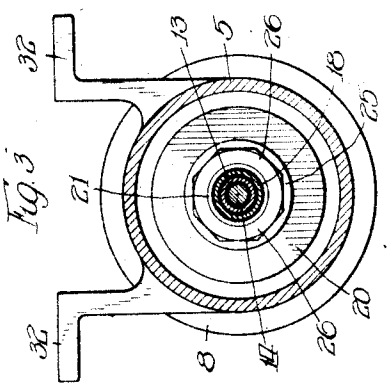
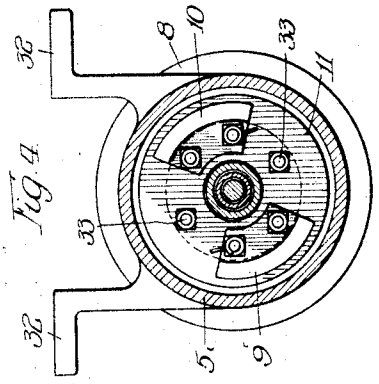
Aug. 10, 1926. 1,595,373

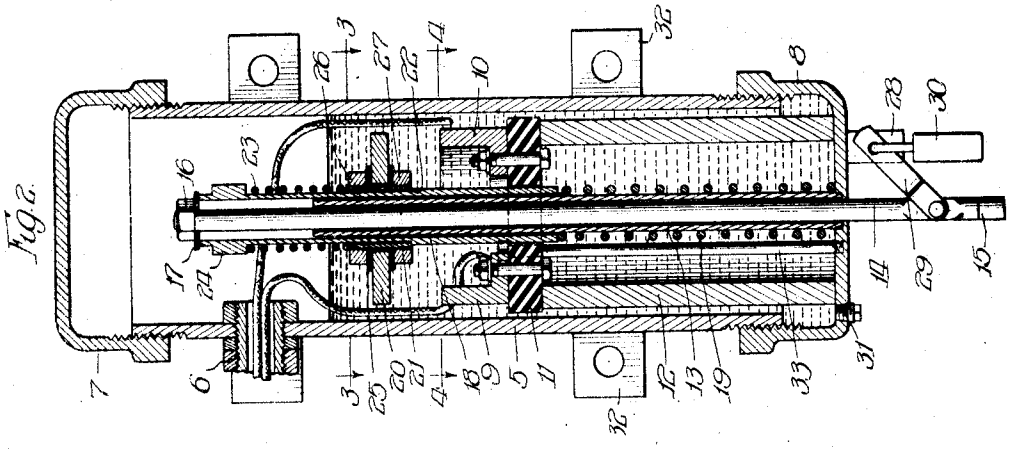
H. F. BATES

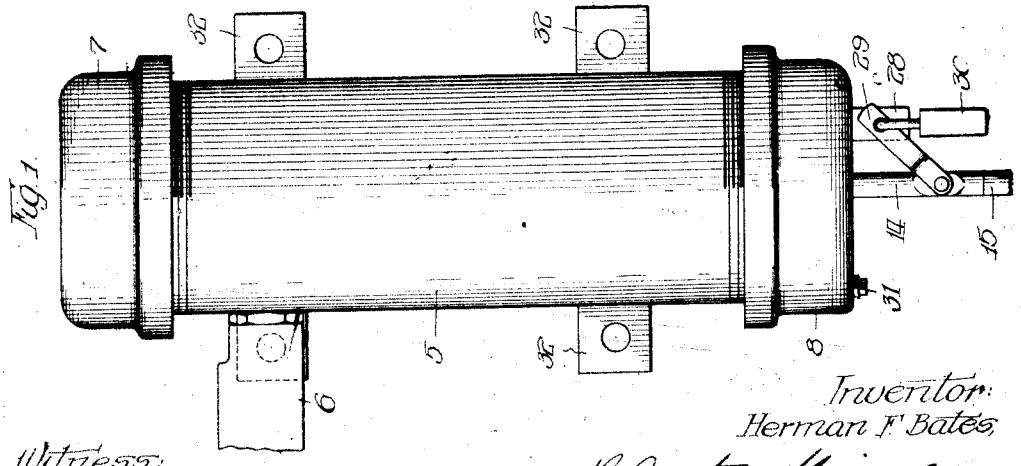
ELECTRIC SWITCH

Filed Dec. 6, 1920









Witness:
R. Burkhardt.

Inventor:
Herman F. Bates,
By D. Anthony Usina
Atty

Patented Aug. 10, 1926. 1,595,373

UNITED STATES PATENT OFFICE.

HERMAN F. BATES, OF IRONWOOD, MICHIGAN.

ELECTRIC SWITCH.

Application filed December 6, 1920. Serial No. 428,521.

This invention relates to a new and improved form of electric switch, and more specifically to an electric switch particularly adapted for use in mines or in other localities where it is essential to have the working parts of the switch protected from gas and from dampness.

In mining operations electrical signals are transmitted from the mine levels to the hoisting engineer in order to direct the raising or lowering of the cage or skip. Signals also are used in connection with other mine purposes. These signals in general consist of various combinations of long and short rings. The switches are used by various workmen who have different methods of ringing, and since the signals depend largely on the character of ring, it is essential that the switch be constructed to give uniform signals with varying operation, in so far as that is possible. That is, some workmen would consider a ring long, while others would consider the same ring short. A careless operation also of switches of the press-button type may give a jingling ring instead of a series of long and short rings. An incorrect rendering of the signal may cause serious injury to workmen or to the mine property. The switches undergo very heavy and rough usage and must be strongly made to stand up under the work.

It is an object of the present invention to provide a switch structure which is substantially moisture-proof and gas-proof, which is simple in design and rugged in construction.

It is a further object to provide a switch having a delayed contact breaking action and therefore adapted to give a generally uniform signal.

It is an additional object to provide a switch in which the contact stroke is cushioned, thus lessening the wear upon the contacts.

It is a further object to provide a switch which is operable by a single pull stroke and which may be readily locked to prevent unauthorized use. Other and further objects will appear as the description proceeds.

My switch broadly comprises a switch shell having therein the switch contacts, the movable contact being operated by a lever extending from the casing. The contacts are covered by a liquid adapted to prevent sparking upon separation of the contacts, the liquid also serving to seal the opening in the casing through which the handle passes. The movable contact is yieldably associated with an operating lever so that movement of the lever may continue after the contact is made, and similarly so that contact will be retained for a short period after the lever is released. I have illustrated a preferred embodiment of my invention in the accompanying drawings, in which—

Figure 1 is an elevation of my switch assembly;

Figure 2 is a vertical section of Figure 1;

Figure 3 is a horizontal section taken on line 3—3 of Figure 2; and,

Figure 4 is a horizontal section taken on line 4—4 of Figure 2.

Referring particularly to Figure 2, the switch is housed in a casing 5, the wiring being led through the conduit 6. The upper end of the casing is closed by the cap 7. The lower end of the casing carries the closure 8, which in turn carries the switch assembly. The fixed contact members 9 and 10 are carried upon the insulation 11, which in turn rests upon the cylindrical support 12. The insulation is held in place by the bolts 33 whose lower ends are threaded into the closure 8. The fixed sleeve 13 is threaded centrally into the closure 8, the closure being provided with an opening corresponding to that in the sleeve. The switch plunger 14 is provided at its lower end with an operating handle 15. The upper portion of the plunger extends upwardly into the casing through the fixed sleeve 13, the upper end carrying a nut 16. This nut 16 bears upon the washer 17, which in turn bears upon the upper end of the movable sleeve 18. This sleeve surrounds the fixed sleeve 13 and extends downwardly through an axial opening in the insulation 11. The lower end of the sleeve 18 bears upon the upper end of a spring 19. This spring surrounds the fixed sleeve 13 and has its lower end engaging the inner face of the closure 8. The movable contact comprises the disk 20, which is carried by the collar 21, the collar being slidable upon the movable sleeve 18. Downward movement of the collar is limited by the shoulder 22 upon the sleeve 18. A spring 23 surrounds the movable sleeve 18, the lower end of the spring bearing against the upper face of the collar 21 and the upper end of the spring en-

gaging a shoulder 24 on the sleeve 18. The movable contact 20 is separated from the collar 21 by insulation 25 and is held in place upon the collar by nuts 26 and 27.

The pierced lug 28 extends from the lower face of the closure 8 and is adapted to coact with a swinging link 29, which is pivoted to the plunger 14. A lock 30 is adapted to have its shank pass through the openings in the link 29 and the lug 28. The closure 8 is provided with a screw-threaded plug 31, through which the oil may be drained from the switch. The switch casing 5 is provided with legs 32, by means of which it may be attached to any convenient support. The switch casing is normally filled with oil up to approximately the top of the fixed sleeve 13.

This switch is operated by a direct downward pull upon the handle 15. This pull is transmitted to the movable sleeve 18 through the nut 16 and washer 17. The pull must overcome the resistance of the spring 19. The movable contact 20 engages the fixed contacts 9 and 10 after a relatively short travel of the plunger. The movable contact 20, however, is yieldably carried by the movable sleeve 18 so that movement of the plunger 14 may continue after the movable and fixed contacts are in engagement. This further movement serves to compress the spring 23, as well as the spring 19. Movement is stopped when the washer 17 engages the upper end of the fixed sleeve 13. Upon release of the handle 15 the plunger is carried upward through the action of the spring 19 against the movable sleeve 18. The movable contact 20, however, is retained by the spring 23 in engagement with the fixed contacts 9 and 10 until the shoulder 22 engages the sleeve 21, at which point the movable contact is lifted from the fixed contacts and the circuit is broken.

When operated by a single full movement and immediate release, the switch, due to the early engagement of the switch elements and their late release, will give a clear and substantially uniform signal. The length of this signal will be substantially constant even when made by different operators. The oil in the switch casing covers the switch contacts and therefore prevents any arcing between the fixed and movable contacts. While the oil may, of course, be omitted when the switch is used in low voltage circuits, the oil has other important functions which render its use generally desirable. This oil serves to have somewhat of a dash pot action upon the movable contact upon its release and cushions its movement. A more important function of the oil, however, consists in the fact that it completely seals the operating handle opening due to the fact that the movable sleeve has its lower end constantly below the surface of the oil. This is particularly important in mine work since it is very desirable to keep out any of the dangerous mine gases which may be exploded by any spark which occurs. It is further particularly desirable to keep out moisture, and due to this oil seal no water can enter the switch directly, and since no air passes through the switch no moisture can be deposited inside the switch by condensation. All parts of the switch are rugged in construction and are readily accessible through removal of the cap 7 or closure 8. The switch may thus be quickly examined, cleaned or refilled with oil when necessary.

The locking feature is desirable since it is often essential that signals may be given only by properly authorized persons.

I claim:

1. An electric switch comprising a casing and a fixed sleeve associated therewith, a fixed contact adjacent the sleeve, a movable sleeve associated with the fixed sleeve and operatively connected to a plunger extending outwardly of the casing, and a movable contact carried by the movable sleeve and adapted to be moved into engagement with the fixed contact by movement of the plunger.

2. An electric switch comprising a casing and a fixed sleeve associated therewith, a fixed contact adjacent the sleeve, a movable sleeve surrounding the fixed sleeve and operatively connected to a plunger extending outwardly of the casing through the fixed sleeve, and a movable contact carried by the movable sleeve and adapted to be moved into engagement with the fixed contact by movement of the plunger.

3. An electric switch comprising a casing and a fixed sleeve associated therewith, a fixed contact adjacent the sleeve, a movable sleeve associated with the fixed sleeve and operatively connected to a plunger extending outwardly of the casing, and a movable contact carried by the movable sleeve and adapted to be moved into engagement with the fixed contact by movement of the plunger, the movable contact having a yielding connection to the movable sleeve whereby it is adapted to engage the fixed contact during portions of the inward and outward stroke of the plunger.

4. An electric switch comprising a casing and a fixed sleeve associated therewith, a fixed contact adjacent the sleeve, a movable sleeve associated with the fixed sleeve and operatively connected to a plunger extending outwardly of the casing, and a movable contact carried by the movable sleeve and adapted to be moved into engagement with the fixed contact by movement of the plunger, the connection between the fixed sleeve and the casing being tight and the

contacts located below the upper end of the fixed sleeve whereby the casing may be filled with a liquid to cover the contacts.

5. An electric switch having a tight casing containing switch contacts, a fixed sleeve extending upwardly therein, a movable sleeve surrounding the fixed sleeve, an operating plunger extending through the fixed sleeve and having a tight connection to the movable sleeve, and a liquid filling the casing to a point above the lower end of the movable sleeve and below the upper end of the fixed sleeve whereby the casing is sealed by the liquid.

6. An electric switch having a tight casing containing switch contacts, a fixed sleeve extending upwardly therein, a movable sleeve surrounding the fixed sleeve, an operating plunger extending through the fixed sleeve and having a tight connection to the movable sleeve, and a liquid filling the casing to above the lower end of the movable sleeve and to below the upper end of the fixed sleeve whereby the casing is sealed by the liquid, the liquid also covering the contacts and being adapted to prevent arcing.

7. An electric switch comprising a casing, a fixed sleeve extending into the casing, an operating plunger extending into the sleeve and freely movable therein, a spring surrounding the portion of the sleeve adjacent the casing, a movable sleeve surrounding the fixed sleeve and bearing against the spring, the inner end of the movable sleeve having connected to the plunger a fixed contact located adjacent the movable sleeve, opposed shoulders upon the movable sleeve, a movable contact adapted to have a sliding movement therebetween, and a spring bearing against one of said shoulders and against the adjacent face of the movable contact thus urging the movable contact against the shoulder adjacent the fixed contact.

8. An electric switch comprising a casing, a fixed sleeve extending upwardly into the casing, an operating plunger extending upwardly into the sleeve and adapted to reciprocate freely therein, a spring surrounding the lower portion of the fixed sleeve and bearing against the casing, a movable sleeve surrounding the fixed sleeve and bearing upon the upper end of the spring, the upper end of the movable sleeve having a connection with the upper end of the plunger, fixed contacts located adjacent the lower portion of the movable sleeve, opposed shoulders upon the movable sleeve, a movable contact having a sliding movement between said shoulders, and a spring bearing against the upper shoulder and the upper face of the movable contact and thus yieldably holding the contact against the lower shoulder.

9. An electric switch comprising a casing, a fixed sleeve extending upwardly into the casing and having a tight connection therewith, an operating plunger extending upwardly into the sleeve and adapted to reciprocate freely therein, a spring surrounding the lower portion of the fixed sleeve and bearing against the casing, a movable sleeve surrounding the fixed sleeve and bearing upon the upper end of the spring, the upper end of the movable sleeve having a tight connection with the upper end of the plunger, fixed contacts located adjacent the lower portion of the movable sleeve, opposed shoulders upon the movable sleeve, a movable contact having a sliding movement between said shoulders, and a spring bearing against the upper shoulder and the upper face of the movable contact and thus yieldably holding the contact against the lower shoulder, the casing being sealed by a filling of oil extending to a point above the lower end of the movable sleeve and below the upper end of the fixed sleeve.

Signed at Ironwood, Michigan, this 29th day of November, 1920.

HERMAN F. BATES.