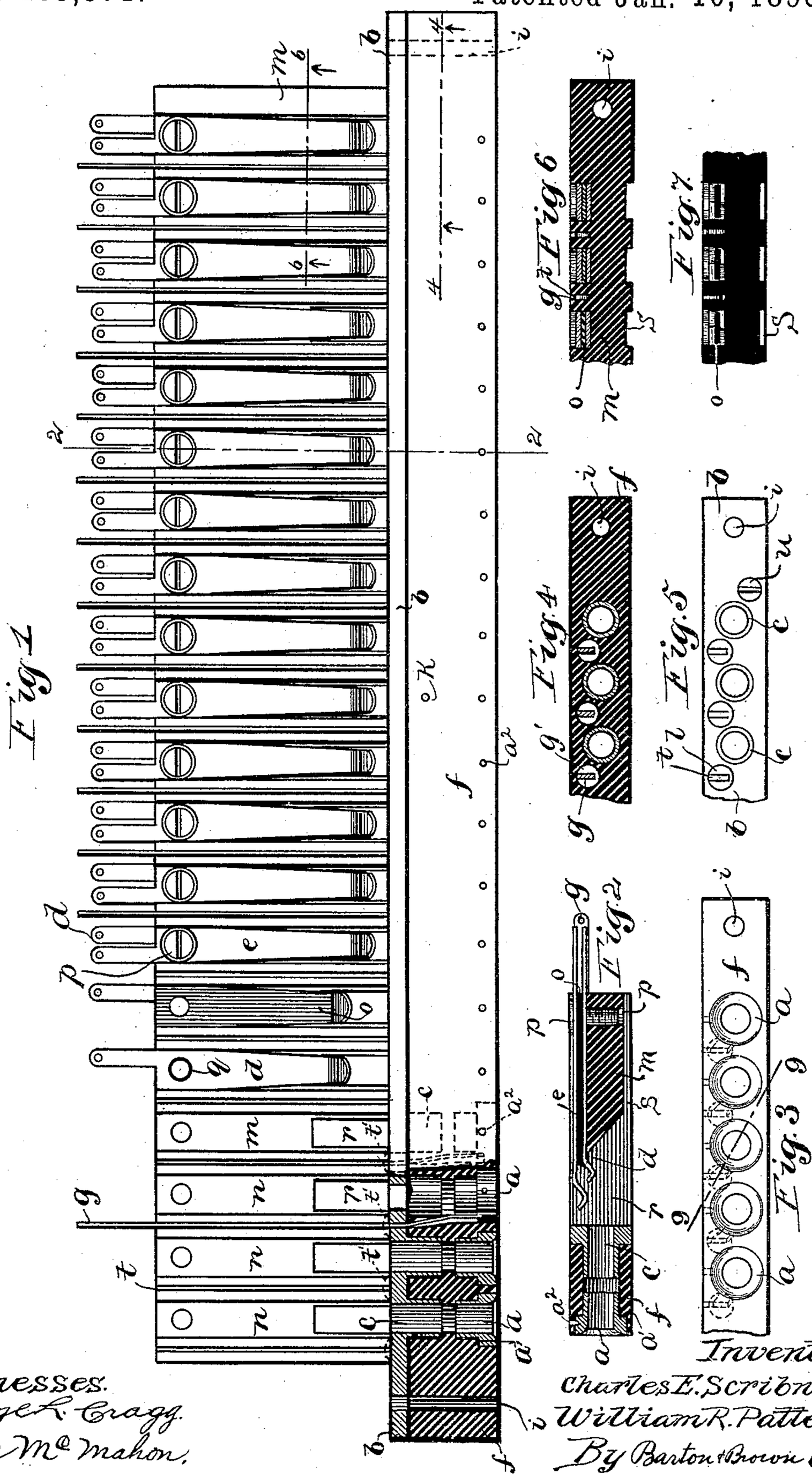
(No Model.) 2 Sheets—Sheet 1.

C. E. SCRIBNER & W. R. PATTERSON.

SPRING JACK SWITCH FOR TELEPHONE EXCHANGES.

No. 489,571. Patented Jan. 10, 1893.



Witnesses.
George L. Cragg.
George McMahon.

Inventors.
Charles E. Scribner,
William R. Patterson.
By Barton & Brown Attys.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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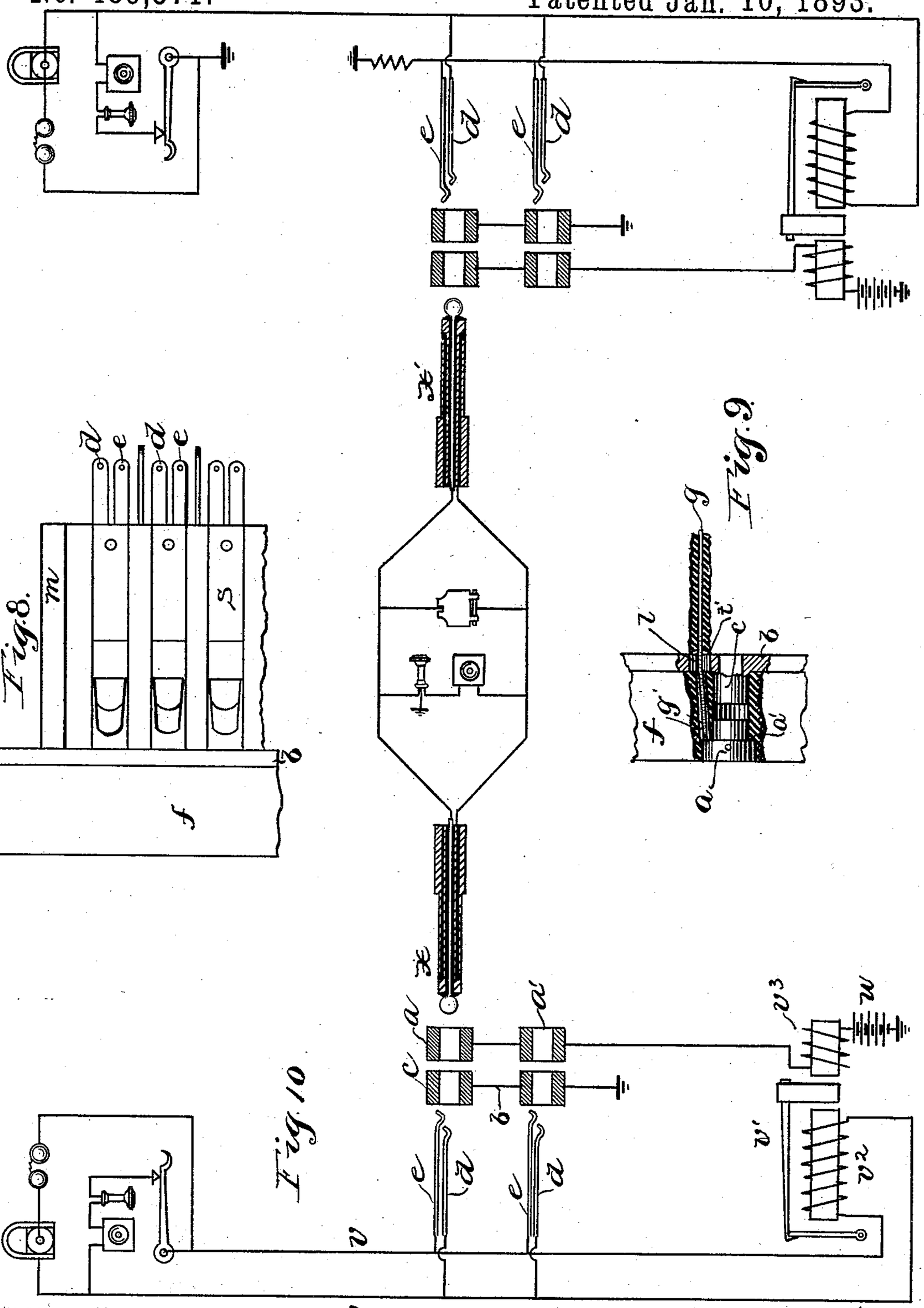

Fig. 1.

Fig. 8.

Fig. 10.

Fig. 9.

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UNITED STATES PATENT OFFICE.

CHARLES E. SCRIBNER AND WILLIAM R. PATTERSON, OF CHICAGO, ILLINOIS, ASSIGNORS TO THE WESTERN ELECTRIC COMPANY, OF SAME PLACE.

SPRING-JACK SWITCH FOR TELEPHONE-EXCHANGES.

SPECIFICATION forming part of Letters Patent No. 489,571, dated January 10, 1893.

Application filed January 21, 1892. Serial No. 418,827. (No model.)

To all whom it may concern:

Be it known that we, CHARLES E. SCRIBNER and WILLIAM R. PATTERSON, citizens 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 for Telephone-Exchanges (SCRIBNER'S Case No. 286, and PATTERSON'S Case No. 95,) 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.

Our invention relates to the construction of spring jack switches of the class which are made up in strips. It has been found convenient to make the extreme length of the front portion of a strip eleven and one-half inches, its height one-half inch and its depth three and one-fourth inches. The rear portion of a strip upon which the line terminals are mounted is usually made ten and one-fourth inches in length. A strip of this size usually contains twenty spring jack switches. These strips are laid up one upon another, usually in sub-divisions of five, so that each sub-division may contain one hundred spring jack switches. We do not deem it necessary to describe further the manner of mounting these strips in the switch board frame. Sometimes the strips are formed into switch board tables, in which case the plug holes will open downwardly. With circuits of the character now usually employed, more particularly in multiple switch board systems, it has been found difficult to dispose the metallic parts of a strip of spring jack switches in such relation to one another that the usual connections and usual contacts may be made secure and certain without liability to accidental crossings or contacts between the various parts, and it was the object of our invention to provide for doing the work required in an efficient and satisfactory manner, while avoiding the objections or difficulties hereinbefore referred to.

Certain features of our invention may be described in general terms as follows:

First. A strip of spring jack switches having a rubber front provided with test thimbles, each thimble having a terminal extension and the socket for each test thimble being provided with an oblique duct or opening through which the terminal piece of the thimble is inserted and extended to the rear.

Second. A strip of switches made up of a front of insulating material carrying test thimbles having oblique terminal extensions, a milled and slotted rear portion also of insulating material carrying the line springs or terminals of the switches, and an intermediate metallic plate or bar placed between said front and rear parts, said bar being provided with openings, one for each test terminal extension, through which these terminal extensions pass respectively without coming in electrical contact therewith, said bar being further provided with tubular extensions, one tubular extension for each thimble socket or opening, through the front of insulating material, said tubular extensions being inserted into said openings from the rear, but not to reach the thimbles so that the thimbles may be insulated from the bar.

Third. The front is provided with openings which are counter sunk to receive the thimbles, and oblique ducts are provided, one for each of said openings, for guiding the thimble extensions to the rear, so that they may lie in slots provided therefor, and be as far as possible removed from the other metallic parts of the strip of switches.

Fourth. The two line terminals of each switch are placed one above the other in their groove, grooves being milled out in the upper side of the rear portion or "comb" of the strip, one groove for each pair of the line terminals, the members of each pair being placed one above the other and being kept apart by an interposed strip of rubber. The two members of each pair when the plug is inserted are flexed together in the same direction, and their insulation from one another maintained, the upper or longer member being connected with an insulated contact sleeve placed in proper position a short distance from the tip of the plug, while the underlying or shorter member is at the same time brought into contact with the tip of the plug.

Fifth. The comb on the underside thereof, back of each plug hole, is milled out to pro-

vide openings through which any dust may be blown out. In case the strips are formed into tables, any dust getting into the plug holes will fall out through these openings.

Sixth. The outer ends of the slots in the comb at the rear of the openings for the test thimble extensions are preferably counter sunk conically, so as to guide the said extensions and cause them to readily enter the slots.

Our invention, while designed especially for multiple switch board use, may be employed whenever it is desired to bring a large number of switches within small compass.

Referring to the accompanying drawings, which are illustrative of our invention,—Figure 1 is a full sized plan view of a strip of spring jack switches embodying our invention, a portion thereof being shown in section, and certain parts of a number of switches being removed. Fig. 2 is a transverse vertical sectional view taken on line 2—2 of Fig. 1. Fig. 3 is a front elevation of one end of the strip, showing the test thimbles of five spring jack switches in place in the counter sunk openings thereof provided in the front. Fig. 4 is a sectional view upon line 4—4 of Fig. 1. Fig. 5 is a front elevation of a portion of the metallic bar showing the tubular extension thereon, and the perforations therein for the extensions from the test thimbles; the slots provided for these extensions being shown back of the perforations. Fig. 6 is a sectional view on line 6—6 of Fig. 1. Fig. 7 is a rear view of three spring jack switches in place. Fig. 8 is a view from below showing the front ends of the springs of three switches through the openings which are milled out in the comb. Fig. 9 is a section on line 9—9 of Fig. 3, showing the oblique opening or duct through which the extension from the test thimble is inserted. Fig. 10 is a diagram illustrative of the circuits of a multiple switch board telephone exchange applied to our spring jack switch.

Like parts are indicated by similar letters of reference throughout the different figures.

Each jack consists essentially of the tubular test thimble *a*, the metallic bar *b* bearing the extensions *c* and the line springs *d* and *e*. The test thimbles *a* are inserted into suitable openings in a strip of insulating material *f*, at regular intervals. The test thimble is formed with a shoulder *a'*, which comes against the bottom of an enlarged or countersunk portion of the opening in the strip, and prevents the further insertion of the thimble into the opening. The outward end of the tube of the thimble is flared as seen in Fig. 2, so as to guide the plug into the tube, and to present a broad surface for the application of the testing plug. The thimbles are secured in place by metallic pins a^2, through the insulating material projecting into the thimble. Each thimble is provided with a terminal *g*, extending to the rear of the strip of jacks, to facilitate the connection of wires to the thimble. As shown in Fig. 9, this terminal is obliquely disposed, and is led through a duct or tube *g'* of corresponding obliquity, formed or bored in the strip *f*, whereby it is insulated from contiguous test-rings and other parts. Thence it extends through grooves to the rear of the strip, in a manner which will presently be more fully described. The metallic strip or bar *b*, extends throughout the length of the strip *f*, and is of equal width thereto. It is provided with tubular extensions *c*, one for each jack, arranged coaxially with the test thimbles, and inserted into continuations of the same openings which receive the thimbles. The extensions *c* are of such length as not to meet the test thimbles *a* however, whereby their insulation is maintained. The openings of the tubular extensions *c* are of equal diameter to those of the thimbles. The strip *b* is retained in position in the strip of jacks when in the board, by screws passing through both, through holes *i*, *i*, into the frame of the board; but after assemblage they may be retained together by a pin *k* through the strip *f*, into one of the tubular extensions.

Openings *l* are provided in the strip *b*, to allow of the passage of the terminal *g*, of the thimble *a;* these openings are of larger diameter than the ducts *g'*, and are practically continuations of them, whereby the terminal strip *g* is prevented from coming into contact with the sides of the opening *l*.

Of the line springs *d* and *e*, one *d* is made shorter than the other, in order that they may make contact with the different contact pieces of a plug. They are mounted upon a strip *m* of insulating material, which we have termed the "comb" in suitable grooves *n* milled therein. The springs are insulated and separated from each other by a thin flexible strip or tongue *o* of insulating material, which by its flexibility allows them free independent movement. The springs *d e* are secured to the comb *m* by a screw *p* passing through them and the tongue *o* into the comb *m*, the insulation of the lower spring *d* being maintained by a small rubber ring *q*, surrounding the screw *p* at that point. A slot *r* is milled into the strip to a short distance, to allow the entrance of the plug beneath the springs *d* and *e*, and to prevent the accumulation of dust under the springs; and a groove *s* is milled into the under side of the comb, to provide a means of removal of dust which may accumulate in the opening *r*, by forcing air into the tube of the jack, if the spring jacks be placed horizontally, or by gravity, if vertically.

Saw cuts *t* are provided in the upper surface of the comb adapted to receive the terminals *g* of the test thimbles, and to retain them in place and insulated from other parts. The front end of the saw cut *t* is provided with a conical countersink *t'* immediately be-

hind the opening *l* in the bar *b*, whereby the terminals *g* are readily guided into the saw cuts when the strip of spring jacks is being put together.

The comb *m* is secured to the bar *b* by suitable screws *u*.

Our improved spring jacks are well adapted for use in connection with switch board circuits such as that shown diagrammatically in Fig. 10. Therein we have shown the essential parts of the spring jack,—the thimble *a*, and the line springs *d* and *e;* the latter are shown connected to the two sides of a telephone circuit *v* in the usual manner. One coil—the operating coil—of a differential annunciator *v'* is connected in a bridge connection between the two sides of the line. The other coil,—the retaining coil—is included in a connection from the test rings *a* and *a'* of the two jacks of that line, through a battery *w*, to earth; while the bar *b* is connected directly to earth.

The plug adapted for use in this system is shown in section at *x*, *x'*. It consists of a conducting tip adapted to make contact with the shorter line spring *d*, *a* short sleeve adapted to make contact with the longer line spring, and a shank adapted to make contact with both pieces *b* and *a*, thereby crossing them together. The circuits between plugs *x x'* are of the usual character; the tips of the two plugs and the short sleeves, are respectively connected together by conducting cords, and the operator's telephone set and clearing out drop are connected in bridge connections between the different cords.

The operation of the system shown is, briefly, as follows: When subscriber calls, by turning his calling generator, current is sent through the front coil v^2 of the annunciator *v'*, thereby causing the shutter to fall. The operator then proceeds to test the line, and to establish connection with the line called for, in the usual manner. When the plug is inserted into any jack of the line, the test thimble *a* is crossed with the piece *b*, through the shank of the plug, and the circuit of battery *w* is closed through the back coil v^3 of annunciator *v'*, whereby the annunciator is prevented from operating when the clearing out signal is sent from the substation. The condition of a line with respect to whether it is in use or not, is indicated to an operator testing in the usual manner,—by applying the tip of one of her plugs to the test thimble of the line to be tested,—by the presence or absence of a click in her telephone at each test; the battery *w* of an idle line sends current through her telephone, but when a connection is made to line, the telephone is short circuited by the connection from test thimble, through shank of plug, to piece *c*, thence to earth.

It is evident that strips of spring jack switches, similar to the strip illustrated in Fig. 1 may be made up and used as a new article of manufacture. Furthermore, single spring jack switches might be made containing certain of the special features of our invention, and we therefore do not limit our invention to the particular details of construction herein illustrated and described.

Having thus described our invention, we claim as new and desire to secure by Letters Patent:

1. In a spring jack switch, the combination with the test thimble provided with the oblique extension of the tubular piece adapted to be connected to ground, which tubular piece is insulated from the test thimble, and the pair of springs insulated from one another with their free ends presented to the plug hole one of said springs being longer than the other, and a plug provided with three contacts, one contact being adapted to connect together the thimble and tubular piece, another contact being adapted to connect with the longer of the springs, while the third contact or tip of the plug is adapted to form an electrical connection with the shorter of said springs when the plug is inserted, substantially as and for the purpose specified.

2. In a spring jack switch, a pair of springs or contact pieces insulated from one another by a strip of rubber or other insulating material, said material extending throughout such lengths of the springs as are straight lines and adapted to flex when the springs are flexed, whereby said contact springs are insulated from one another and adapted to move together when flexed, substantially as described.

3. In a strip of spring jack switches, the combination, with the rubber front provided with test thimbles having extensions, of the comb carrying the pairs of contact springs of the switches, and provided with slots for the extensions from the test thimbles and an intermediate bar provided with tubular extensions, one tubular extension corresponding to each test thimble, substantially as specified.

4. In a spring jack switch, a test thimble provided with an oblique terminal extension, and a tubular portion, said thimble and tubular portion being insulated from one another, in combination with contact springs having their free ends presented to the plug hole formed by said thimble and tubular piece, and a plug adapted to be inserted therein to connect the thimble and tubular piece together and make separate connection with the insulated contact pieces, substantially as specified.

5. A spring jack switch, having the thimble or test piece thereof provided with a rearwardly projecting extension, in combination with a tubular portion corresponding in position to the said thimble, said tubular portion being connected with ground and provided with a perforation larger than the terminal extension from the thimble through which said extension piece passes, whereby the insulation of the thimble or test piece is secured, substantially as specified.

6. In a strip of spring jacks, the combina-

tion with a strip of insulating material, of test thimbles inserted in perforations therein and provided with shoulders adapted to rest against the bottoms of counter-sunk portions of said perforations, and a metallic bar having cylindrical extensions projecting into the same perforations from the opposite side of the strip, substantially as described.

In witness whereof we hereunto subscribe our names this 8th day of January, A. D. 1892.

CHARLES E. SCRIBNER.
WILLIAM R. PATTERSON.

Witnesses:
CHARLES A. BROWN,
GEORGE L. CRAGG.