C. C. BADEAU.

DISTANT CONTROL ELECTRIC SWITCH.

APPLICATION FILED FEB. 17, 1911.

1,036,417.

Patented Aug. 20, 1912.

2 SHEETS—SHEET 1.

Fig. 1.

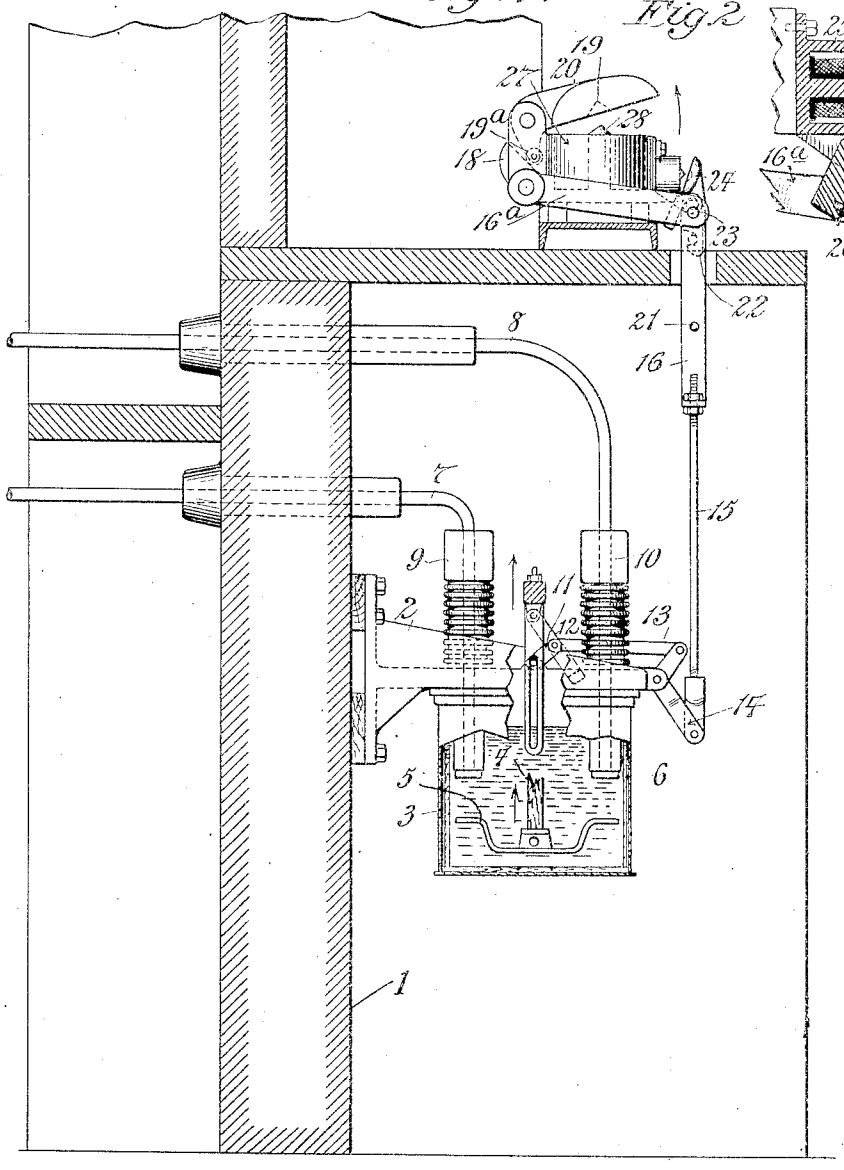

Fig. 2.

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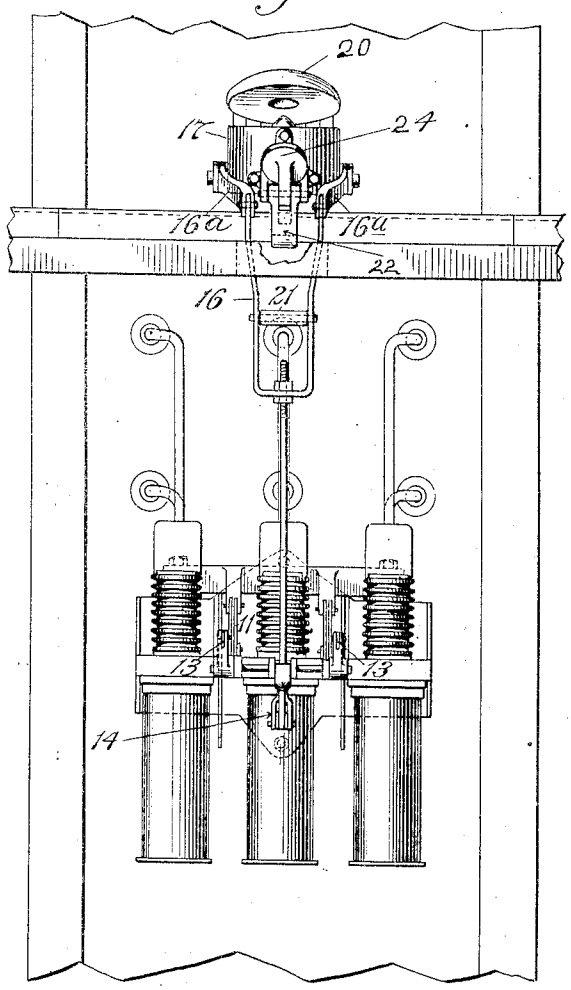
2 SHEETS—SHEET 2.

Fig. 3.



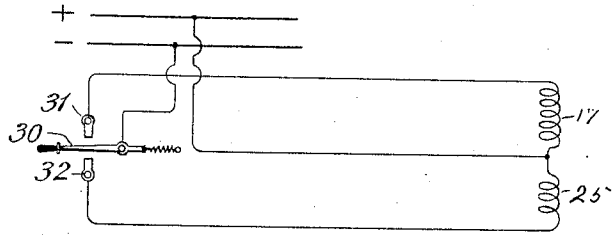


Fig. 4.

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UNITED STATES PATENT OFFICE.

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DISTANT-CONTROL ELECTRIC SWITCH.

1,036,417. Specification of Letters Patent. **Patented Aug. 20, 1912.**

Application filed February 17, 1911. Serial No. 609,132.

To all whom it may concern:

Be it known that I, CHARLES C. BADEAU, a citizen of the United States, residing at Winthrop, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Distant-Control Electric Switches, of which the following is a full, clear, and exact specification.

This invention relates to electrically operated switches or circuit breakers, the object being to provide for a distant control of such devices so that their circuits may be made and broken from a distant point thus enabling the switch to be manipulated with a maximum of convenience in any desired part of the operating station and at the same time insuring the safety of the operator, which in the case of high potential switches is necessary to insure safety of life. The operating parts of such switches are bodies of considerable weight and as a firm pressure on the contacts at which the circuit is made and broken, is necessary, considerable power is required in the operating mechanism. Very often electric motors are employed for this purpose or solenoids of great power and it is one of the objects of my invention to cheapen the operating mechanism in this respect. I employ for the purpose an iron-clad magnet so arranged that as its armature during the tractive effort approaches closer to the core and the magnetic circuit gives increased power, a cam mechanism interposed between the armature and the operating rod increases the leverage and therefore multiplies the power. By this means I am able to effect the operation of the heaviest switches employed in service for supply and distribution of electricity with a comparatively small electromagnet. The magnet is preferably of the bell type in which both the core and shell are of iron and coöperate in rendering maximum the tractive effort on the armature. A very important incident of this structure is that the violent jar on the switch parts usually occurring when the switch is thrown open or shut is avoided in my structure and although the heavy armature when drawn to the magnet moves with great speed and closes the switch very quickly, the vibration and jar of the switch apparatus is almost nil. This result is principally due to the sliding relation given by the cam which throws the switch, the lever connected with the armature being provided with a roller contact which rides easily on the cam surface of the switch-operating lever and always provides a yielding relation between the parts.

Another feature of my invention consists in providing on the frame of the operating magnet a trip-magnet and latch for engaging the mechanism when the switch is closed and holding it in the closed position thereby permitting both operating magnets to be de-energized, resulting in an economy of operating current.

My invention therefore consists in an operating magnet for an electric switch combined with a power multiplying mechanism between the armature and switch, physically disconnected from one another, but mechanically related.

It consists also of such an organization in combination with a latch for locking the switch closed, permitting release of the closing magnet, and an independently operated trip-magnet for releasing the latch.

It comprises also an operating magnet and tripping magnet mounted on the same frame having a common operating rod and common switch parts.

It comprises also other features, the novelty of which will be hereinafter more fully described and will be definitely indicated in the claims accompanying this specification.

In the accompanying drawings which illustrate my invention Figure 1 is a sectional view showing the relation of the operating magnet and a group of switches embodying my improvements; Fig. 2 is a sectional detail view more clearly showing the structure of the tripping magnet and latch; Fig. 3 is a view, at right angles to that of Fig. 1, showing the parts in elevation; and Fig. 4 is a diagrammatic illustration of the control circuits.

1 represents a support for an oil switch or group of oil switches. This may be a switch-board panel or it may be a cell in which the high potential switch is isolated. It is made of fire proof and moisture proof insulating material. From a casting 2 bolted to the support is supported a group of oil vessels 3; through an opening in the insulating cover of each switch projects a wooden rod 4, at the bottom of which is an elastic bridging contact 5 adapted when the rod is lifted to engage the switch terminals 6

and complete the circuit between supply or distribution leads 7, 8 carried through tubular insulators in the support. The leads enter the switch through porcelain insulators 9, 10; the switch rod 4 is raised and lowered by means of a toggle, the two links 11, 12 of which are actuated by a bar 13 and bell crank lever 14 connected with the operating mechanism. The link 12 of the toggle is hinged to a bar connecting with the rod 4 or any number of similar rods in the group of switches.

As shown in Fig. 3, there are three oil vessels and the movable contacts of all three are simultaneously controlled by the toggle 11, 12 as will be apparent from Figs. 1 and 3. The lower link 11 of the toggle is pivoted at a fixed point on a frame secured to the insulating cover. Connecting with the bell crank 14 is a rod 15, the end of which is screwed into a yoke 16 pivotally connected with two arms 16^a, 16^a journaled on the magnet frame 17. The arms are rigid with a cam 18 (see Fig. 1) set at an angle relatively to the arms and in coöperative relation to a roller 19^a on an arm rigidly related to the magnet armature 20, but lying at a suitable angle relatively thereto; across the arms of the yoke 16 is a pin 21 adapted to be engaged when the armature 20 is drawn up to the magnet by a pivoted latch 22. This latch is pivoted on a stud 23 on which is also pivoted the armature 24 of a release magnet 25 supported on the frame of the operating magnet, and the armature 24 has an overhanging arm provided with an adjusting screw 26 lying in the path of the latch 22 so that when the armature 24 is attracted the screw 26 knocks the latch away from the detaining pin 21 leaving the switch free to open. The switch element is given a normal bias to the open position by counter weights or springs and in the opening movement will act on the cam lever and restore the operating armature to its normal position or, if desired, this armature may also be spring retracted.

The frame of the operating magnet is an iron casting of mild steel or cast iron and contains an annular cavity 27 to receive the operating coil. In the casting is provided an integral pole piece 28, the tip of which is conical in shape, as indicated in Fig. 2, and enters a conical recess 19 in the armature. This relative arrangement of the working parts of the core and the armature gives a wider area of magnetic flux and intensifies the tractive effort of the armature when it occupies the open position and also equalizes the pull by making the changes of field strength more uniform. The bell shaped magnet moreover produces an annular magnetic field which acts with rapidly increasing power on the armature as it closes. It will be evident, moreover, that in the operation of closing the roller 19^a rides over the working face of the cam 18 and gradually increases the leverage thereby multiplying the power exerted on the switch during the progress of its closing movement and when it is nearly closed, that is to say after the engagement of the bridging contact with the fixed contacts, a maximum power is exerted assuring a good electric working relation of the contact parts. The movement of the armature strikes a hard blow upon the adjoining parts, but as the magnet has considerable mass and as there is a disconnected relation between the cam-roller 19^a and the operating mechanism almost no vibration is manifested at the switch which is a new result in switch operation. Ordinarily, where toggles and similar devices are employed, a sudden closing movement of the switch jars the switch parts violently.

In Fig. 4, I have shown a control circuit for the closing and release magnets; a spring retracted switch lever 30 normally biased to open position coöperates with contact clips 31, 32, each of which leads to a terminal of the operating and tripping magnet respectively. The other terminals are connected together and lead to one pole of a source of electric supply, the other pole of which is connected with the fulcrum of the switch lever. Thus, when the switch is thrown to the clip 31, the operating circuit is closed and the switch shifted to closed position, and when shifted to clip 32 the release magnet is operated and the switch circuit tripped.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. In a distant control electric switch, the combination of an operating magnet controlling the closure of the switch, an armature engaging with a cam, an operating rod shifted by the cam, an oil bath for the contacts, a toggle operated by the rod, a movable contact operated thereby, a detent on the rod, a latch having a fixed pivot and adapted to engage the detent when the switch is closed, a tripping magnet to release the latch and a distant control switch for the closing and trip magnets.

2. The combination of an iron clad electromagnet, an operating armature pivoted on the magnet frame, a power multiplying lever pivoted on the magnet frame, having a cam face engaged by the operating armature, a pivoted operating rod connected to the lever and a toggle and switch member operated thereby connected to the rod.

3. An electrically operated switch comprising an operating magnet, an armature and operating lever independently movable both pivoted to the magnet frame and mechanically related through power multiplying cam operating mechanism, switch con-

tacts having their movement controlled by the armature, and a distant control switch in an operating circuit for the magnet.

4. An electrically operated switch comprising an operating magnet, an armature and operating lever independently movable both pivoted to the magnet frame and mechanically related through power multiplying cam operating mechanism, switch contacts controlled by the operating lever, a detent on the magnet frame to latch the switch in closed position, a release magnet, and a distant control circuit for the operating and release magnets.

5. An electrically operated switch comprising an operating magnet, an operating armature pivoted thereon, an operating lever shifted by the armature, a cam and roller between the two engaging through increasing leverage when the magnet is energized, movable switch contacts operated by the armature, a detent to latch the switch in closed position, and a release magnet controlling the detent.

6. An electrically operated switch comprising an operating magnet and a trip magnet mounted on a frame common to both, a switch operating rod, a cam lever connected thereto, engaged by the armature of the operating magnet, a latch controlled by the trip magnet, and a detent on the switch rod movable into engaging relation with the latch when the operating magnet is energized.

7. The combination of an iron clad magnet, an armature and operating lever both pivoted on the magnet frame, a cam and roller engagement between the armature and lever to multiply power on the lever when the magnet operates, a detent to latch the switch in closed position, a release magnet controlling the detent, and switch contacts shifted into engagement by the armature when operated.

8. The combination of an ironclad magnet, an armature and operating lever both pivoted on the magnet frame, a cam and roller engagement between the armature and lever to multiply power on the lever when the magnet operates, whereby the shock due to the hammer blow of the armature is minimized, a trip magnet on the magnet frame, switch contacts normally biased to open relation shifted into engagement by the magnet and a distant control circuit for both magnets.

In testimony whereof I affix my signature, in presence of two witnesses.

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Witnesses:

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GEORGE A. BURNHAUS.