C. & A. BECK.
ELECTRIC SIGNAL SWITCH.
APPLICATION FILED SEPT. 17, 1910.

1,023,410. Patented Apr. 16, 1912.

FIG. 1.

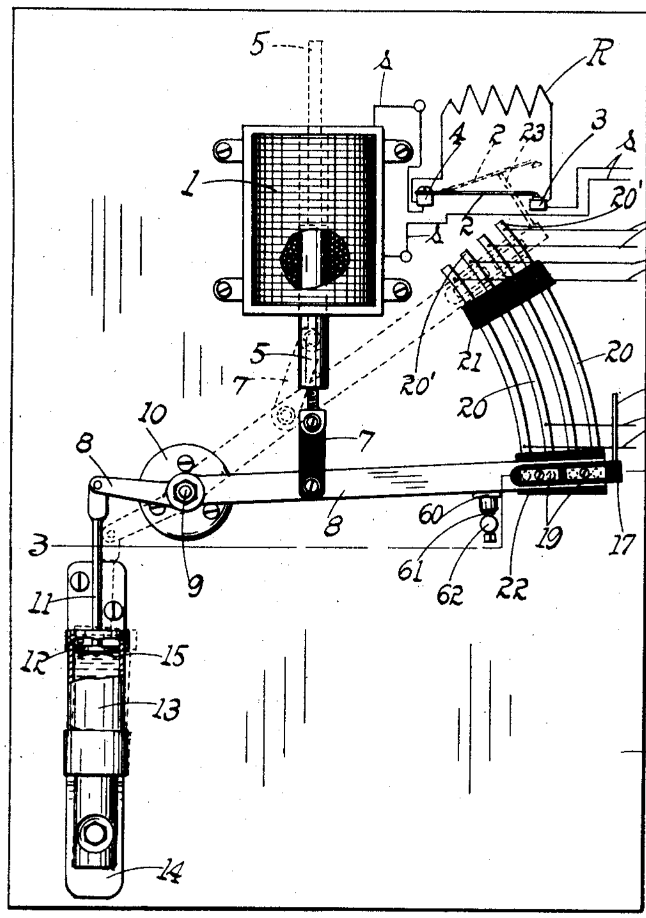
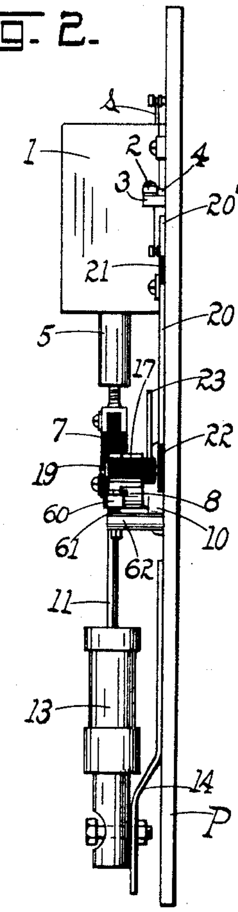


FIG. 2.



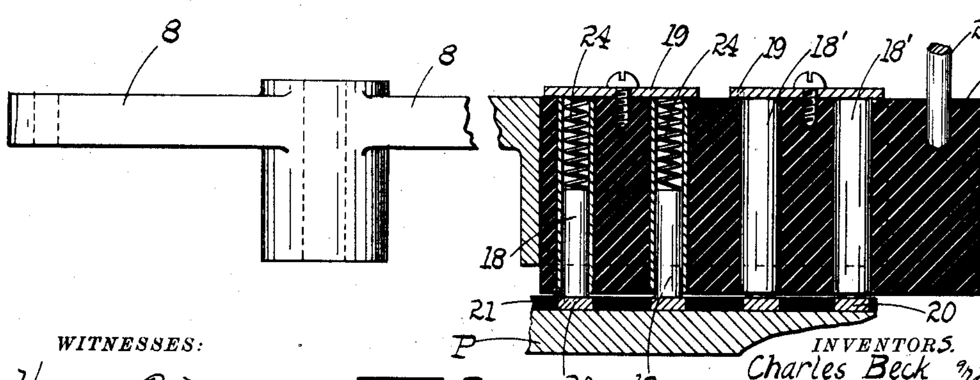


FIG. 3.

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ELECTRIC SIGNAL-SWITCH.

1,023,410. Specification of Letters Patent. Patented Apr. 16, 1912.

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To all whom it may concern:

Be it known that we, CHARLES BECK and ARTHUR BECK, citizens of the United States, residing at St. Louis, State of Missouri, have invented certain new and useful Improvements in Electric Signal-Switches, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

Our invention has relation to improvements in electric signal-switches; and it consists in the novel details of construction more fully set forth in the specification and pointed out in the claims.

In the drawings, Figure 1 is an elevation of the switch; Fig. 2 is an edge view, or at right angles to Fig. 1; and Fig. 3 is an enlarged longitudinal section of the free end of the long arm of the switch-lever on the line 3—3 of Fig. 1, the rails traversed by the brushes being in section, and also showing the insulating fiber at the upper end of the long rail-sections.

The object of our invention is to construct an electro-magnetically operated switch which will permit the starting of electrically driven machinery (once such machinery has been stopped for any purpose) only upon the conclusion of a timely warning to the operator, giving such operator and his helpers ample time to step aside and away from such machine and avoid being caught, maimed or otherwise injured by an accidental starting of the machine resulting from any imperfect breaking of the circuit of the driving current or by accidental short circuiting of parts which will allow the current to reach the motor.

A further object is to provide a switch which will supplement such warning or signal by a preliminary signal upon the stopping of the machinery.

A further object is to provide a signal switch which will likewise serve as a starting switch or circuit closer upon the conclusion of the warning signal.

The present improvement is susceptible of use in connection with any character of machinery, though specially devised to serve in connection with large printing presses where the sudden starting of a press often results in serious accidents.

The advantages of the invention will be fully apparent from a detailed description thereof, which is as follows:—

Referring to the drawings, *s*, *s*, represent conducting wires leading from a main line wire (not shown) and which supply the energizing current to the switch-coil 1, the current ordinarily traversing a spring arm 2 fixed at one end, the opposite end being free and normally bearing against a contact 3 in the path of the circuit; the fixed end is secured to a binding post 4. Upon disengagement of the free end of the spring 2 from the contact 3, the current traverses the resistance R interposed between the parts 3, 4, such disengagement being effected as the plunger-armature 5 of the coil approaches the limit of its upward stroke under circumstances to be presently referred to. The circuit *s*, *s*, is provided with a switch (or push-button) not shown, for turning on the energizing current. The base of the plunger 5 has coupled thereto through the medium of a link 7 (preferably of insulating material) the long arm of a switch-lever 8, which is adapted to sweep in a vertical plane, the lever being pivoted or fulcrumed about a stud 9 on a plate 10 secured to a base plate P of slate or composition. The free end of the short arm of the switch-lever is pivotally coupled to the upper end of a piston-rod 11 secured to a piston 12 within the cylinder 13, the latter (to allow for the arcuate movement of the lever arm) being hinged at the base to a bracket 14 carried by the plate P. With the oscillations of the lever 8, the cylinder 13 will necessarily be subjected to a slight oscillation about the bracket-arm 14 as a fulcrum. The piston 12 is provided with a series of openings not shown, which may be to a greater or less degree covered by a flexible metallic disk-valve 15 riveted centrally to the under side of the piston, the metal of the disk springing toward the piston, but limited by an adjusting screw not shown operating through the piston and engaging the valve.

The cylinder is filled with oil or other suitable liquid, the piston freely moving upward through the oil since the latter passes freely through the ports behind the disk 15, but moving slowly downward or in the opposite direction, owing to the partial closing or seating of the valve against the piston face and over the ports. The piston

therefore, is susceptible of a comparatively rapid travel upward through the oil, and a slow travel downward, the rate being regulated by a proper adjustment of the screw. This method of regulating the piston speed through the cylinder is not new *per se*, and hence there is no occasion to illustrate all the details of the construction.

The free end of the long arm of the switch-lever 8 is provided with an insulating block or head 17 equipped with contact members or "brushes" 18 arranged in pairs, each pair being connected by a conducting strip 19. Each pair of brushes is designed to traverse a pair of curved conducting rails 20, 20′, composed each of two sections (a long and a short section) the short sections 20′ being separated from the long sections 20 by a gap which is preferably filled with an insulating block of fiber 21 or equivalent material, a similar block 22 being located at the lower ends of the sections 20. The free end of the long arm of the lever carries a tripping arm 23 which strikes the free end of the spring arm 2 just as the lever is passing over the block 21, thereby disengaging the arm 2 from the contact 3 and causing the current to traverse the resistance R. This is done to reduce the current strength through the coil 1 and prevent heating the same, as by that time very little magnetic force is required to lift the plunger 5 (and the weight coupled thereto) through the small fraction of the stroke which the plunger makes to actuate the lever 8 as presently more fully apparent. The preferred manner of mounting the brushes 18 is shown in the enlarged section in Fig. 3. Each brush is movably confined in a tube or sleeve 18′ in the block 17, and forced into yielding engagement with the rail 20 (20′) by a compression spring 24 interposed within the tube 18′ between the resilient arm of the conducting strip 19 and the brush. In this way any unevenness in the movement of the switch-lever is corrected by the brushes, the springs 24 too keeping them in firm contact with the rails as the brushes wear away.

Leading from one pair of the rail sections 20′ are circuit wires *a*, *a*, and leading from the other pair are circuit wires *b*, *b*, the several wires forming parts of any desirable motor-circuit (not shown). Leading from a pair of rail-sections 20, are circuit wires *e*, *e*, forming part of any desirable alarm or light signal-circuit not shown.

The operation is substantially as follows:—If it be desired to stop the motor of any motor-circuit, the operator opens the switch of the circuit *s*, *s*, thus breaking the circuit, and deënergizing or demagnetizing the coil 1. The circuit thus broken releases the plunger 5 which allows the long arm of the switch-lever 8 to drop, the latter dropping without material resistance since the oil in the cylinder 13 flows freely through the ports of the piston 12 with an upward stroke of the latter for reasons already explained. The impact of the lever when it drops is taken up by the buffer-head 60 at the upper end of a stem 61 mounted slidingly in a bracket-arm 62, a spring not shown being interposed between the head and bracket. Any equivalent buffer may of course be substituted. When the lever 8 (always referring of course, to the long arm thereof) is in its lowest position (Fig. 1) the brushes 18 are in engagement with the insulating fiber block 22 and hence the several circuits *a*, *a*, *b*, *b*, *e*, *e*, are broken and the motor is at a stand-still. To start the motor, the operator closes the switch of the circuit *s*, *s* which instantly energizes the coil 1 thus lifting the plunger armature 5 slowly. This in turn lifts the lever 8 slowly (at a rate depending on the degree of adjustment of the screw which regulates the flex of the disk 15 controlling the ports) as previously described. The moment the free end of the lever 8 passes off the block 22 and onto the rail sections 20, the brushes 18, 18, and their strip 19 close the circuit *e*, *e*. As the lever is sweeping across the gap and over the block 21 between the rail sections 20, 20′, the alarm-circuit *e*, *e* current will be broken, but by that time every one has had a chance to get out of the way of the machinery to be now started, because the necessary alarm was given during the sweep of the lever 8 over the rails 20. The moment the lever 8 reaches the rail-sections 20′ (dotted position Fig. 1) by which time the plunger 5 has been nearly fully raised the tripping arm 23 disengages the free end of the spring arm 2 from the contact 3, causing the current of the circuit *s*, *s*, to traverse the resistance R, the current being however, sufficient to maintain the plunger 5 in its raised position, but not strong enough to overheat the coil 1. With the switch-lever 8 on the rail-sections 20′, the circuits *a*, *a*, *b*, *b*, are closed, and their motor may be started.

When the switch of the circuit *s*, *s*, is open the lever 8 falls quite rapidly as the oil in the cylinder passes freely through the ports of the piston 12 with a rise of the piston as already explained. The instant the lever 8 passes off the rails 20′ in its downstroke, the circuits *a*, *a*, *b*, *b*, are broken; as the lever is passing over the rails 20 a short signal or alarm is also sounded, but this signal is not the one depended on. When the lever 8 reaches the block 22 (Fig. 1) the circuit *e*, *e*, is broken. With the lever 8 in its lowest position the motor is at a stand-still, and the necessary repairs may be made to the machinery.

Obviously, the present switch may be used in connection with any other power driven

machinery, that here shown being but a single example of its application.

By "short" rail sections (such as 20′) is not necessarily meant that the rails must be short, but rather that the sweep of the lever 8 need be for a short distance since only sufficient sweep thereover as will complete the circuits *a*, *a*, *b*, *b*, is necessary. In practice however, long sections beyond the block 21 are not necessary. By "rails" is meant of course, any equivalent conducting members which the brushes or contacts 18 may ride over.

Having described our invention, what we claim is:—

1. In combination with a movable member provided with pairs of electrically connected contacts or brushes, pairs of rails composed of two sections spaced apart at their adjacent ends and insulated from one another, and means for actuating the movable member to cause its brushes to traverse the respective rail sections through unequal distances from the center of the space between the sections.

2. In combination with an oscillating lever provided with pairs of electrically connected, yielding brushes, pairs of curved rails composed of two sections spaced apart at their adjacent ends and leaving a non-conducting gap between them, and means for oscillating said lever to cause its brushes to traverse the respective rail sections through unequal distances from the center of the gap.

3. In combination with a reciprocating member provided with pairs of electrcially connected brushes, pairs of rails composed of two sections spaced apart at their adjacent ends and insulated from one another, an insulated member at the outer terminal of one of the sections for engaging the brushes at the end of one stroke of the reciprocating member, and means for actuating the member to cause its brushes to traverse the rail sections.

4. In combination with a movable member provided with pairs of electrically connected contacts or brushes, pairs of rails composed of two sections spaced apart at their adjacent ends and insulated from one another, an energizing coil, and means operating in conjunction therewith for permitting the actuation of said member over one of the sections toward the space aforesaid at a given speed, and from the space at a relatively different speed.

5. In combination with an oscillating lever provided with pairs of electrically connected yielding brushes, pairs of curved rails composed of two sections spaced apart at their adjacent ends and leaving a non-conducting gap between them, an energizing coil, and means operating in conjunction therewith for permitting the movement of the lever over one of the sections toward the gap at a given speed, and from the gap at a relatively greater speed.

6. In combination with a pair of stationary conducting members, a movable member having an insulating block, movable brushes arranged in sockets of said block, a conducting strip secured to the block across the sockets, and springs interposed between the strip and the brushes for yieldingly forcing the latter into engagement with the stationary members during the traverse of the movable member thereover.

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

CHARLES BECK.
ARTHUR BECK.

Witnesses:
EMIL STAREK,
JOS. A. MICHEL.