

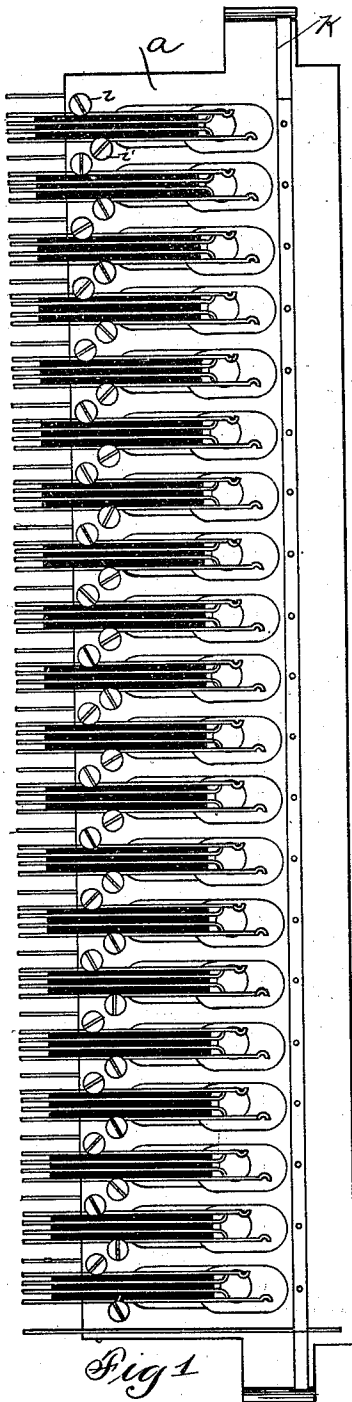
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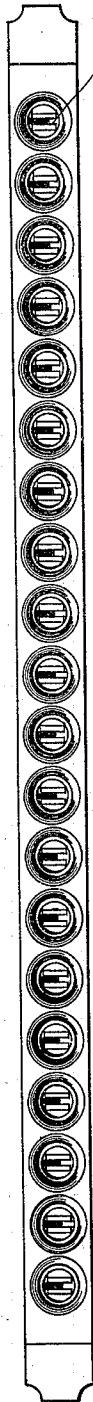
C. E. SCRIBNER.  
SPRING JACK SWITCH.

No. 552,729.

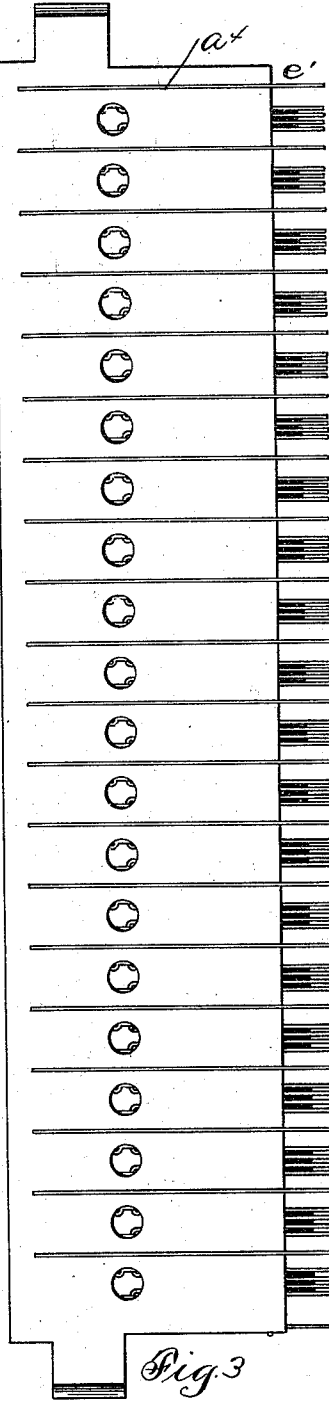
Patented Jan. 7, 1896.



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*George L. Cragg.*  
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*Fig. 2*



*Fig. 3*



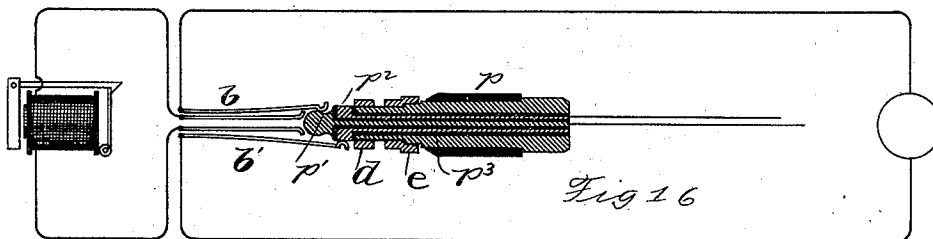
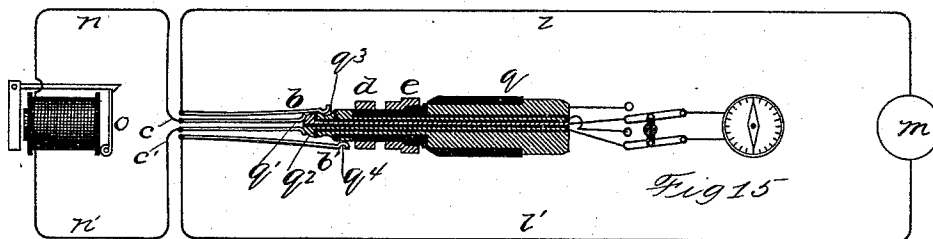
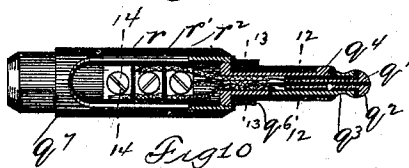
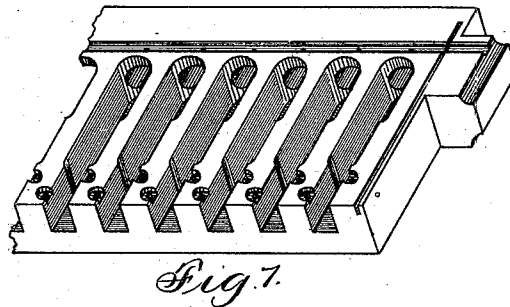
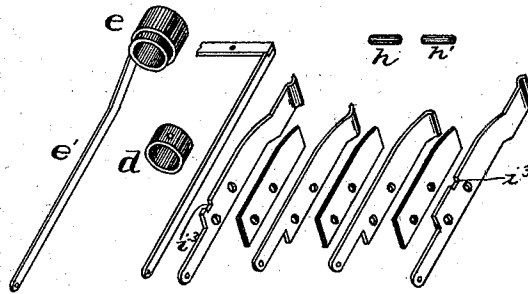
*Fig. 4*

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# UNITED STATES PATENT OFFICE.

CHARLES E. SCRIBNER, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE WESTERN ELECTRIC COMPANY, OF SAME PLACE.

## SPRING-JACK SWITCH.

SPECIFICATION forming part of Letters Patent No. 552,729, dated January 7, 1896.

Application filed May 9, 1893. Serial No. 473,585. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES E. SCRIBNER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Spring-Jack Switches, (Case No. 333,) of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to spring-jack switches for telephone-switchboards. Its object is to produce a compact and durable spring-jack for use with metallic-circuit lines, which shall control the continuity of both limbs of the metallic circuit, and whose switch-contacts shall be accessible for testing to determine the insulation and continuity of the circuit-wires.

In telephone-switchboards of the multiple type it is usual to provide a spring-jack or terminal socket upon each section of the multiple switchboard for each line. The first spring-jack of the series is arranged in the form of a switch which is adapted to disconnect the remainder of the circuit through the switchboard. The long-distance connections or other connections requiring the highest insulation and greatest freedom from disturbance are made with this first spring-jack of the series by means of the usual loop-plug, in order to free the line from the disturbances arising from cross-talk or induced currents taking place in the cables of the switchboard, and the shunting effect of the annunciator which is permanently connected with the switchboard-circuit. The necessity also frequently arises of testing to locate defects upon the line, which defects may be either in the switchboard or upon the line-circuit, and such tests have been provided for by a second switch in the line or switchboard circuit adapted to open the line-circuit in order that the circuit through the switchboard and that through the line might be separately tested. The spring-jack switches have usually been arranged in groups of twenty, the different members of the group being mounted upon a common base-plate, the aggregation being denominated a "strip of spring-jacks."

Since the capacity of a telephone-exchange is to a large extent limited by the number of spring-jacks which can be grouped within reach of an operator, it becomes essential that these spring-jacks shall be as small as possible consistent with the durability and insulation of their parts.

In my invention I have aimed to produce a simple and durable strip of spring-jack switches whose contact-points are not only adapted to make connection with the corresponding portions of the ordinary connecting-plugs, but which are also accessible for testing by means of a specially-constructed testing-plug which I have provided, by which separate circuits may be closed through the switchboard-circuit and through the line-circuit simultaneously. My improved spring-jack is also provided with the usual "local" contact-pieces which are connected with the annunciator for the purpose of restoring it and for testing purposes.

My invention is illustrated in the accompanying drawings and will be described in full in connection therewith.

In the drawings, Figure 1 is a plan of a strip of twenty spring-jacks constructed in accordance with my invention. Fig. 2 is a front elevation of the strip. Fig. 3 is a view of the same from beneath. Fig. 4 is a rear elevation of the strip. Fig. 5 is a transverse section through the strip, taken upon the center line of a spring-jack. Fig. 6 is a longitudinal section of three spring-jacks on the line 6 6 of Fig. 1. Fig. 7 is a perspective view of a section of the strip, the parts being removed from their places in the strip, and the parts of one spring-jack being displayed above the strip. Fig. 8 is a side elevation of the special testing-plug which I have provided. Fig. 9 is a longitudinal vertical section of the plug. Fig. 10 is a view showing the plug in partial longitudinal horizontal section. Fig. 11 is an end elevation of the plug. Fig. 12 is a transverse section through the stem on line 12 12 of Fig. 10. Fig. 13 is a transverse section on line 13 13 of Fig. 10. Fig. 14 is a transverse section on line 14 14 of Fig. 10. Fig. 15 is a diagram showing the testing-plug inserted into a spring-jack which is connected with a line-circuit and a switch-

board-circuit, a switch and galvanometer being shown in circuit with the test-plug. Fig. 16 is a diagram showing the ordinary "three-part" plug inserted in the same spring-jack in place of the testing-plug.

The parts of the spring-jacks are mounted upon the common plate *a*, which is preferably of hard rubber or other insulating material, in suitable recesses provided for them.

As may be best seen in the diagrams Figs. 15 and 16, each spring-jack switch comprises, essentially, a pair of line-springs *b b'*, which constitute the line connections of the spring-jack, their co-operating switch-contact anvils *c c'*, and two short thimbles *d* and *e*. The line-springs *b b'* are adapted to be separated from their contact-anvils *c c'* by an inserted plug, the line-springs making connection with corresponding contact-pieces upon the plug, while the two thimbles *d* and *e* are arranged to be crossed together through the metallic sleeve or shell of the plug. The line-springs *b b'* of a spring-jack and the springs *c c'*, which constitute their respective contact-anvils, are arranged together in a group or bundle, the different springs being separated by tongues *f f' f<sup>2</sup>* of hard rubber or other flexible insulating material. Two perforations *g* and *g'* are made in each of the springs and rubber tongues of one spring-jack, and insulating-pins *h* and *h'* are inserted into the perforations extending through the group of springs and tongues and holding them in place with respect to each other. The entire group is then inserted into a groove *a'* in the strip *a*. This groove is of sufficient depth to bring the upper edges of the springs a little below the upper surface of the strip *a*. The groove *a'* is sufficiently wide throughout most of its length to permit free play of the springs *b b'* when they are forced downward by an inserted plug; but it is contracted at the rear portion so as to fit the group of springs tightly to hold them in place. In order to insure their rigid retention in place, two screws *i* and *i'* are screwed down into countersunk holes in the strip *a*, so that the heads of the screws come below the surface of the strip in such position that the heads overlap upon the springs *b b'* and prevent their slipping out of the groove *a'*, notches *i<sup>2</sup> i<sup>3</sup>* being cut in the springs to permit the screw-heads to be brought down to the proper level. Thus when the bundle of springs *b b'*, contact-pieces *c* and *c'*, and tongues *f, f'*, and *f<sup>2</sup>* have been pinned together by the pins *h* and forced into the groove *a'*, and the screws *i* are screwed down into place, the parts are held securely from motion in any direction, while at the same time the means employed for thus securing them are exceedingly compact and permit of close arrangement of the spring-jacks upon the plate *a*. In front of each pair of line-springs a cylindrical opening *a<sup>3</sup>* is made in the plate *a* extending from the front of the groove *a'* to the front of the strip, the opening being countersunk at the front of the strip. In this tubular

opening the two thimbles *d* and *e* are mounted, fitting closely the opening. The thimble *d* is secured in place in the opening by means of a pin *d'* driven into the thimble through the plate *a*. All the different thimbles *d* of the strip of spring-jacks are connected together by means of a ribbon *k* of metal laid into a groove in the surface of the plate *a*, so as to come a little below the surface, through which ribbon the pins *d'* pass and in which their upper extremities are soldered. The thimble *e* is provided with a shoulder which fits the countersunk portion of the tubular opening *a<sup>3</sup>*. This thimble is provided with a rearward extension *e'*, which is led through an oblique duct in the plate *a* into a transverse saw-cut *a<sup>4</sup>* on the under side of the strip to the rear of the strip, in order that connection may be made with the thimble *e* from the rear of the spring-jacks.

The springs *b* and *b'* have a downward curvature to bring their tips or curved extremities opposite the opening of the thimbles *d* and *e*, so as to make proper contact with the plug inserted through the openings. The floor *a<sup>3</sup>* of the groove *a'* is depressed at this point to allow free play to the extremities of the springs.

As shown in diagrams Figs. 15 and 16, the springs *b* and *b'* are connected with the limbs *l l'* of the telephone line-circuit extending to the telephone sub-station *m*. The contact-springs *c* and *c'* are connected with the limbs *n n'* of the circuit through the remainder of the telephone-exchange, including the annunciator *o* of the telephone line. The thimbles *d* and *e* may constitute the normally-disconnected terminals of the local circuit including the restoring-coil of the individual annunciator, or provided for testing purposes, in the well-known manner. To this end the thimbles *d*, connected with the common ribbon *k*, may be grounded by means of the ribbon. When the ordinary triple connecting-plug, as *p*, is inserted into the spring-jack, Fig. 16, the line-springs *b* and *b'* are separated from their contact-anvils *c c'* and make connection with the tip *p'* and the short sleeve *p<sup>2</sup>*, respectively, while the thimble *d* and the thimble *e* are crossed together through the metallic sleeve or shell *p<sup>3</sup>* of the plug.

In testing to locate defects in a telephone-circuit my special plug *q*, Figs. 8 to 15, is employed. This plug is constructed with four contact-pieces, two, *q'* and *q<sup>2</sup>*, being arranged to make contact with the anvil-springs *c c'*, while the other two contacts, *q<sup>3</sup> q<sup>4</sup>*, make connection with the line-springs *b* and *b'*, the latter springs being at the same time lifted out of connection with their anvils *c c'*. The different contacts *q' q<sup>2</sup>* and *q<sup>3</sup> q<sup>4</sup>* may be connected with the points of a switch in circuit with suitable testing apparatus, so that by the movement of the switch the line-circuit *l l'* to station *m* or the switchboard-circuit *n n'* may be tested. In the construction of this plug *q* I prefer to arrange the contact-pieces

$q'$  and  $q^2$  together so as to constitute a thin stem having a hemispherical head, the stem and head being divided longitudinally by a thin strip of insulating material. The stem is inserted through a tube  $q^3$  of metal, being insulated from it by an annular bushing of insulating material. The tube  $q^3$  is in turn inserted through a ring  $q^4$  of metal, being also insulated from this in a suitable manner.  
 10 The stems of the contact-pieces  $q^3$  and  $q^4$  are arranged in the form of a tube  $q^5$  longitudinally divided. This composite tube is surrounded by an insulating-shell  $q^6$ , which serves to preserve it from contact with the thimbles  $d$  and  $e$  when the plug is inserted into the spring-jack. Binding-posts  $r$   $r'$   $r^2$  are provided within the body  $q^7$  of the plug to which the different contact-pieces  $q^1$ ,  $q^2$ , and  $q^3$  are connected by means of wires, and  
 20 with which the external testing-circuit may be connected by suitable leading-wires.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

25 1. The combination with a telephone line of a spring jack having four contact pieces arranged in two pairs, whose members are separable, one pair being included in each line conductor, and a plug adapted to make  
 30 connection with the four contact pieces; substantially as described.

2. The combination with a plate of insulating material having transverse grooves in one face and a plug-opening from the edge of the  
 35 strip into the transverse groove, of line springs placed on edge and forced into the groove, the springs being separated by an interposed tongue of insulating material, substantially as described.

40 3. The combination with the plate  $a$  having the groove  $a'$ , of the line springs  $b$  and  $b'$  separated by an interposed tongue of insulating material, forced on edge into the groove  $a'$ , the groove being widened near the extremities of the springs to permit their play,  
 45 as described.

4. The combination with the plate  $a$  having the grooves  $a'$  formed in it, of the line springs  $b$   $b'$  and their contact springs  $c$   $c'$  separated by interposed tongues of insulating material, forced on edge into the groove, substantially as described.

50 5. The combination with the plate  $a$  having the groove  $a'$  formed in it, of the line

springs  $b$   $b'$  placed upon edge in the groove, 55 and the screws  $i$   $i'$  screwed into the plate  $a$  with their heads overlapping the springs, whereby the springs are held in place, substantially as described.

6. The combination with the plate  $a$  having the perforations  $a^3$  formed in it, of the thimbles  $d$  in the perforations, the ribbon  $k$  upon the face of the strip, the ribbon being connected with the thimbles  $d$  by pins passing through the intervening portions of the  
 65 plate  $a$ , substantially as described.

7. The combination with the plate  $a$  having the groove  $a'$  and the corresponding opening  $a^3$  formed in it, of the springs  $b$   $b'$  lying in vertical planes, the ends thereof being  
 70 transversely displaced to bring the ends down to the center line of the opening, substantially as described.

8. The combination with the springs  $b$   $b'$  and their corresponding contact springs  $c$   $c'$ , 75 of the interposed rubber tongues  $f$   $f'$   $f^2$  separating the different springs, and an insulating pin  $h$  extending transversely through the group of springs and contacts, substantially  
 80 as described.

9. The combination with the plate  $a$ , of line springs  $b$   $b'$  and their contact springs  $c$   $c'$  secured on edge in a transverse groove in the plate, and the thimbles  $d$   $e$  in a transverse perforation in alignment with the springs, 85 substantially as described.

10. The combination with a spring jack having two line springs  $b$   $b'$  and two contact anvils  $c$   $c'$  therefor, of a plug  $q$  inserted in the spring jack having contact pieces touching the two contact anvils  $c$   $c'$ , and contact sleeves making connection with the springs  $b$  and  $b'$ , respectively, and lifting them from their respective contact anvils, substantially  
 90 as described.

11. The combination in a testing plug, of a stem terminating in a hemispherical head, the stem and head being longitudinally divided into contact pieces  $q'$   $q^2$ , and the insulated sleeve  $q^3$  concentric with the stem, substantially as described. 100

In witness whereof I hereunto subscribe my name this 19th day of April, A. D. 1893.

CHARLES E. SCRIBNER.

Witnesses:

ELLA EDLER,

GEORGE L. CRAGG.