spring actuated member, which is that of a bow form of spring 47, whose opposite ends 48 and 49 are curled about pins 50 and 51, in the outer ends of the respective links 41 and 42, the middle portion of the spring being connected at 52 to the upper end 53 of the float rod 89. The spring is preferably of a broad flat form as illustrated in Fig. 12 with the middle portion of the arms at 88 cut away so as to graduate the cross-section of the two arms to render its strength proportional throughout its length.

The action of a spring of this character is that when the contact plate is raised into operative position, the links 41 and 42 are in the position of least tension as shown in Figs. 11 and 12. When the float rises the ends 48 and 49 of the links swing outward gradually increasing this tension until the links pass the center line *a—b* or the point of connection to the contact plate tube, at which time the spring acting through the links, force their central pivoting point 43 downward, causing a quick snap or movement on the plate 39 to break the circuit through the contact fingers 35.

Owing to the fact that this type of spring is liable to set or lose its effectiveness after long action, we prefer to use the helical type of spring as shown at 54 in Figs. 3 and 4 in the use of which spring we provide a cap 55 attached to the upper end of the float rod or actuating member 37 the same having arms 56 and 57 with pins 58 and 59 to which is pivoted the second set of link members 60 and 61, the lower end of these members being connected by pins 62 and 63 to the links 41 and 42. On the pins 58 and 59 we have placed the coil springs 54 which are adapted to act upon the arms 60 and 61 to press them inward, and so cause substantially the same action upon the links 41 and 42 as is the case with the bow springs, that is, when the float rod, which in Fig. 3 is shown in raised position, moves downward the ends 45 and 46 of the links 41 and 42 are swung outward until they reach and pass the center line *c—d*, then these springs which have been placed under tension by the outward motion of the links act to move the tube 38 upward and throw the contact plate against the contact fingers 35 with a quick, sharp stroke.

When a double throw type of switch is

desired the contacts 35 may be reversed into the dotted position shown in Fig. 2 so that another contact will be made and another circuit completed when the plate moves to down position.

In some cases when a double pole switch is desired, two separate contact plates 64 and 65 are employed, see Figs. 7 and 8, the plate 64 engaging the pair of fingers 66 while the plate 65 engages the pair of fingers 67, each pair being shown in Fig. 7 as set at 90° from each other. When heavy currents are to be carried we provide laminated contact fingers 67 as illustrated in Fig. 8 but for light currents a single form of contact finger is employed as illustrated in Figs. 2 and 3.

A feature of this invention is the deep well type of construction illustrated in Figs. 9 and 10, in which a frame 68 is connected to the bottom of the casing 69 through which the float rod 70 works. In this frame is mounted a pulley 71 over which a rope 72 is drawn in one direction by the float 73 which float is counter-balanced by the weight 74. On the rope is mounted engaging members 75 and 76. A lever 77 is pivoted to the pulley shaft 78 and is provided with downwardly extending ears 79 which are provided with pins 80 and to which are connected a link 81 whose upper end is pivotally connected to the lower end 82 of the float rod 70. As the water falls in the tank the float 73 drops and causes the weight 74 to rise and the member 75 to engage the lever 77 and swing the same substantially 180° about its shaft, passing between the arms of the link 81 so that it will extend in the opposite direction. This movement as will be seen throws the pins 80 from down to up position on the opposite side of the shaft, which movement operates through the rod 70 on the mechanism above described to reverse the position of the contact plate. When the water lever rises again the member 76 will engage and retain this lever to the position shown in Fig. 9 which action also serves to again shift the contact plate.

Figs. 13 and 14 show modified forms of construction by which the contact plate may be moved either up or down with a quick sharp snapping action to make or break the circuit. In the constructions shown in Fig. 13, 82 represents the bow type of spring mounted on the float rod 90 and having rolls 83 at its ends which engage the surface of a double cone member 84, whereby a downward movement of the float rod causes the rollers to pass over the largest center of the cone and the inward pressure of the spring causes a quick upward movement of the cone and the contact plate which is connected to the sleeve 91.

Practically the same effect is secured by the action of the mechanism illustrated in Fig. 14 in which the arms 85 are pressed inwardly by the coil springs 86 to act upon the double cone 87 in the manner of the bow spring illustrated in Fig. 13 as above described.

This invention is not restricted to any of the particular forms of mechanism herein illustrated and described as various modifications may be made without departing from the spirit and scope thereof.

We claim:

1. A switch of the character described comprising an actuator member, a guiding means engaging one end thereof, means connected with the other end of the actuator member for imparting rectilinear movement thereto, a contact carrier movably engaging said guiding means and having a lost motion connection with the guided end of said actuator and means for imparting sudden independent movement to said carrier when the actuator member has moved a predetermined distance.

2. A switch of the character described comprising an actuator member, a guiding means engaging one end thereof, means connected with the other end of said actuator member for imparting rectilinear movement thereto, a contact carrier movably engaging said guiding means, links pivotally connecting said contact member with the guided end of said actuator to provide a lost motion connection, and springs acting upon said links to impart sudden independent movement to said contact carrier when the actuator member has moved a predetermined distance.

3. A switch of the character described comprising an actuating rod, and a tubular guide therefor, a contact member slidable upon said guide, said contact member and said rod having complemental means for imparting sudden independent movement to the contact member when the rod is moved a predetermined distance.

4. A switch of the character described comprising an actuator rod, a tubular guide therefor, a sleeve slidable upon said guide and provided with a movable contact member, links pivoted to said sleeve, and spring means connecting said rod and said links.

5. A switch of the character described comprising an actuating rod, a tubular guide therefor, means connected with one end of the rod for imparting movement thereto, and a contact member slidable upon said guide, said contact member and said rod having complemental means for imparting sudden independent movement to the contact member when the rod is moved a predetermined distance.

6. A switch of the character described comprising an actuator rod, a tubular guide therefor, means connected with one end of

the rod for imparting movement thereto, a sleeve slidable on said guide and provided with a movable contact member, links pivoted to said sleeve and spring means connecting said rod and said links.

7. A switch of the character described comprising an actuator member, a guide therefor, a contact member movably engaging said guide, links pivotally attached to the contact member, and spring links movably attached to said actuator member and to said first mentioned links.

8. A switch of the character described comprising an actuator rod, a tubular guide therefor, a movable contact member slidable on said guide, links pivoted to said movable contact member, and spring links movably connected with said rod, and with said first mentioned links.

9. A switch of the character described comprising a casing provided with a tubular guide, an actuator rod slidable in said guide, a contact member slidably mounted upon the exterior of said guide, links pivoted to said contact member, and spring links movably connected with said contact member and said rod.

In testimony whereof we affix our signatures in presence of two witnesses.

LOUIS W. DOWNES.
WALTER S. MAYER.

Witnesses:
GEORGE W. STEERE,
R. C. PATTON.