(No Model.)

L. A. BERTHON.

SPRING JACK COMMUTATOR FOR TELEPHONE SWITCH BOARDS.

No. 458,258. Patented Aug. 25, 1891.

Fig. 3.

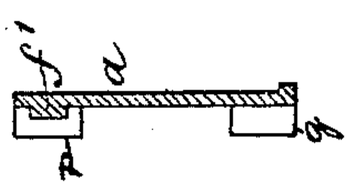

Fig. 4.

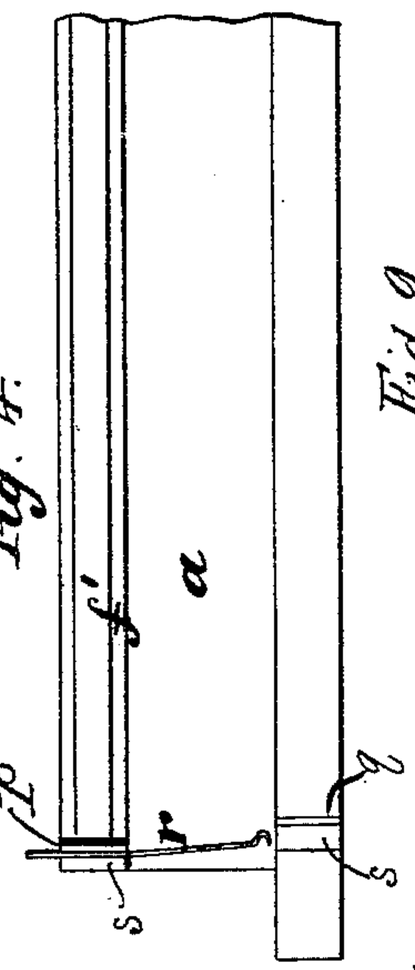

Fig. 1.

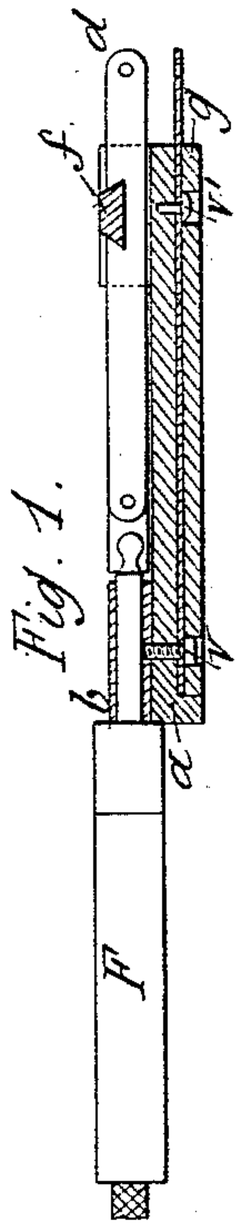

Fig. 2.

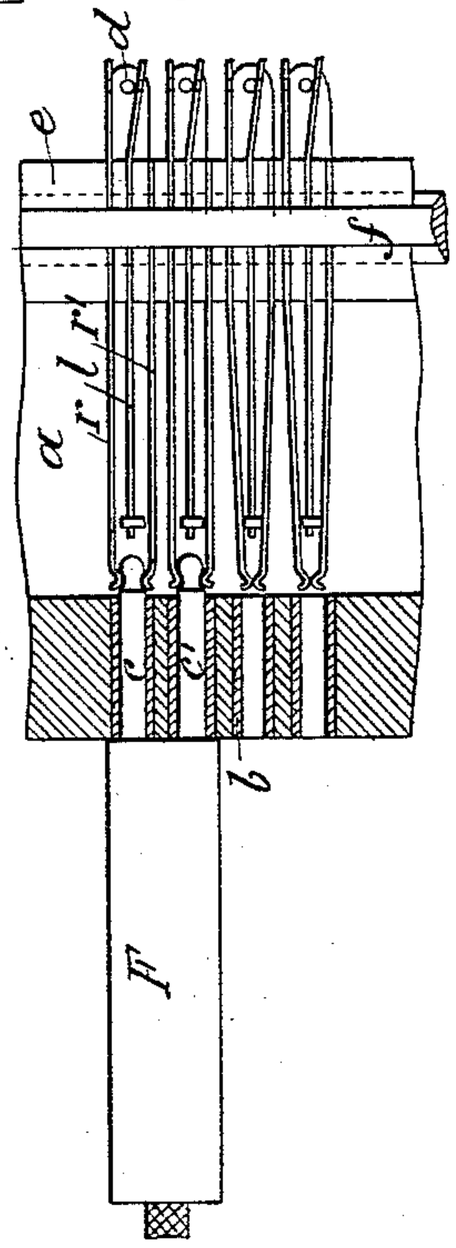

Fig. 9.

Fig. 10.

Fig. 13.

Fig. 11.

Fig. 12.

Fig. 7.

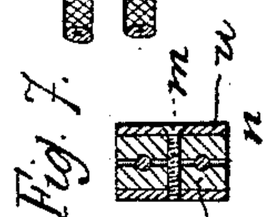

Fig. 5.

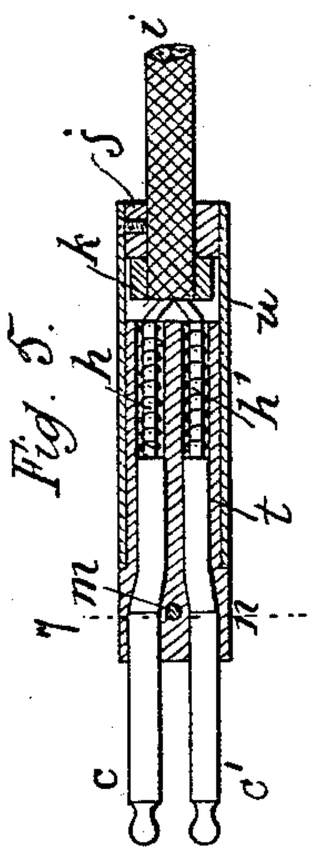

Fig. 6.

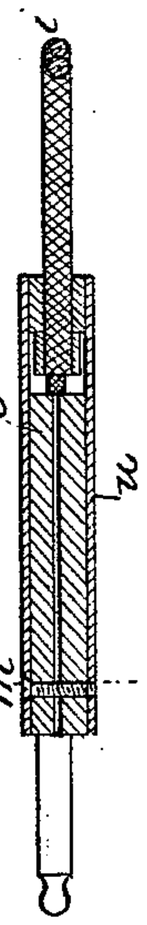

Fig. 8.

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SPRING-JACK COMMUTATOR FOR TELEPHONE SWITCH-BOARDS.

SPECIFICATION forming part of Letters Patent No. 458,258, dated August 25, 1891.

Application filed January 30, 1891. Serial No. 379,746. (No model.) Patented in England December 30, 1890, No. 21,224.

To all whom it may concern:

Be it known that I, LOUIS ALFRED BERTHON, a citizen of the Republic of France, residing in Paris, France, have invented certain new and useful Improvements in Spring-Jack Commutators for Telephone Switch-Boards, of which the following is a specification.

This invention is the subject of Letters Patent in Great Britain, No. 21,224, dated December 30, 1890.

This invention relates to improvements in commutators of the kind commonly known as "spring-jacks" or "jack-knives" and in their stoppers or contact-plugs. Such commutators are commonly employed for telephonic circuits, either for metallic or for simple circuits.

My invention consists more particularly in improved arrangements, first, of the springs and the double fixed outer contact for a multiple commutator with metallic circuits; secondly, of the parts forming the plug with two parallel contacts to the said spring-jacks for metallic circuits; thirdly, of the spring and fixed external contact forming the spring-jack for multiple commutators with simple circuits; fourthly, of the parts forming the plug for the said spring-jacks, and, fifthly, of the same constructions of spring-jacks and plugs for ordinary commutators with simple and metallic circuits.

The improvements have for their object to reduce to a minimum not hitherto obtained the thickness of the bands of spring-jacks and the dimensions of the plugs in all the above-named applications, resulting in the following advantages: First, the capacity of a multiple commutator—that is to say, the number of circuits that can be connected thereto—can be considerably increased; second, if an increase of capacity is not desired, the height of a commutator constructed with the improved spring-jacks and plugs may be considerably reduced, and thus the service of the commutator may be rendered much more convenient; third, the trial of the circuits—that is to say, the operation which consists before establishing any communication with a spring-jack in insuring that there is not already established a communication by means of the corresponding spring-jack in another section of the multiple commutator—will be effected rapidly and with certainty, although this is effected with the aid of a double contact, as the two contacts are external.

This invention is illustrated by the following figures.

Figure 1 is a vertical section of a row of spring-jacks for a multiple commutator with metallic circuits, showing the general arrangement, juxtaposition, and insulation of the springs of the fixed external double contact. Fig. 2 is a horizontal section of the same row, showing two adjacent spring-jacks. Each spring-jack consists, as shown, of six springs and two fixed external contacts. Figs. 3 and 4 show a modification of the row of spring-jacks on a smaller scale. Figs. 5 and 6 are longitudinal sections; Fig. 7, a cross-section on line 7 7 in Figs. 5 and 6, and Fig. 8 a horizontal view of the stopper with two parallel contact-pins. Figs. 9 and 10 are respectively a vertical section and a horizontal section of a band of spring-jacks for a multiple commutator with simple circuits, showing how with a stopper with single contact-pin, as shown at Figs. 11, 12, and 13, the method of arranging juxtaposition and insulation, taken as a whole, of the springs and fixed contact, as above described, is applicable to the multiple commutator with simple circuits. In this case, consequently, each row contains a number of spring-jacks double that contained in a row of the same length applied to a multiple commutator with metallic circuits.

Referring to Figs. 1 and 2, which show a vertical and horizontal section of a row of spring-jacks for a multiple commutator with metallic circuits, the following is the mode of construction and the functions of the various parts composing the same:

a is a base or plate of ebonite or other suitable insulating material, formed by cutting or molding with a raised edge on each side, so as to be of a shallow trough shape, the plate being mounted securely on a framing. In the inner edge of the plate is cut a longitudi-

nal dovetail groove, and into this groove is fitted a dovetail key *f*, also of ebonite or other insulating material.

In the outside edge of the plate *a* are cut by means of a row of small cutters mounted at equal distances apart on one and the same shaft a series of equidistant transverse grooves for receiving the tubular outer contacts or sockets *b*, and in line herewith are cut in the opposite edge of the plate *a* a series of equidistant narrow slots or grooves for the reception of spring-blades or jack-springs *r*, *r'*, and *l*. The tubular contacts *b* are of brass, bronze, or other conducting metal of rectangular external configuration and having an internal cylindrical bore for the reception of the cylindrical contact-pins *c c'* of the stopper F. These contacts *b b* are fitted tightly into the grooves of the plate *a*, and they are fixed by means of a conducting-screw *v* to a hardened copper conducting-strip *g* on the under side of the plate *a*, to the projecting end of which strip is fixed the wire which forms part of the general electrical communications of the commutator.

In order to avoid the strips *g* or their screws *v* and rivets *v'* making contact with the metallic parts of the spring-jacks below, the said strips are insulated along the entire width of the plate by means of a plate of ebonite *a'*, having holes at the places where the heads of the screws and rivets are situated.

One pair of springs *r r'* corresponds to one of the contacts *c* or *c'* of the plug, and between them is situated a spring *l*, which performs the office of a fixed contact. These springs *r r' l* are of hardened copper, and have formed at their inner part a notch or recess, by preference of dovetail shape, corresponding to the cross-section of key *f*, so that the latter in being slid into its groove in the plate *a* at the same time locks the springs in position on the plate. To one of the springs *r r'* and to the contact-spring *l* are fixed the wire conductors for the general electrical communications of the commutator.

Instead of employing, as shown in Figs. 1 and 2, an ebonite key *f* for maintaining the springs in position in a re-enforced part of the ebonite plate *a*, said key and re-enforced part may be replaced by any longitudinal strip, such as a rib *f'*, (shown in section, Fig. 3, and in plan, Fig. 4, on a smaller scale,) integral with the plate *a*. The springs, instead of having in their upper part a notch for the passage of the key, have this notch in their lower part for receiving the rib *f'*. The other projecting band of the plate *a*, receiving the tubular sockets *b b* is also dispensed with. The springs and the sockets are separated by means of small ebonite plates *p q*. (Indicated in Fig. 3.) These plates separating the metallic parts are strongly fastened by cement or otherwise. If necessary, they are covered by a layer of india-rubber, glue, or gum-lac or other similar matter. At the ends the springs *r r'* and the contacts *b b* are fastened, Fig. 4, against the raised end shoulders *s* of the ebonite plate *a*.

The plug, with two parallel contacts, which form the complement of the spring-jack commutator, as above described, consists of two contact-pins *c c'*, of brass, iron, or steel, inclosed in grooves between two ebonite or other insulating-cheeks, constituting a divided block *t*, molded, of the form shown at Figs. 5, 6, and 7. These two contact-pins *c c'* are formed at their outer ends with spherical heads, while the inner ends are formed into shanks *h h'*, serving to make contact with the helical wires forming the two conductors of a flexible cable *i*, serving to establish the communications. At the point where the two helices of the cable are united under the same sheathing is fixed a ring *k*, which is contracted at the middle, so as to make it assume the form of the figure **8**, and thus be securely fixed on the cable. A second ring *j*, which is fixed in the outer end of the thin brass casing or outer sleeve *u* of the stopper, as shown at Fig. 5, serves to secure the end of the cable in the stopper. The last-named ring is chamfered off at its outer edge in order to prevent any cutting of the cable sheathing. The two contact-pins *c c'* are also firmly secured in the stopper by means of a clamping-screw *m*, which passes through the stopper. The copper sheath *u* of the stopper is slotted on both sides for a certain length at *n* for preventing all contact between it and the contact-pins *c c'*.

The above description of a spring-jack commutator and of the plug for the multiple commutator with metallic circuits is equally applicable to the spring-jack commutator and plug for multiple commutators with simple circuits, such as is shown at Figs. 9, 10, 11, 12, and 13, by simply dividing each group of blades forming a spring-jack into two, the plug being made with a single contact-pin, as shown at Figs. 11, 12, and 13, combined, as already described with reference to the plug with two parallel contact-pins.

In my invention the spring-jack commutator is made so compact that the capacity of the switch-board may be greatly increased. For example, a section of the board of such height and length as to be within reach along its entire surface of a person of average height when seated may contain six thousand commutators for metallic circuits, or one of such height as to be within reach along its entire length of the hand of a person of average height when standing may contain twelve thousand metallic circuits. It should be observed here that a commutator of six thousand metallic circuits may be used for twelve thousand simple circuits without any other alteration than the division into two of each group of spring-jacks. In the same way a commutator of twelve thousand metallic circuits could be made available for twenty-four thousand simple circuits if the manipulation of so large a number should become possible.

I claim as my invention the following-de-

fined novel features or combinations, substantially as hereinbefore specified, namely:

1. The combination of an insulating-plate, tubular contact-sockets fastened thereto along one edge, and transversely-arranged jack-springs fastened along the opposite edge of the plate, with a longitudinal part engaging notches in said springs for holding them in place.

2. The combination of an insulating-plate formed of trough shape, jack-springs projecting transversely across the open space in the trough and fastened in grooves in one side thereof, a longitudinal strip engaging notches in the springs to hold them in place, and tubular contact-sockets fastened in grooves in the other side of the trough.

3. In a spring-jack commutator, the combination of an insulating-plate formed of trough shape, one of the sides thereof formed with a longitudinal dovetail groove and with transverse grooves, jack-springs fitted in said transverse grooves and formed with notches coinciding with said dovetail groove, a dovetail strip entered into said dovetail groove, and notches to hold the springs in place.

4. The combination of an insulating-plate having transverse rectangular grooves formed in the edge thereof, contact-sockets made exteriorly rectangular fitted in said grooves, jack-springs fastened to one side of said plate in positions corresponding to said sockets, and connection-strips arranged on the opposite side of the plate and connected metallically with the respective sockets.

5. The combination of insulating-plate *a*, tubular contact-sockets *b b*, connection-strips *g g* in connection with the respective sockets, notched transversely-arranged jack-springs *r l*, and longitudinal fastening-strip *f*, engaging the notches therein.

6. The combination of metallic pins *c c'*, a divided insulating-block in which the shanks of said pins are embedded, an outer sleeve inclosing said block and holding its halves together, a flexible cable entering the rear end of said sleeve, and the conductors thereof connected to the respective pins.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

LOUIS ALFRED BERTHON.

Witnesses:
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ROBT. M. HOOPER.