(No Model.)

F. G. BOLLES.

ELECTRIC SWITCH.

No. 528,900. Patented Nov. 6, 1894.

FIG. 1.

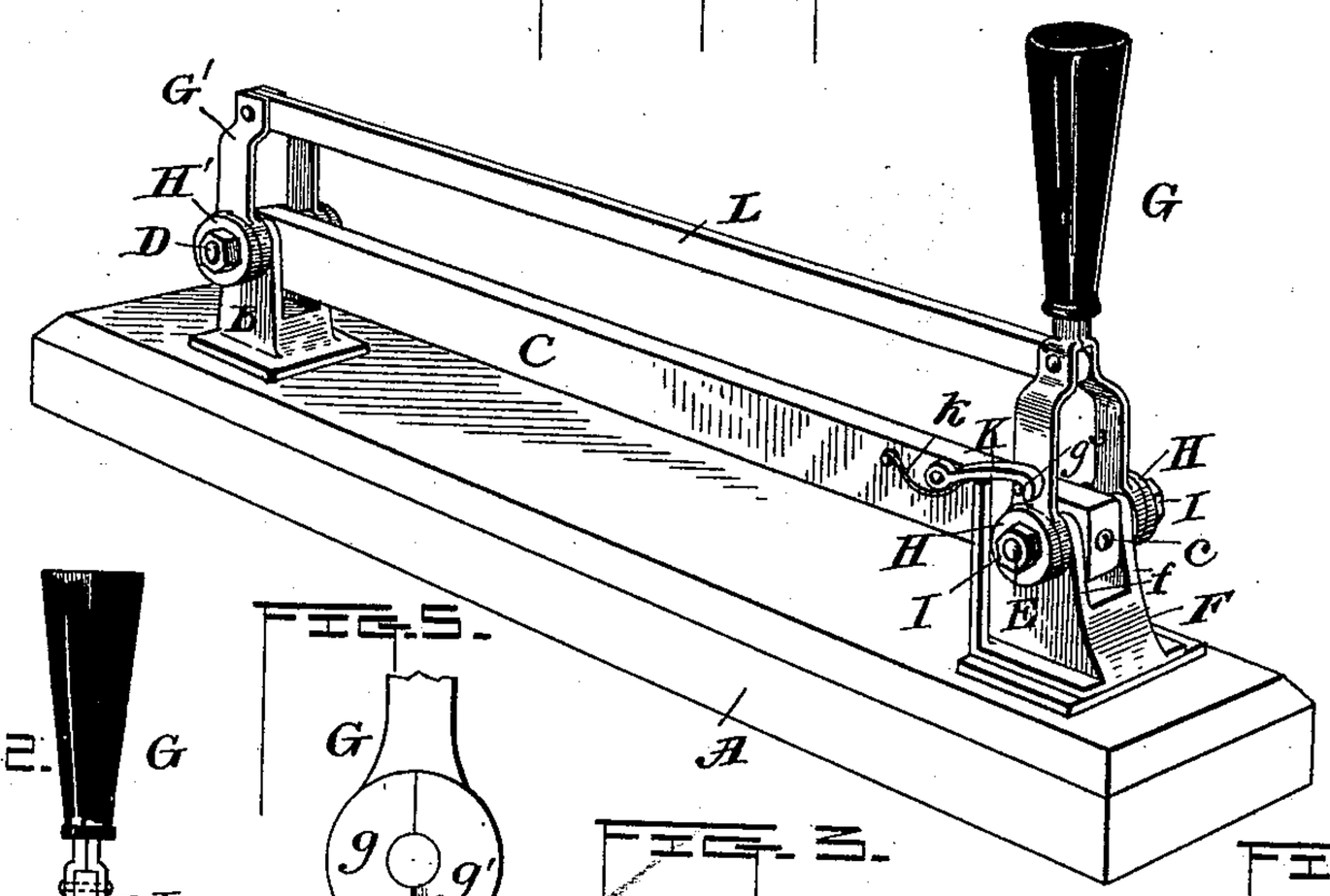


FIG. 2.

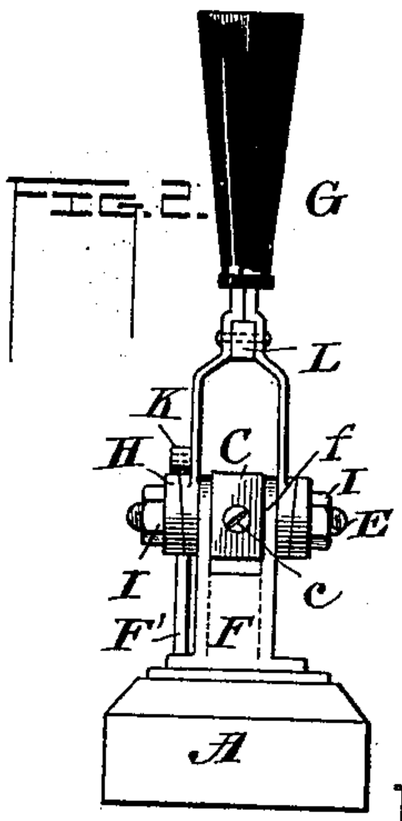


FIG. 5.

FIG. 3.

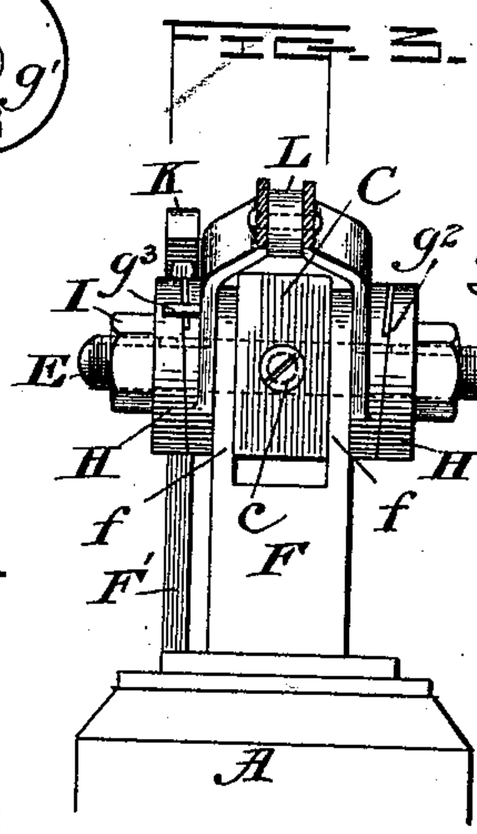


FIG. 4.

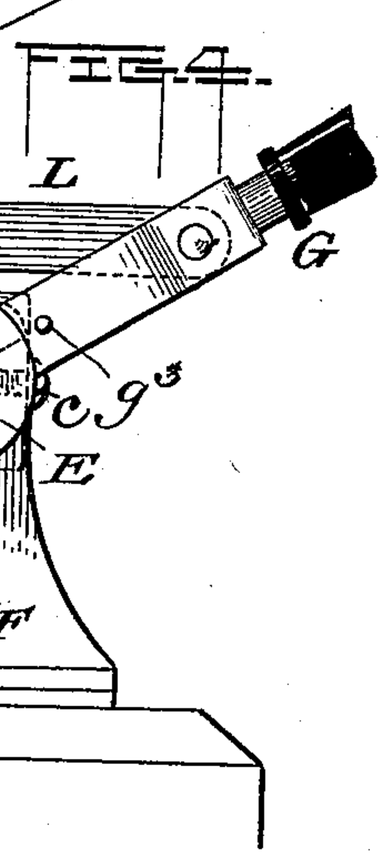
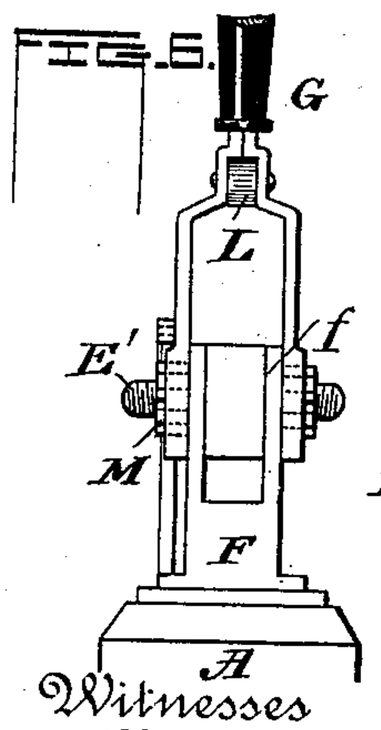
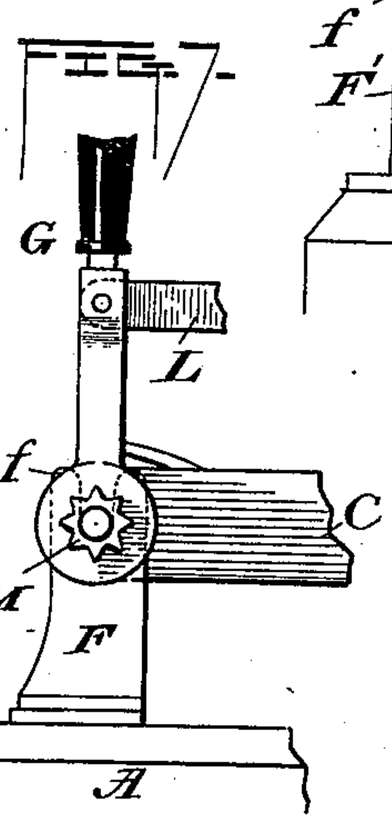
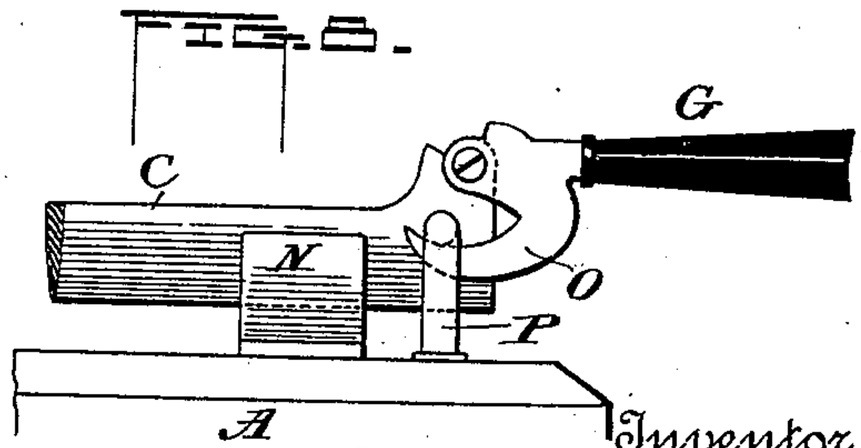


FIG. 6.







Witnesses
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UNITED STATES PATENT OFFICE.

FRANK G. BOLLES, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR OF ONE-THIRD TO PAUL EATON, OF SAME PLACE.

ELECTRIC SWITCH.

SPECIFICATION forming part of Letters Patent No. 528,900, dated November 6, 1894.

Application filed March 27, 1894. Serial No. 505,298. (No model.)

To all whom it may concern:

Be it known that I, FRANK G. BOLLES, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Switches for Controlling Electric Circuits; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention relates to switches for controlling electric circuits, especially those in which heavy currents are used, as in electric lighting, electric railways, and other systems of power transmission. It is found that considerable loss of energy is due to imperfect electrical contacts in the switches and other circuit controlling devices, and the object of my invention is to overcome these difficulties.

In the ordinary knife blade switch in general use for heavy currents, the perfection of the contact depends upon the resiliency of the springy metallic plates which form the stationary terminal, and between which the movable terminal or blade enters. When the switch is of large dimensions, it is sometimes difficult to open it, owing to the great friction between these terminals, and the slowness with which the switch may have to be opened increases the danger of injurious arcing between the terminals.

My invention consists in a device for tightening the contact between the terminals of an electric switch after the switch is closed, in order to reduce the resistance and insure a more perfect electrical continuity of the circuit.

The invention is capable of being carried out in a variety of ways, and is applicable to many different kinds of switches.

I do not limit myself to any particular device or devices; but I prefer to use a construction in which the handle of the switch is utilized to effect the tightening of the contacts. In order to do this, the handle must be movable relatively to the movable contact or the blade of the switch, and this movement may be coincident or parallel with or at an angle to the axis of motion of the movable contact. The tightening or clamping action may take place in a direction either transverse to the movement of the movable contact, or in line therewith. It may be applied to one or more contacts, and in the latter case, they may be operated simultaneously or separately as desired.

In the accompanying drawings, Figure 1 is a perspective view of one form of switch embodying my invention. Fig. 2 is an end elevation thereof, showing the contacts not tightened. Fig. 3 is an end elevation on a large scale, showing the contacts tightened. Fig. 4 is a side elevation of Fig. 3. Fig. 5 is a side view of the end of the handle. Fig. 6 is an end elevation of a modified construction. Fig. 7 is a side elevation thereof. Fig. 8 is a side elevation of a second modification.

The base A is of some insulating material, such as slate. The bifurcated block B serves as a support or fulcrum for the movable knife blade contact C, which is shown hinged on a transverse bolt D. Passing transversely through the free end of the blade C is a bolt E which is rigidly fastened in place, as by the set screw *c*. The stationary contact is a bifurcated block F having space enough between its arms to receive the blade C which fits snugly therein, to close the circuit, the line terminals being connected to the blocks B, F. Each arm *f* of the forked block F is notched to receive the bolt E.

On the projecting ends of the bolt is fulcrumed the forked handle G, the yoke of the fork being wide enough to pass down outside of the arms *f*. The bolt is also equipped at one or both ends with clamping or tightening devices, adapted to be operated by turning the handle, and serving to clamp the arms *f* tightly against the blade C, thereby greatly improving the electrical contact and reducing the resistance of the circuit.

In Figs. 1 to 5, the ends of the handle yoke are shown as provided on their outer faces with inclined surfaces or planes, preferably two, constituting the cams *g g'*. In contact with these are washers H, each having a corresponding double cam, and locked to the bolt by a spline *h* entering a keyway in the bolt.

Nuts I engaging with the screw-threaded ends of the bolt enable the washers to be adjusted toward the arms *f* in order to increase the clamping action or compensate for wear. Since the washers H do not turn on the bolt, there is no tendency to turn the nuts when the handle is moved.

The handle stands normally as shown in Figs. 1 and 2, with the abrupt shoulder g^2 at the ends of the cams *g g'* abutting against the corresponding shoulders in the washers, and preventing the handle from being moved farther back. Forward movement is prevented by a pawl K pivoted to the knife blade C and engaging with a pin g^3 on the handle. A spring *k* may be used to hold the pawl in engagement if desired.

The operation is as follows: When the movable contact is swung down, it enters between the arms *f*, and closes the circuit. At the same time the pawl is lifted off the pin g^3 by striking a stop F' rising adjacent to the block F. The handle can now be swung forward, and the interoperation of the cams on the handle yoke and the stationary washers squeezes the arms of the yoke together and clamps the arms *f* tightly against the blade C. It will be seen that only a very slight inclination of the cam surfaces is necessary to cause a powerful clamping action. To open the switch the handle is lifted, until the shoulders of the cams strike, when the parts will be so loosened that they can be easily separated, and the pawl K dropping down over the pin as the blade is lifted.

If desired, the bolt D on which the blade is hinged may be fitted with stationary washers H' having cam surfaces, and a yoke G' similarly provided, the yoke being connected by a link L with the handle G, so that the handle operates a clamping device at each end of the movable contact.

In the modification shown in Figs. 6 and 7, the handle yoke engages with two nuts M, the screw-threads on the ends of the bolt E' being right-and left-handed respectively, so that the movement of the handle screws the nuts toward each other, and causes them to clamp the arms *f* against the blade C. The nuts have polygonal peripheries fitting polygonal holes in the handle yoke, to permit them to be adjusted.

In the modification shown in Fig. 8, the blade C closes on a V shaped stationary contact N, and the handle has one or more hooked cams O to engage with a stationary post P and force the blade down tightly into the contact N.

These are but three of many modifications of my basic idea, and indicate that it may be carried out in a number of different ways without departing from the spirit of my invention.

Having thus described my invention, what I claim as new is—

1. A switch for controlling electric circuits, having a fixed contact and a movable contact, an operating handle on the movable contact, and movable relatively thereto, and a clamping device operated by an independent movement of said handle for tightening the contact between the fixed and movable contacts after the circuits are closed, substantially as described.

2. A switch for controlling electrical circuits, provided with a clamping device to tighten the contact between its movable and stationary parts, said device being operated by the switch handle independently of the movement which it imparts to the movable portion of the switch, substantially as described.

3. A switch for controlling electrical circuits, having its movable contact provided with a relatively movable handle, and a clamping device for tightening the contact, operated by said handle independently of the movable contact, substantially as described.

4. A switch for controlling electrical circuits, having its movable contact provided with a relatively movable handle, a stationary contact with which the movable contact engages, and a clamping device operated by said handle independently of the movable contact and serving to force the contacts together in a direction transverse to the line of movement of the movable contact after the circuit is closed, substantially as described.

5. A switch for controlling electrical circuits, having its movable contact provided with a relatively movable handle, a bifurcated stationary contact, and a clamping device operated by said handle and serving to tighten the arms of the stationary contact against the movable contact, substantially as described.

6. A switch for controlling electrical circuits, having its movable contact provided with a relatively movable handle, and a transverse bolt, and a clamping device movable axially of said bolt and operated by said handle, serving to tighten the contact between the movable and stationary parts of the switch, substantially as described.

7. A switch for controlling electrical circuits, having its movable contact provided with a relatively movable handle and a transverse bolt, and a clamping device comprising two inter-operating inclined planes one of which is movable by said handle, said clamping device operating to tighten the contact, substantially as described.

8. A switch for controlling electrical circuits, having its movable contact provided with a relatively movable handle and a transverse bolt on which said handle is fulcrumed, and two stationary washers on said bolt each having one or more cam surfaces to cooperate with similar surfaces on the end of the handle, substantially as described.

9. A switch for controlling electrical circuits, having its movable contact provided with a transverse bolt, a handle having a

forked yoke fulcrumed on said bolt, and provided with cam surfaces and shoulders, washers splined on said bolt and having cam surfaces cooperating with those on the yoke, and nuts on the bolt to adjust the washers, substantially as described.

10. The combination with the stationary bifurcated contact block, of the movable contact blade, the transverse bolt, the forked handle fulcrumed thereon, and carrying the cam surfaces, the stationary cam faced washers on the bolt, the pawl pivoted to the movable contact, and the pin on the handle, substantially as described.

11. In an electric switch, the combination with the movable contact, of a handle hinged thereto, and a locking device for locking the handle to the contact, substantially as described.

12. In an electric switch, the combination with the movable contact, of a handle movable relatively thereto, a locking device for locking the handle to the contact, and means for automatically unlocking the handle when the electric circuit is closed, substantially as described.

13. In an electric switch, a clamping device for tightening the hinge joint of the movable contact, and a handle movable relatively to the movable contact and adapted to operate said clamping device, substantially as described.

14. In an electric switch, the combination with a clamping device for tightening the hinge joint of the movable contact, of a similar device for tightening the contact between the switch terminals, and means for operating them simultaneously, substantially as described.

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

F. G. BOLLES.

Witnesses:
PAUL EATON,
W. H. BENTLEY.