No. 706,540. Patented Aug. 12, 1902.

W. L. R. EMMET.

ELECTRICALLY CONTROLLED SWITCH.

(Application filed Nov. 3, 1899.)

(No Model.)

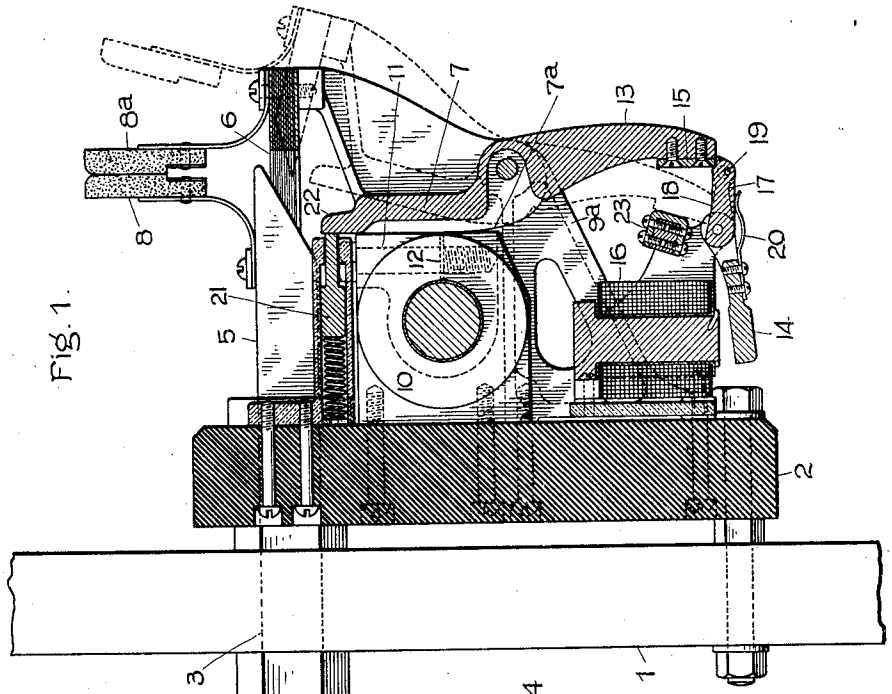

Fig. 1.

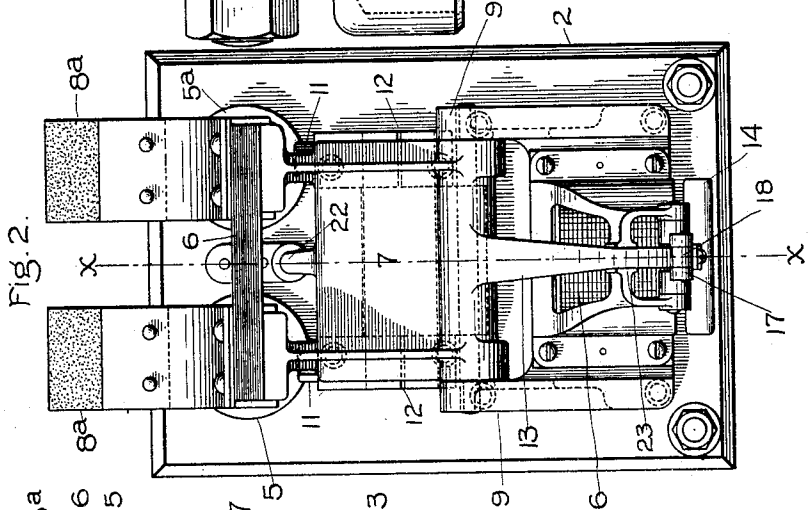

Fig. 2.

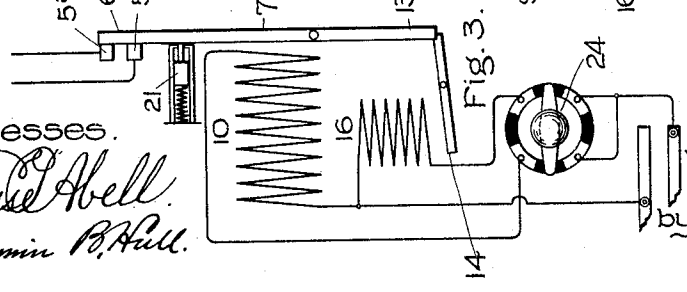

Fig. 3.

Witnesses.
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UNITED STATES PATENT OFFICE.

WILLIAM L. R. EMMET, OF SCHENECTADY, NEW YORK, ASSIGNOR TO THE GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

ELECTRICALLY-CONTROLLED SWITCH.

SPECIFICATION forming part of Letters Patent No. 706,540, dated August 12, 1902.

Application filed November 3, 1899. Serial No. 735,702. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM LE ROY EMMET, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Electrically-Controlled Switches, (Case No. 1,473,) of which the following is a specification.

This invention relates to an electrically-controlled switch in which a circuit may be closed or opened from a distant point.

The object of the invention is to provide a device capable of such control which may be compact in structure and effective in operation.

The invention embodies various structural features, the description of which will be more fully hereinafter set forth and the novelty of which will be specifically indicated in the claims.

In constructing the switch I mount the contact-terminals by which the circuit is made and broken at the top of the device, thereby preventing any arcing which may take place from damaging the operative parts. The movable armature which carries the circuit closing and breaking contacts is journaled on an axis below the contact-terminals and movable in a plane to and from the same, the controlling-magnet which closes the switch being housed within the space formed below the contact-terminals and between the armature and the supporting-board, and the tripping devices which control the opening of the switch being also between the plane of the armature and the supporting-board. By this arrangement a very compact organization is provided, and but little room is required for a switch of large capacity.

In the drawings which illustrate my invention, Figure 1 is a sectional elevation, the plane of the section being indicated by the line X X of Fig. 2. Fig. 2 is a front elevation, and Fig. 3 is a diagram, of the circuit connections of a switch embodying my improvements.

Referring to the drawings, 1 represents a switchboard or other insulating-support upon which the switch is mounted. The switch itself comprises an insulating-base 2, of slate or other insulating fireproof material, from the back of which project metallic posts 3, to which the circuit-terminals 4 may be secured. These posts terminate on the front side of the base in two contact-terminals, as 5 5^a, adapted to be bridged by a laminated bridge-contact 6, mounted upon an arm or extension of an armature 7 of the circuit-closing magnet. Fixed to the terminal 5 and the arm which carries the bridging-contact 6 are two stout elastic strips of metal, such as phosphor-bronze, upon which are mounted carbon blocks 8 8^a, a pair of which coöperates with each pair of contacts. The bundle of laminated strips which form the bridging-contact 6 is yoke-shaped, the two limbs of the yoke engaging the contact-terminals 5 5^a, and a pair of carbon contacts 8 8^a shunt the brake at each limb of the yoke. The armature 7 is pivoted in two standards or brackets 9 9^a, leaving a space in which the switch-operating magnet 10 may be inclosed. Two stout pole-pieces are secured to the ends of the core of this magnet by means of bolts 11, engaging the two sides of the pole-piece formed by a saw-cut 12, formed therein.

The magnet may be secured to the supporting-base by bolts, as indicated in dotted lines, engaging the pole-pieces. The axis of the armature is at or near the plane of the lower side of the pole-pieces, and the ends of the casting which forms the armature are enlarged, as indicated at 7^a, and have a curved swell, so that as the armature swings away from the pole-piece the air-gap will change but little at or near the lower edge of the pole-pieces, thereby permitting the lines of force to act effectively in swinging the armature toward the magnet when the circuit is closed and to bring the body of the armature into active relation to the pole-pieces. The relation of this curved edge and the pivot on which it swings to the pole-faces is such that a part of the armature swings through a field of slightly-varying magnetic density—namely, that part which is involved by the curved edge of the armature—while another part of the armature swings over a wide gap through a widely-varying field. The arm 13, projecting below the armature-pivot, coöperates with a latch 14 for opening the switch. The lower portion of the arm 13 is shod with a hardened

steel piece 15 to engage the latch and prevent wear. The releasing-magnet 16 is mounted on the floor of the support which carries the armature 7. Its armature 14 is pivoted on the supporting-frame and provided with a forked end at 17, in which is placed a movable catch 18, which acts as a detent for the armature 7. A pin 19, connecting the prongs of the fork, extends through a hole formed in the dog somewhat larger than the pin, so as to permit a certain amount of relative freedom of motion, which is normally taken up by a leaf-spring 20.

When the circuit is closed, a plunger 21, acting against a compression-spring, is forced inwardly by a projection in the armature-casting, as indicated at 22. The plunger and spring are housed within a tubular support lagged fast to the base by set-screws, as will be clearly evident from an inspection of Figs. 1 and 2. When the apparatus is set up in a vertical position, as indicated in Fig. 1, the tension of the springs upon which the shunt-contacts 8 8ª are mounted may be relied upon, in connection with gravity, to produce a quick rupture of the circuit, and by making these springs of sufficient elasticity the plunger 21 and its controlling-spring may be dispensed with.

The movement of the armature when the apparatus is tripped is arrested by a stop 23, which may be covered with leather or a durable soft fabric to cushion the blow.

The controlling-circuits of the switch are indicated in Fig. 3, in which 10 and 16 represent the two controlling-magnets of the switch, 7 the switch-controlling armature, and 14 the releasing-armature. A hand-controlled switch 24, which may be located at any accessible point, permits either the magnet 10 or 16 to be cut into circuit between two terminals connected with a suitable source of electricity. The switch itself may be placed at any point in the station or system. As shown in the drawings, it is mounted upon the station switchboards, inaccessible for prompt manual operation. When thrown to one position, as will be evident from an inspection of the diagram, the magnet 10 will be energized and the armature drawn up to the position indicated in Fig. 1, the steel shoe 15 being latched under the squared shoulder in the end of the detent 18. When the switch-button 24 is turned to the other position, the coil 16 is energized, attracting the armature 14 (see Fig. 1) and shifting the pin 19 through the slot or enlarged hole in the detent, thereby accumulating a certain amount of momentum in the armature and giving a sharp blow to the detent 18, releasing the armature 7, which under the pressure of the plunger 21 rapidly opens the circuit. During the opening movement the bridging-contact 6 first breaks contact with the contact-terminals 5 5ª without arcing, and the carbon-blocks 8 8ª separate a moment later, absorbing the spark. The location of these contacts at the top of the apparatus prevents any danger of fire or other injury from heat to the parts. The armature 7 drops back to the position indicated by dotted lines in Fig. 1, and when the circuit of the magnet 10 is again made there is no resistance to motion except the small overbalancing effect of the top of the armature, and, as will be understood from the description of the construction of the armature, the air-gap is very short at its lower portion, providing an effective action in starting it into movement when the circuit is closed. When it is drawn up to a position of substantial parallelism with the face of the pole-pieces and the air-gap is short throughout the whole field of force, it engages the plunger, and at this position of maximum effect it forces the inclined face of the flexible bridging-contact 6 hard against the fixed contact-terminals 5 5ª, thereby making good contact. It will be noted that the laminæ of the bridging-contact will be substantially in line with the fixed contacts and that the contacting face forms an acute angle with the laminæ. This brings them together with a sliding motion, which is effective in keeping the contact-surfaces clean and making good connection.

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

1. A magnetically-controlled switch comprising fixed contact-terminals, an armature carrying a bridging-contact, auxiliary shunting-contacts to absorb the spark of rupture, a switch-operating magnet housed between the armature and the base, and a releasing-magnet and tripping devices between the plane of the switching-armature and the base.

2. A magnetically-controlled switch comprising a circuit-closing armature, an operating-magnet, the armature being journaled to move to and from the field-poles over a wide air-gap and having a curved face near the journal to maintain a continuously-varying short air-gap thereat throughout its entire range of motion.

3. The combination of a magnet having split pole-pieces firmly engaging the ends of its core, and an armature coöperating with the said pole-pieces pivoted near the face of the pole-piece and provided with a curved edge to maintain a short air-gap in part of the magnetic field throughout the entire range of motion of the armature.

4. A magnetically-controlled switch comprising a setting-magnet, an armature moving in a plane at right angles to said magnet's axis and coöperating with both its poles, main and shunt contacts for an electric circuit, a magnetically-controlled trip, and a spring-pressed pin to assist withdrawal of the armature, said pin being mounted so as to engage the armature only after the latter is close to the poles of the magnet.

5. A magnetically-controlled switch comprising a magnetically-controlled armature

carrying the movable contacts supported for movement to and from the base, a controlling-magnet between it and the base, an extension-arm to the armature, magnetically-controlled tripping devices for the armature between the extension and the base, a stop to arrest the armature when released, and a spring arc-rupturing device strained when the switch is closed, but permitting free movement of the armature while the air-gap is long and the torque weak.

In witness whereof I have hereunto set my hand this 2d day of November, 1899.

WILLIAM L. R. EMMET.

Witnesses:
BENJ. B. HULL,
MABEL E. JACOBSON.