(No Model.) 2 Sheets—Sheet 1.

E. H. WRIGHT.

MULTIPLE CONTACT SWITCH.

No. 558,750. Patented Apr. 21, 1896.

Fig. 1.

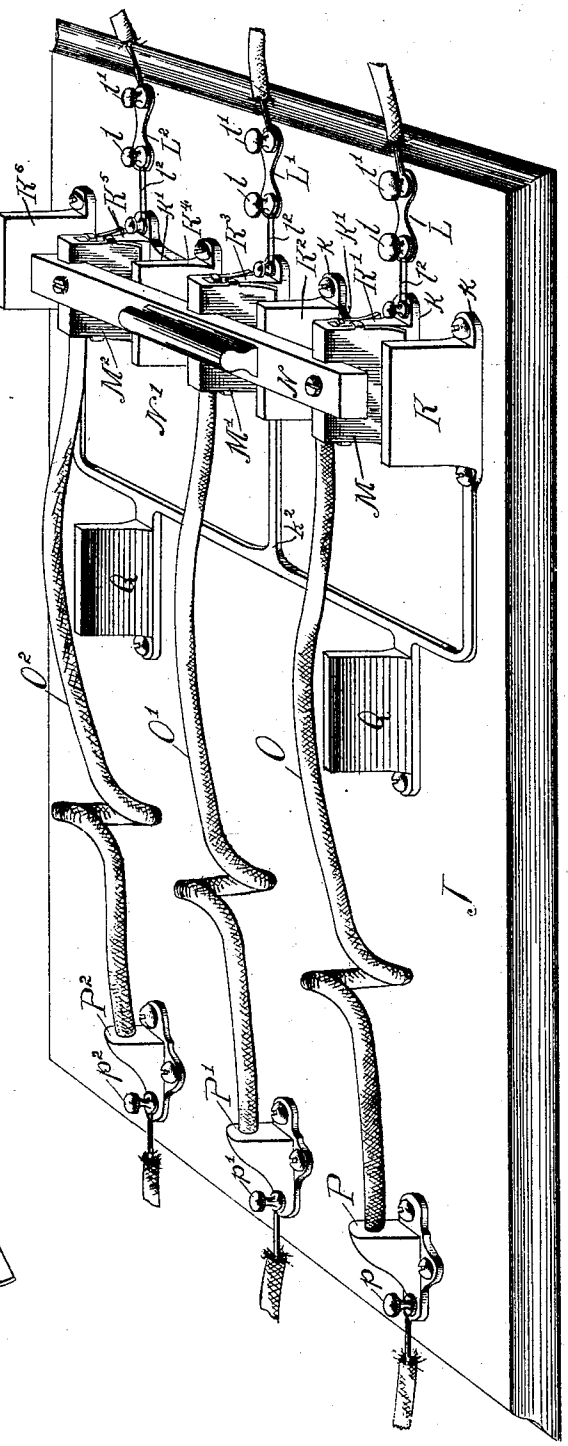
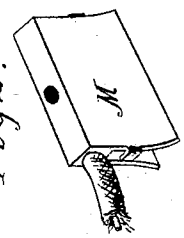


Fig. 2.



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 3

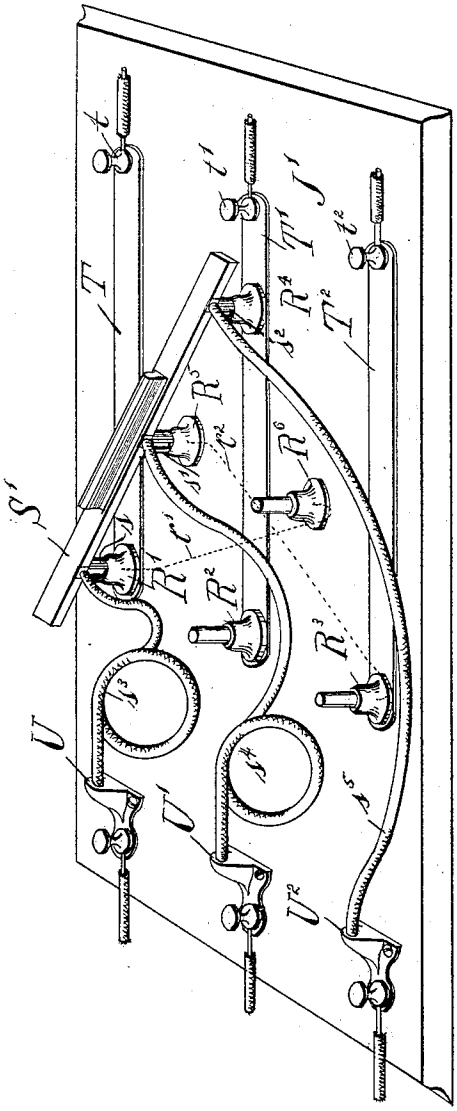
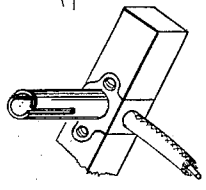


Fig. 4



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UNITED STATES PATENT OFFICE.

ELMER H. WRIGHT, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-THIRD TO JAMES J. HECKMAN, CHARLES C. CARNAHAN, AND ALBERT H. GRAVES, OF SAME PLACE.

MULTIPLE CONTACT-SWITCH.

SPECIFICATION forming part of Letters Patent No. 558,750, dated April 21, 1896.

Application filed November 28, 1894. Serial No. 530,257. (No model.)

To all whom it may concern:

Be it known that I, ELMER H. WRIGHT, a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Multiple Contact-Switches; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in electric switches, and more specifically to an improved multiple contact-switch especially adapted for simultaneously effecting a change of polarity or circuit in a plurality of conductors connected with or controlled by said switch.

I am aware that it is not new to provide a switch having a plurality of circuit-controlling contacts operating to simultaneously change or shunt one or more circuits to different lines, or a switch adapted to simultaneously reverse the polarity of a plurality of lines; but neither of these constitutes my invention.

A principal object of my invention consists in providing a switch adapted to control a plurality of circuits (at least three) of different character or potential, and by means of which their relation to one another may be changed at pleasure.

The object of the invention is to provide a simple and efficient device of the character referred to; and the invention consists in the matters hereinafter described, and more particularly pointed out in the appended claims.

The invention will be readily understood from the following description, reference being had to the accompanying drawings, in which—

Figure 1 is a perspective view of a switch embodying my invention. Fig. 2 is a detail of one of the pairs of contact-tongues. Fig. 3 is a perspective view of a switchboard provided with six fixed contact-points. Fig. 4 is an enlarged detail in perspective of an end portion of the contact-carrying bar shown in Fig. 3, inverted.

The invention is herein shown as applied to the Edison three-wire system of incandescent electric lighting, a switch embodying my invention being specially adapted for readily accomplishing the changes of circuit with relation to each other necessary to secure proper polarity in the conductors, as will hereinafter more fully appear; but it is to be understood that the use of the switch is not limited to this particular purpose, the invention obviously being capable of use in various other ways, and either in its present embodiment or in other forms adapted to the particular use to which it is applied.

In the Edison three-wire system the triple arrangement of conductors extends throughout the entire system, each branch comprising a positive, negative, and neutral conductor. In practice the main distributing branches or underground leads are laid in metal pipes, the three insulated wires being packed together and inserted into a pipe only large enough to receive them. The interstices between the conductors and pipes are usually filled with a solid composition of insulating material. In wiring for this system of lighting it is the uniform practice, and one of the requirements of the board of underwriters, that a switch or cut-out (technically called the "service cut-out") be provided immediately adjacent to where the secondary branch enters each individual building, so that when necessary the circuit in the entire building may be instantly cut out. From this switch or cut-out the secondary branch leads to the various floors and points in the building from which it is desired to distribute to the individual lamps, each of these latter distributing-points being provided with a "branch cut-out."

Notwithstanding the care taken in the preparation and laying of the conductors forming the main leads, owing to the powerful current which they carry, the insulation is frequently destroyed and the current "grounded." When this happens, the current usually burns and melts both the pipe and the conductors therein, so that the ends of the conductors or leads will be separated by a considerable space, which must be filled in with new conductors.

Upon the discovery of a break the lineman first proceeds to the building where the lights have failed and tests at the service cut-out. If no current comes to the building, it is certain that the trouble is in one of the main or street leads, and he thereupon throws out or opens all of the service-cut-out switches of the buildings affected by the break. Having done this, he proceeds to locate the break and repair the same.

Owing to the manner in which the conductors are insulated and embedded within the piping, and the fusing and shortening of the ends of the leads, as hereinbefore described, it is usually impossible to determine certainly which is the neutral and which the positive and negative leads of the "dead" end of the branch, and even were it possible or practicable to determine how the ends should be properly connected it would in many instances be extremely difficult or inconvenient to do so owing to the difficulty of manipulating the wires thus covered. For this reason it is the general practice of line-repairers to pay no attention whatever to the identity of the leads, but to simply connect the ends in whatever way is most convenient. The chances are, therefore, two out of three that the conductors will be connected in such a manner as to change or cross the circuits.

The line having been repaired the lineman proceeds to the service cut-out, tests the live ends of the conductors or those leading to the street-main, thus determining which is the neutral and which the positive and negative, and if he finds that the conductors have been crossed or their relative polarities changed by the repairing of the break he thereupon proceeds to disconnect the conductors and rearrange them in their proper relation. This is a work of considerable difficulty, owing to the relatively large size of the conductors and the difficulty of manipulating them, and more especially so because it must usually be performed in inconvenient locations—usually in the basement of the building, closely adjacent to the outer wall thereof, and in many instances in some inconvenient recess or angle where the conductors will be least in the way. It will be obvious, furthermore, that this work of testing, disconnecting, and rearranging the conductors must be performed at each service cut-out affected by the break, and with an easy possibility of making a wrong connection notwithstanding the tests made. It is absolutely necessary that these connections be correctly made before the current is turned on, because if otherwise connected the effect is to increase the voltage on the lamps on one side of the neutral to such an extent as when thrown into circuit to instantly disable and in many instances completely destroy every lamp on that side.

It is the object of the present invention to provide a switch by means of which the proper relations of the circuit-conductors may be readily and certainly established, the particular device herein shown being designed to be used in lieu of the service cut-out.

Referring now to Fig. 1, in which is illustrated a switch embodying my invention, I designates the base or support of insulating material, usually of slate or hard rubber, upon which is mounted a plurality of contact-points, for the present use of the switch seven in number, as K K′ K^2 K^3 K^4 K^5 K^6. In the present instance the switch is constructed with what are commonly known as "knife" contacts—that is to say, each of the contact-points comprises a blade or male member adapted to enter between two resilient tongues comprising the female member of the contact-points. The blades K K′, &c., are arranged to stand at uniform intervals apart in parallel vertical planes, in a row or series across one end of the base I, being to this end secured upon or made integral with metallic base portions k, suitably mounted upon the base I. The contact-points K′ K^2 and K^4 K^5 are electrically connected in pairs, as herein shown, by means of metallic base portions k' k', while the two outer contact-points K and K^6 are electrically connected with each other and with the central blade K^3 by means of a conductor k^2.

L, L′, and L^2 are three binding-plates provided at each end with binding-screws l l', mounted upon the base I and electrically connected with the base portion k of the contacts K′, K^3, and K^5, respectively. In the present instance these connections l^2 l^2 l^2 are in the form of fusible strips, for the purpose of protecting the lamps from any sudden excess of current.

M, M′, and M^2 are three pairs of spring contact-tongues adapted to fit upon and embrace the contact-blades of the switch. These contact-tongues are secured in a vertically-depending position upon a suitable insulating-bar N, at a distance apart exactly equal to twice that of the intervals between the blades K K′, &c., so that when in contact the spring-tongues will engage alternate ones of the said blades. From each pair of tongues M M′ M^2 extends a flexible conductor O O′ O^2, respectively, having connection at their opposite ends with suitable terminals or binding-studs P, P′, and P^2. Preferably, and as herein shown, these flexible conductors will be connected with the tongues and binding-studs by soldering, thereby forming a perfect metallic union, and may conveniently be constructed of ordinary insulated conducting-wire. It will be noted that each of the flexible conductors is somewhat longer than is necessary for it to reach between the tongues and binding-studs when the former are in their central position, as herein shown, such extra length being provided in order that the switch-bar may be shifted laterally in either direction and placed in contact with the alternate blades K^2, K^4, and K^6 or K, K^2, and K^4, or reversed by turning the bar around in a horizontal plane end for end and placing it in

contact in the central position or shifted to either side, as before described.

Each of the binding-studs is provided with a binding-screw, as $p\ p'\ p^2$, by means of which the conductors leading from the street-leads may be connected with the switch. For convenience of manipulation the bar N is provided upon its upper side with a suitable knob N', by means of which the switch-bar may be lifted up and replaced, as desired. Preferably a pair of insulated rests or blades Q Q will be provided upon the base I, upon which the tongues M M^2 may be placed when it is desired to leave the switch open.

The use of the switch thus described is as follows: Normally, or when the currents are not crossed, the movable member of the switch will be arranged in contact with the central contact-blades—that is to say, the central pair of spring contact-tongues will be in contact with the central blade K^3, while the outer pairs of tongues will rest in engagement with the blades K' and K^5, respectively. In this position of the switch the circuits will be in direct lines across the switchboard. Should a break in the main lead occur, the lineman will throw the local system of the building out of circuit while the break is being repaired by simply withdrawing the movable member from the contact-blades and placing it upon the insulated rests. After the break has been repaired and the current turned on the lineman will proceed to the switch and, applying his instrument to the tongues of the movable member, determine whether or not the wires have been crossed in repairing the break. If he finds that one of the outer conductors—as, for instance, O—has become the neutral line he will, in closing or replacing the switch-bar, shift it from its normal central position to that side of the switchboard on which the neutral line is found to exist—that is to say, if he finds that the conductor O has become the neutral line he will place the bar in such position that the tongues M will be in engagement or contact with the blade K, the tongues M' with the blade K^2, and the tongues M^2 with the blade K^4. If now the circuit be traced, it will be seen that the neutral line O leads from binding-stud P to tongue M, thence through the blade K, conductor k^2, and to lamp-circuit through plate L', no other exit or circuit existing and the neutral being therefore transposed to its proper central relation. Similarly, assuming O' to have become the positive conductor, the current will pass through the tongue M', blade K^2, from thence through the base k' to blade K' and out to lamps through plate L. The circuit in negative O^2 will be transmitted across the board precisely similar to that of O'. On the other hand, should the test disclose that O^2 has become the neutral, then the lineman will shift the switch to that side of the board, with the same result of properly transmitting the several circuits across to the lamps. If, however, it be found that the neutral has been properly connected and remains central, but the negative and positive lines have been transposed, the operator will reverse the bar by turning it end for end and replacing it, and similarly if the neutral has been changed to either side and the other two transposed, the bar in its reversed position may be shifted to one side or the other, as required.

The foregoing is a description of what I consider a preferred form of embodying my invention and a sufficient illustration for a full comprehension of the same. It is to be noted, however, that various modifications may be made without departure from the invention and without the exercise of more than ordinary mechanical skill. It will be obvious, for instance, that a switchboard having but six contact-points, as shown in Fig. 3, may be constructed which will serve to transpose the neutral line to the center in the same manner as in the former construction.

In said figure J' designates the base; R', R^2, R^3, R^4, R^5, and R^6, the fixed contact-studs, four of which are mounted upon three parallel embedded bars T T' T^2, each provided at its end with a binding-screw $t\ t'\ t^2$, respectively. Each of the two contact-studs R^6 R^6 not mounted upon one of the embedded bars is electrically connected with one of those that is, the stud R^5 with R^3 and R^6 with R', by means of conductors embedded in the under side of the base, as indicated in dotted lines $r'\ r^2$.

S' designates the contact-carrying bar, $s\ s'\ s^2$ the tubular bifurcated contacts thereof, and $s^3\ s^4\ s^5$ the three flexible conductors extending from the respective contacts to binding-studs U U' U^2.

It is also clear that the flexible connections may be of various forms; or pivoted, sliding or other forms of connections may be employed in combination with bars or other inflexible conductors. It will be obvious, furthermore, that the device may be placed in line at any desired point other than in lieu of the service cut-out. These and other analogous modifications I claim as being within the scope of my invention.

I claim as my invention—

1. A three-wire-system switch comprising a switchboard provided with two sets of terminals, each of which sets of terminals embraces three binding-screws or connecting devices, a plurality of contact-points on said switchboard, arranged in three electrically-connected groups, each of which groups is electrically connected with one of the terminals of one of the said sets, and a movable member provided with a plurality of contact-points each electrically connected with one of the terminals of the other set of the switchboard, the contact-points of the movable member being adapted for various engagement with those of the switchboard, substantially as set forth.

2. A three-wire-system switch, comprising

a switchboard provided with two sets of terminals, each of which sets embraces three binding-screws or connecting devices, a movable member, contact-points thereon, each electrically connected with one of the terminals of one set by means of a flexible conductor and a number of contact-points on the switchboard in excess of those on said movable member, arranged in three electrically-connected groups, each of which groups is electrically connected with one of the terminals of the second set, the contact-points of the movable member being adapted for various contact with the contact-points of the switchboard, substantially as set forth.

3. A plurality-contact permutation-switch, comprising two sets of terminals, each of which sets embraces a terminal for each line conductor of a system composed of an odd number of line conductors, two contact-carrying members one of which is movable with relation to the other, one of said members being provided with a contact-point for each line conductor and the other member being provided with a number of contact-points in excess of the number of line conductors, arranged in electrically-connected groups equal in number to the number of line conductors, each group electrically connected with one of the terminals of one set, and each contact-point of the other member being electrically connected with one of the terminals of the other set, the contact-points of one member being adapted for various contact with those of the other member, whereby the relations of currents of different character carried by said line conductors may be changed at will, substantially as set forth.

4. A three-wire-system switch comprising a switchboard provided with two sets of terminals of three each, a plurality of contact-points arranged upon said switchboard in three electrically-connected groups, each of which groups is connected with one of the terminals of one set, a contact-carrying member provided with three contact-points adapted for various engagement with those of the switchboard and flexible conductors connecting each of the contact-points of the movable member with one of the terminals of the second set, substantially as set forth.

5. A three-wire-system switch comprising a switchboard provided with two sets of terminals of three each, seven contact-points, arranged in a series at uniform intervals apart across said switchboard and electrically connected in three groups, each group electrically connected with one of the terminals of one set, one of said groups comprising three contact-points and the other groups two each, and a contact-carrying switch-bar provided with three contact-points spaced at a distance apart equal to twice the distance between those of the switchboard and adapted for various engagement with the latter; said contact-points of the switch-bar each having electrical connection with one of the terminals of the second set by means of flexible conductors, substantially as set forth.

6. A three-wire-system switch comprising a switchboard provided with two sets of terminals of three each, seven contact-points arranged in a series at uniform intervals apart across said switchboard and electrically connected in three groups, each group electrically connected with one of the terminals of one set, one of said groups comprising three contact-points and the other groups two each, and a contact-carrying switch-bar provided with three contact-points spaced at distances apart equal to twice the distance between those of the switchboard and adapted for various engagement with the latter; said contact-points of the switch-bar each having electrical connections with one of the terminals of the second set, by means of flexible conductors and fusible strips interposed in each circuit between the terminals of the switch substantially as set forth.

7. A plurality-contact permutation-switch comprising two sets of terminals, each of which sets comprises a terminal for each line conductor of a system composed of an odd number of line conductors, two sets of contacts, one of which sets comprises a contact for each line conductor, each connected with one of the terminals of one set, and the other of which sets of contacts comprises a number of contacts in excess of the number of line conductors, said last-mentioned contacts being electrically connected in a number of groups equal to the number of line conductors, each of which groups is electrically connected with one of the terminals of the other set, and means for bringing the contacts of one set into various electrical connection with those of the other, substantially as set forth.

8. A plurality-contact permutation-switch comprising two sets of terminals, each of which sets comprises a terminal for each line conductor, of a system comprising an uneven number of line conductors, two sets of contacts, one of which sets comprises a contact for each line conductor, each connected with one of the terminals of one set, and the other of which sets of contacts comprises a number of contacts in excess of the number of line conductors, said last-mentioned contacts being electrically connected in a number of groups equal to the number of line conductors, each of which groups is electrically connected with one of the terminals of the other set, and means for bringing the contacts of one set into various electrical connection with those of the other, substantially as set forth.

In testimony that I claim the foregoing as my invention I affix my signature in the presence of two witnesses.

ELMER H. WRIGHT.

Witnesses:
JAMES J. HECKMAN,
CHARLES C. CARNAHAN.