No Model.)

2 Sheets—Sheet 1.

J. J. WOOD.

ELECTRICAL SWITCH BOARD.

No. 412,818. Patented Oct. 15, 1889.

Fig. 2.

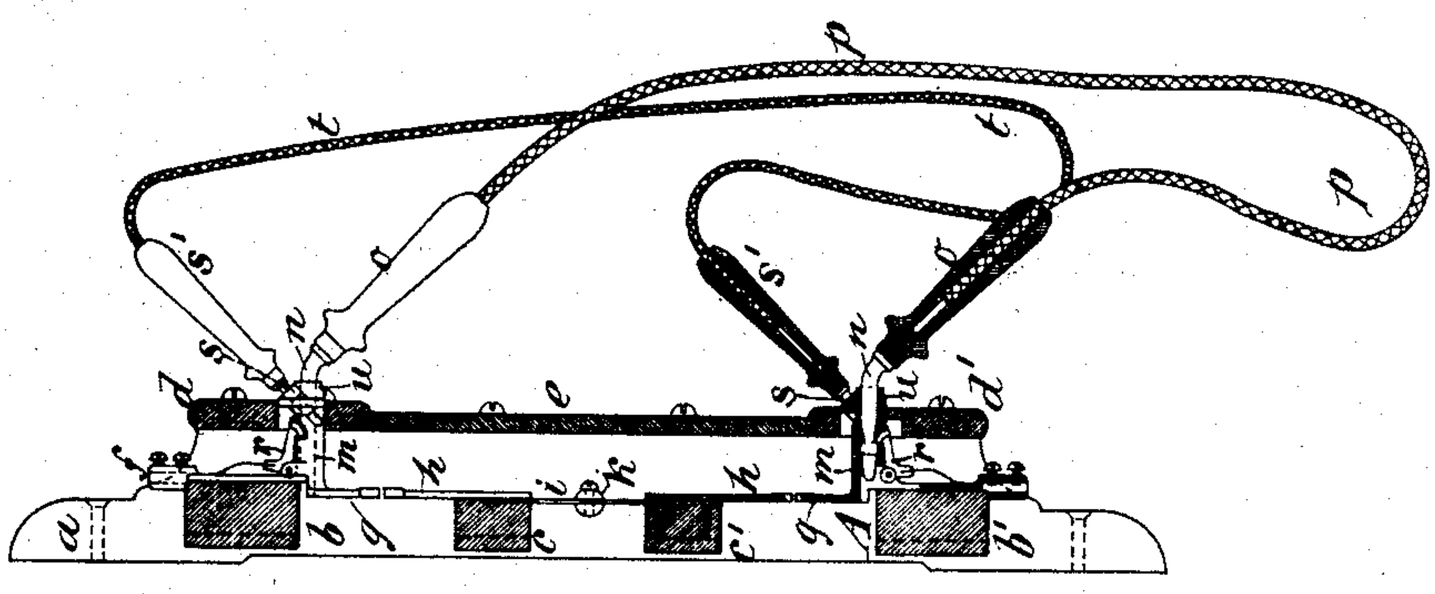
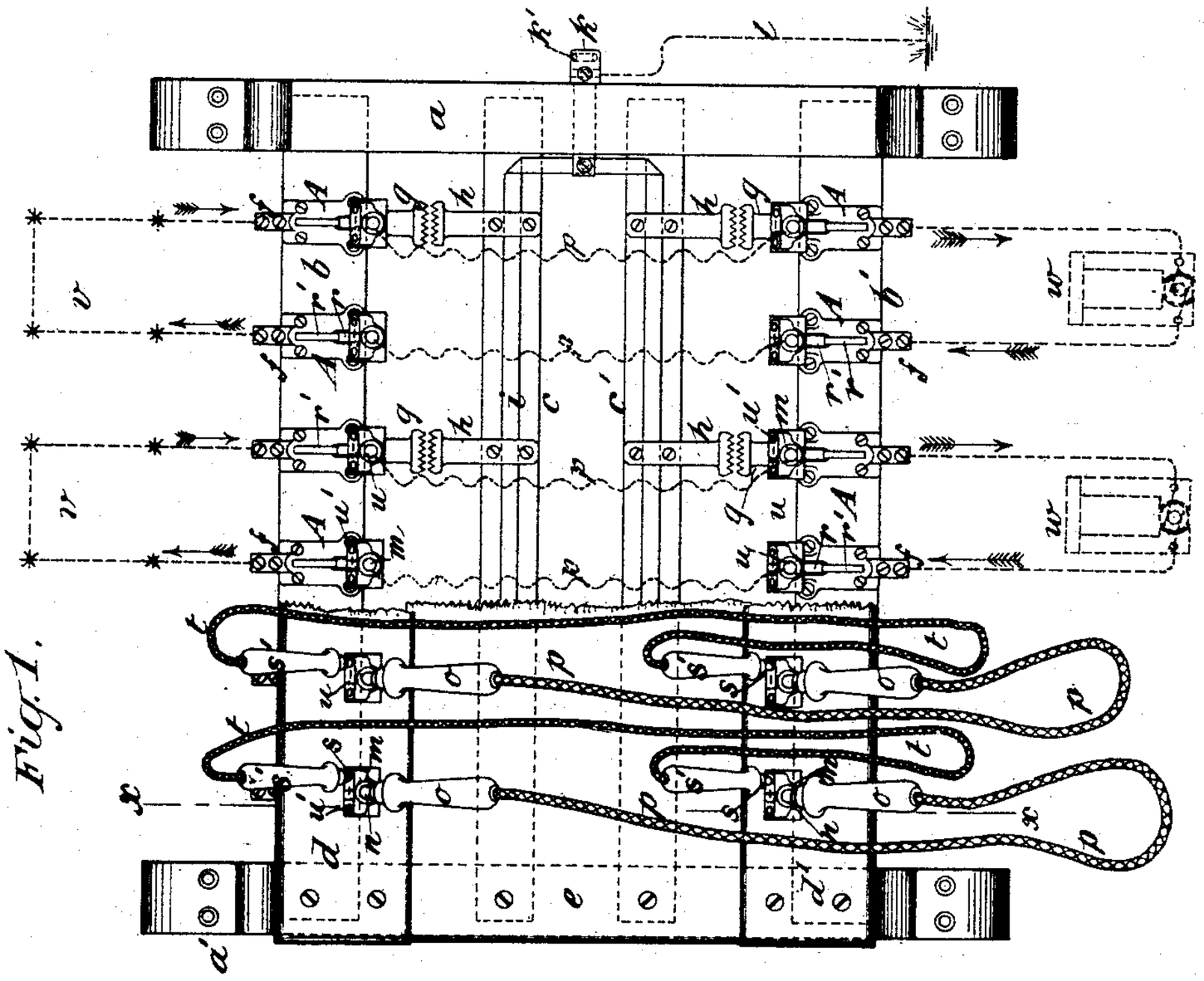


Fig. 1.



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(No Model.) 2 Sheets—Sheet 2.

J. J. WOOD.

ELECTRICAL SWITCH BOARD.

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Fig. 4.

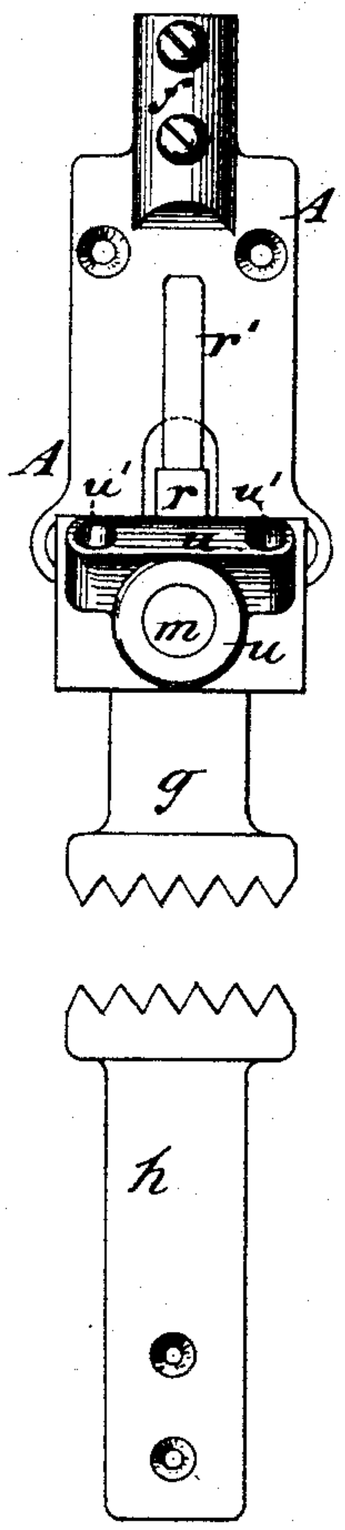


Fig. 3.

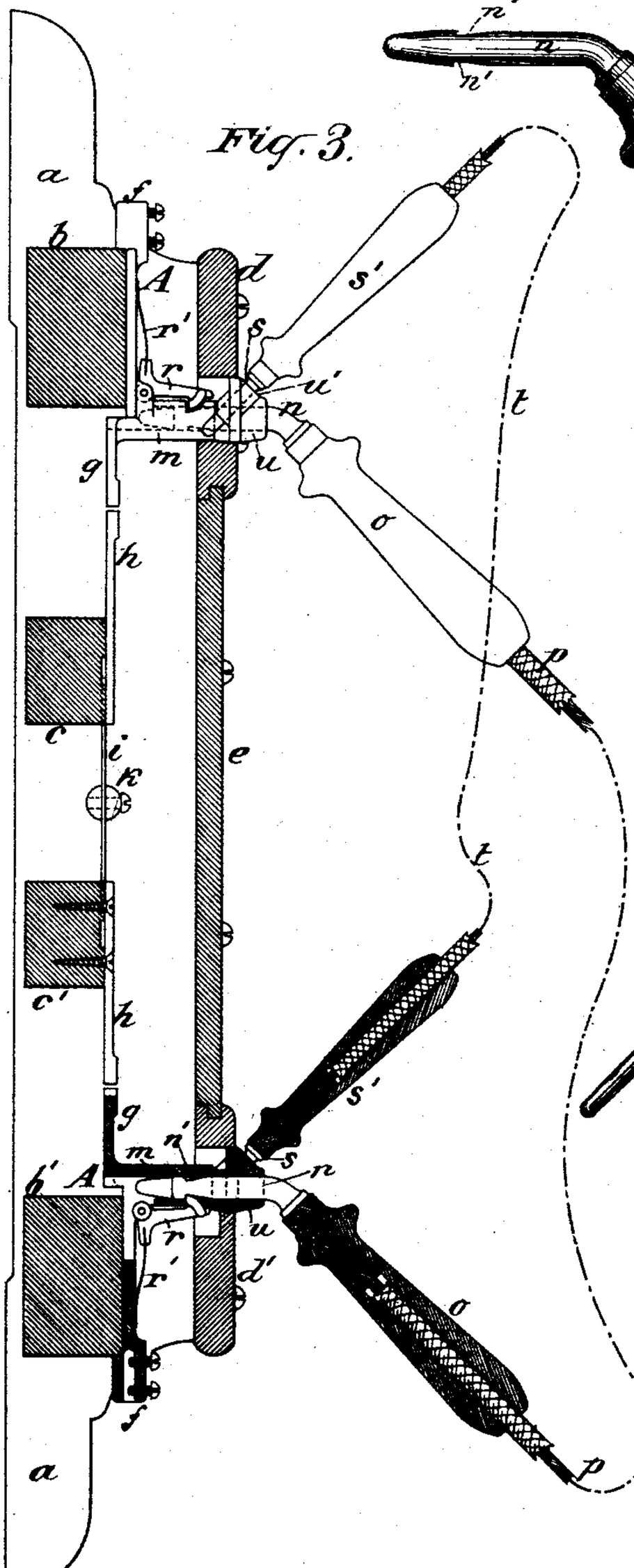


Fig. 5.

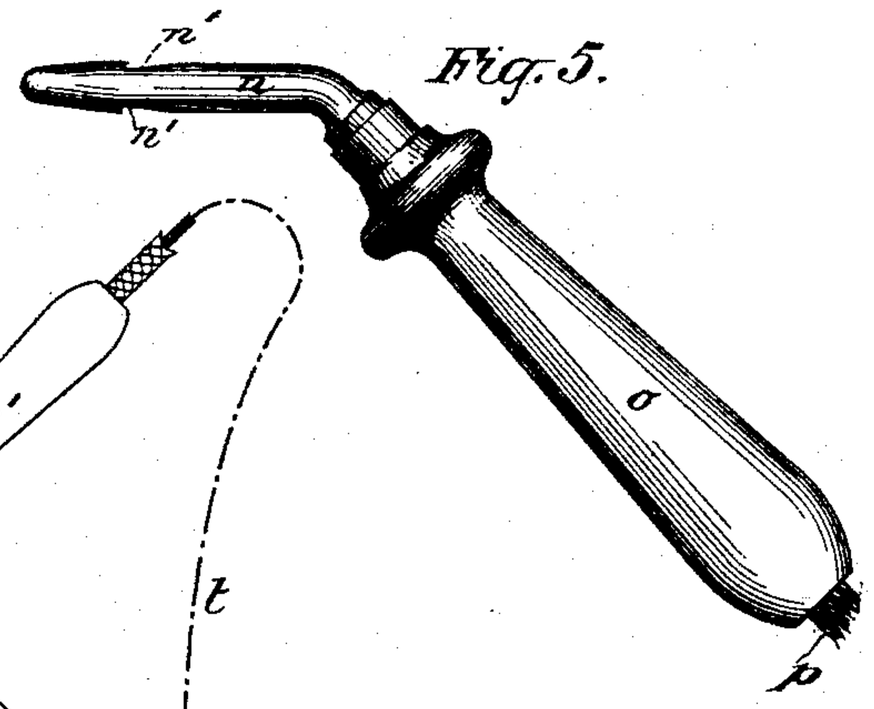
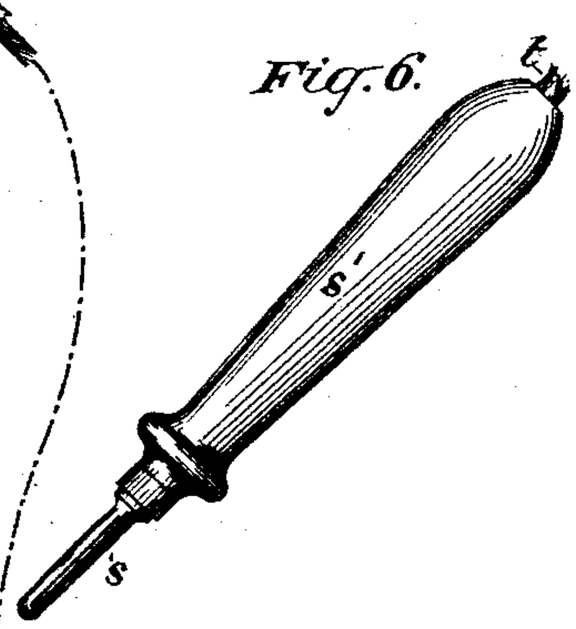


Fig. 6.



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UNITED STATES PATENT OFFICE.

JAMES J. WOOD, OF BROOKLYN, NEW YORK.

ELECTRICAL SWITCH-BOARD.

SPECIFICATION forming part of Letters Patent No. 412,818, dated October 15, 1889.

Application filed December 14, 1887. Serial No. 257,869. (No model.)

To all whom it may concern:

Be it known that I, JAMES J. WOOD, of Brooklyn, Kings county, New York, have invented certain new and useful Improvements in Electrical Switch-Boards, of which the following is a specification.

My invention relates more especially to multiple switch-boards for electric-light lines, to be used in central stations, from which a series of lines or circuits emanate and where a number of dynamos are operated, so that the different lines may be coupled with the different dynamos, or with each other, in various arrangements, according to circumstances.

My invention relates to that class of switch-boards heretofore used chiefly for telephone-stations, which employ a series of sockets on opposite sides of the board connected with the lines, the sockets being connected across the board by loops of cable having fixed on each end switch-pins which enter the sockets, so that by shifting the cables and switch-pins to different sockets various connections of the lines will be produced. In connection with the main switch-pins and cables minor switch-pins and cables are used for transfer or testing purposes. My improvements lie chiefly in the special form of the binding-posts or terminals to which the lines connect, and which contain the sockets for the switch and transfer pins; also, to the special form of the switch-pins and the manner of connecting the cables therewith and in the special formation of the pin-sockets and in the combination of a lightning-arrester with the sockets or terminals, and in other details, as hereinafter fully set forth and claimed.

In the drawings annexed, Figure 1 gives a front elevation of my improved switch-board, shown partly broken away to expose the socket-heads or terminals and also the lightning-arresters, and showing diagrammatically the connection of the lines and dynamos. Fig. 2 is a cross-section on *x x*. Fig. 3 is a cross-section, on a larger scale, showing the construction of the socket-heads, switch-pins, &c., more clearly. Fig. 4 is an enlarged plan of one of the socket-heads detached, with its adjacent lightning-arrester. Fig. 5 is an enlarged view of one of the switch-pins. Fig. 6 is a similar view of one of the transfer-pins.

Referring first to Figs. 1, 2, and 3, the frame of the board consists of two strong end cleats or brackets *a a'*, joined by two main longitudinal bars *b b'* and two minor longitudinal bars *c c'*, near the middle of the board, as will be readily understood from Figs. 1 and 2. To the top of the cleats, over the bars *b b*, are fixed the front or marginal boards *d d'*, the inner edges of which are grooved to receive the tongued edge of the sliding leaf or board *e*, which may be slid off to expose the inner mechanism of the board or replaced to cover and conceal the same, as will be understood from Figs. 1 and 3.

When in use the switch-board is presumed to be secured in a vertical position against the wall or other support, the end brackets *a a'* having screw-holes to admit of the board being so secured, as seen in Figs. 1 and 2.

Now, A are the main terminals or socket-heads of the board, which are fixed on the bars *b b'* in the space between the same and the marginal boards *d d'*, and the socket end of each terminal, which is of rectangular form, protrudes through snugly-fitting square apertures in the boards *d d'*, to receive the switch-pins, as will be readily understood from Figs. 1 and 3. Each socket-head is terminated with a binding post or socket *f*, which projects from the outer edges of the bars *b b'* to receive the wires from the lines or dynamos, as seen in diagram in Fig. 1, while from each alternate socket-head—that is, from all the socket-heads of one polarity—there projects inwardly a serrated prong or tongue *g*, which closely approaches a similarly-serrated tongue or prong *h*, which prongs *h* are secured to the central bars *c c'* and connected to a copper strip *i*, or other large conductor, which runs along the bars *c c'*, and is connected to a binding-post *k*, projecting externally from the middle of the bracket *a* and connected by a suitable conductor *l* with the ground, as indicated in Fig. 1, thus forming a lightning-arrester to protect the dynamos, which may be connected with the switch-posts, as will hereinafter more fully appear. Now, as shown best in Figs. 2 and 3, each socket-head A is formed with a tubular socket-post *m*, which, as before stated, protrudes on the front of the board, and has a deep, slightly-tapering socket-hole to receive the

main switch-pins *n*, which, as shown, are bent into a cranked or angular form, so that the handle *o* of the pin assumes an inclined position at about an angle of forty-five degrees, while the socketing end of the pin, while tapering at the point, is otherwise straight and fits snugly in a horizontal position in the socket-tube and makes electrical contact therewith, as shown best in Fig. 3. The switch-pins *n n* are of course used in pairs to connect any two sockets across the board, and are hence joined by a slack length or loop of flexible conductor or cable *p*, heavily insulated, the core of which is metallically connected at opposite ends to the respective switch-pins, as best seen in Fig. 3—that is, the covered ends of the cable are passed through the tubular wooden or non-conducting handles *o* and the metallic core of the cable is soldered into a hole in the end of the pins *n*, which are then screwed into the wooden handle, as shown at the base of Fig. 3, thus making a secure and simple connection. The socketing ends of the switch-pins *n* are round in cross-section, as best shown in Figs 3 and 5; but their round or cylindrical surface is recessed with two angular notches *n'*, as shown best in Fig. 5, one on each side, so that when the pins are forced into their sockets a spring-latch *r*, pivoted on the socket-head and actuated by the spring *r'*, will spring through an opening in the socket-tube and engage one of the notches on the pin, and thus firmly hold the pin in its socketed position and prevent accidental removal. It will be also seen that the latch engaging the pin in the socket by a lateral pressure makes a better and surer contact, and obviates a very close fit of the pin in the socket, as the latch takes up any play, and thus renders contact certain, as will be readily comprehended from Fig. 3. It may also be seen, by referring to Fig 3, that as the pin has an engaging notch *n'* both at top and bottom, either pin can be put into either the upper or lower socket, and will always engage with the latch *r* of either socket, thus making the pins interchangeable in the sockets.

It will be further noted, on referring to Fig. 3, that the bent form of the switch-pins and the inclined position of the handle bring the handle in a much more convenient position to grasp and manipulate than if the handle were straight out in line with the socket end of the pin and at right angles to the board, as is usually the case; and, furthermore, this bent form of the pin and handle gives the handle the effect of a rotary crank-lever, which enables the pins to be inserted in and removed from their sockets more easily. For example, to insert the pin, it is forced straight into its socket with a slight twisting motion, to insure better contact, and the latch *r* will automatically snap into engagement with the notched part and hold the pin securely, whereas, to remove the pin, the handle is rotated about one-quarter revolution until the notch *n'* is revolved away from the latch, which is thus pressed back by contact with the round side of the pin, and is thus disengaged, so that the pin can now be drawn freely out of the socket. By this construction it is, therefore, obvious that no accidental removal of the switch-pins, when once in place, can occur, and yet the insertion and removal of the pins by intentional action is rendered very easy and convenient.

Now, in addition to the main switch-pins *n n* and their cables *p*, one or two pairs of minor pins *s s*, termed "transfer" or "testing" pins, are used. These pins *s* are smaller than the main pins *n*, and are split or cleft for elasticity, as seen in Fig. 6, and are cylindrical in form, but slightly swelled at the middle, with a tapered or rounded end, and the handle *s'* is in a straight line with the pin, as illustrated, the pins being connected by a cable *t*, in the same manner as the main pins, as seen in Fig. 3. Now, the end of each socket-tube *m* is fitted with a socket nose or block *u*, having an inclined face and two socket-holes *u'* in said face, at right angles thereto, but at an angle of about forty-five degrees to the socket *m*, one of the said holes *u'* being on each side of the main socket *m*, as fully shown in Figs. 1, 4, and 3, the transfer-pins *s* being adapted to be inserted in either of these holes, as seen in Figs. 1, 2, and 3. It will therefore be seen that, according to this construction, the handles of the transfer-pins, when the pins are inserted in their socket-holes, will stand straight out from the board at an upward incline of about forty-five degrees, and therefore at about a right angle with the handles of the main pins, as seen in Figs. 1 and 3, thus keeping each set of pins in distinct positions well separated from each other, and thus allowing free scope to the hand in manipulating either set of pins, and rendering it unlikely to confound one pin with the other or to accidentally displace one set of pins in operating the other set.

When the switch-board is set up in a central lighting-station the lines and dynamos will be usually connected therewith, as shown in diagram in Fig. 1—that is, each distinct line or circuit, as shown at *v v* in Fig. 1, will connect at its opposite end to the binding-posts *f* of two adjacent socket-heads A A at the top of the board, while the poles of the dynamos *w* will connect to the two corresponding socket-heads at the bottom of the board, as illustrated. By now connecting the socket-heads across the board by the switch-pins and cables, as indicated by the wavy dotted line, the circuits of the two lines and dynamos will be completed, forming two distinct circuits, each operated by a distinct dynamo. Referring, therefore, to Fig. 1, it will now be apparent to the electrician that various changes in the circuits may be made by shifting the switch-pins on the board according to circumstances. It is not necessary to describe all such changes, as they are so va-

rious, but a few may be referred to, so as to better illustrate the action of the parts. For instance, suppose it is desired to put the two circuits of the two dynamos in one series or circuit. In that case, one set of the transfer-pins will be used to laterally connect the two inner socket-heads at the top and another set to connect the two inner socket-heads at the bottom of the board. After this the main switch-pins connecting the two inner socket-heads across the board will be pulled out and the same replaced, so as to connect the two socket-heads laterally on the board, after which the transfer-pins will be pulled out and the main pins left in place, the transfer-pins being thus only used temporarily to prevent breakage of the circuit while the main pins are being shifted. It will also be understood that any of the dynamos *w* may be put in circuit with any of the lines *v* by appropriate shifting of the pins, which will be obvious to the electrician, the transfer-pins being always used temporarily to maintain the circuit while the main pins are being shifted. In a similar way, by means of the transfer-pins, instruments may be introduced in any of the circuits to test the currents without breaking the circuit at any time.

Referring to Fig. 1, the action of the lightning-arrester will be readily understood, for it will be seen that should lightning strike any of the lines *v* it will, of course, take the shortest passage to the earth, and will therefore jump from the line at the prongs *g* to the prongs *h*, and thence flow by the conductors *i k l* to the ground, thereby saving the dynamos *w* from any injury. It will be seen in Fig. 1 that the grounded binding-post *k* is formed with socket-holes *k'* to receive the transfer-pins, so that by proper connections of the transfer-pins with the lines and testing-instruments tests can be made for leaks or "grounds," as will be readily understood.

On referring to Figs. 3 and 4 it may be seen that the socket-nose *u*, having the two small socket-holes *u'* for the transfer-pins, is formed of a metallic block separate from the main socket-tube *m*, and is fitted tightly thereon and soldered thereto, as best indicated in Fig. 3; but, if desired, the socket-block may be cast solid on the socket-tube *m*.

What I claim is—

1. The combination, in a switch-board, of two terminals adapted to be introduced in the circuit and formed with horizontal socket-holes, with two switch-pins adapted to fit said holes, a handle fastened to each pin and projecting angularly therefrom in such direction that when the pin is in its normal position in the socket the handle inclines downwardly, and a flexible conducting loop or cable secured at each end to the pins and passing through and issuing from said handles, whereby by the flexure of the cable at its junction with the handles is reduced, and by its weight it tends to hold the pins in their normal position in the sockets, substantially as and for the purpose set forth.

2. In a switch-board, the combination, with terminals or socket-heads having a socket *m* and an engaging-latch *r*, of the bent switch-pin *n*, having recess *n'* and crank-handle *o* relatively arranged so that when the recess is in position to be engaged by said latch the crank-handle is turned downward and tends by its weight to keep the pin locked by said latch, substantially as and for the purpose set forth.

3. In a switch-board, the combination, with two sets of socket-terminals having spring-latches entering their sockets and said latches relatively inverted in the respective sets, of two switch-pins and an intervening loop or cable, with its opposite ends connected to said pins, each of said pins bent downwardly and a handle fixed on the bent portion thereof, with the cable issuing from the end of the handle, and the pins formed each with notches or recesses on both top and bottom sides for engagement by said latches, whereby the pins may be entered in the sockets of either set of terminals interchangeably, and when engaged therewith the handles project downwardly and the weight of the handles and cable tends to retain the pins in the engaging position, substantially as set forth.

4. In a switch-board, the combination of terminals or socket-heads formed with main sockets *m*, extending horizontally, and with minor sockets *u'*, extending downwardly at an inclination adjacent to the main sockets, with main switch-pins to fit the main sockets, formed with handles bent downwardly, and minor switch-pins to fit the minor sockets, formed with straight handles, all combined and arranged substantially as shown and described, whereby, when the pins are inserted, the handles of the main pins project downwardly and those of the minor pins project upwardly at widely-diverging angles, so that they are readily distinguishable and accessible without interfering with one another.

5. In a switch-board, the combination, with the end brackets *a a'*, of the longitudinal bars *b b'*, marginal boards *d d'*, pin-sockets or terminals fixed to bars *b b'* and projecting through said boards *d d'*, and central sliding leaf *e*, substantially as shown and described.

6. In a switch-board, a terminal or socket-head formed with the binder *f*, socket-tube *m*, and prong *g*, substantially as and for the purpose set forth.

JAMES J. WOOD.

Witnesses:
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JNO. E. GAVIN.