

W. W. DEAN.
ELECTRIC SWITCHING APPARATUS.

No. 559,792.

Patented May 12, 1896.

Fig. 1.

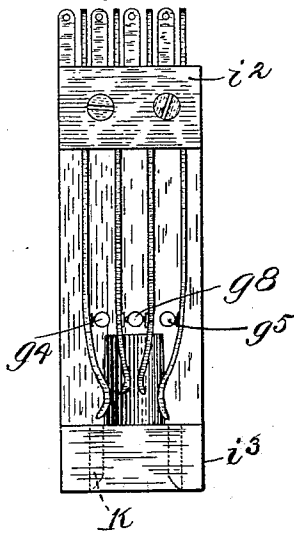


Fig. 2.

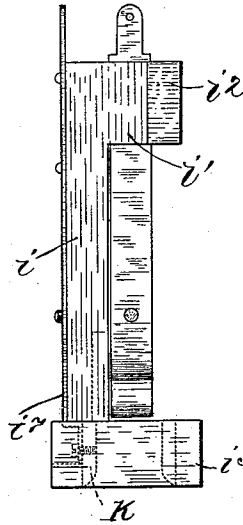


Fig. 3.

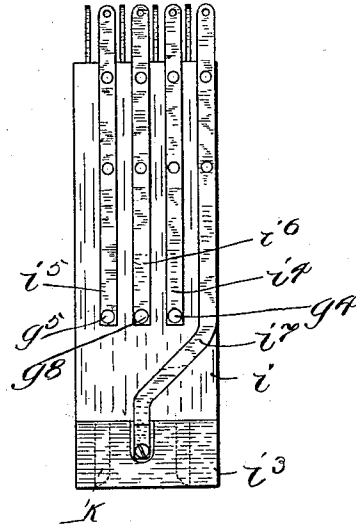


Fig. 5.

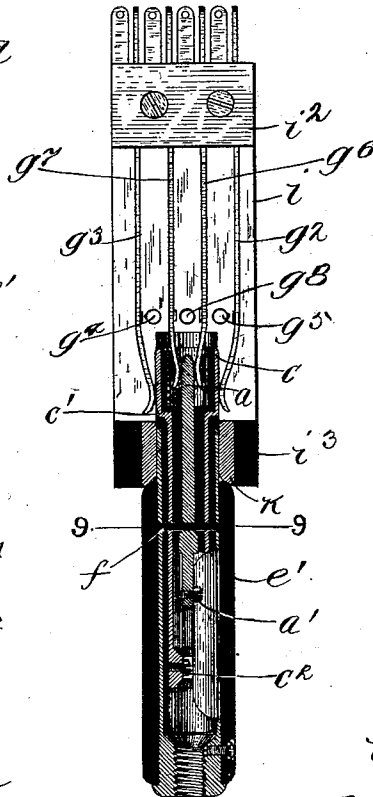


Fig. 4.

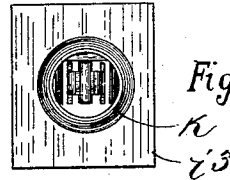


Fig. 6.



Fig. 8.

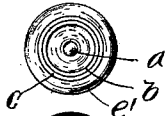


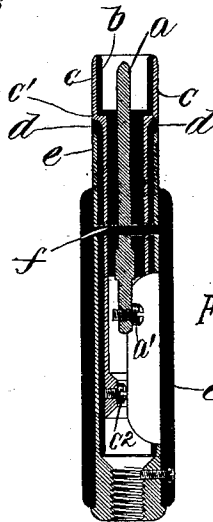
Fig. 9.



Witnesses:

S. M. C. Tanner,
George L. Cragg.

Fig. 7.



Inventor:
William W. Dean,
By Bartlett Brown,
Attorneys.

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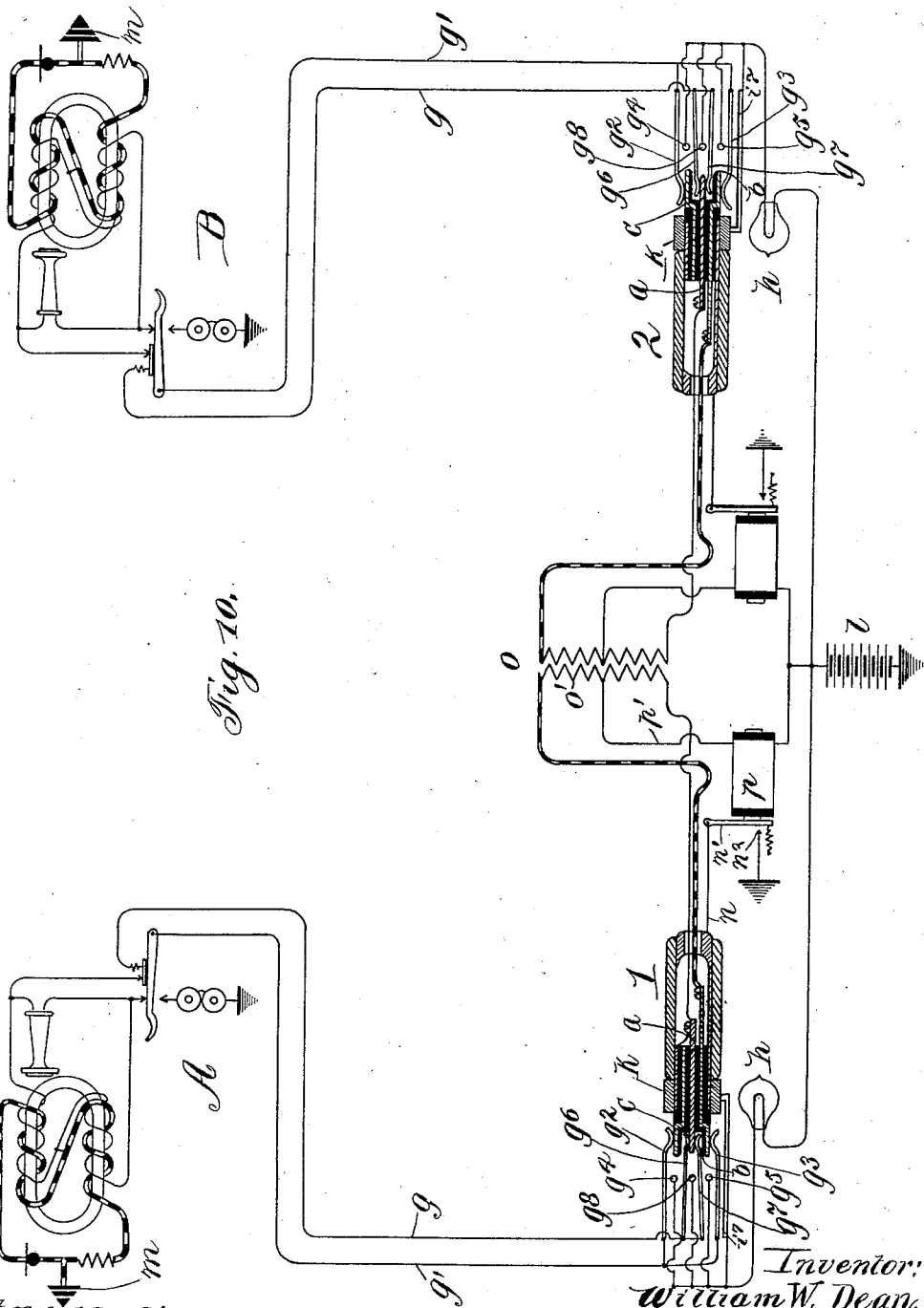


Fig. 10.

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UNITED STATES PATENT OFFICE.

WILLIAM W. DEAN, OF ST. LOUIS, MISSOURI, ASSIGNOR TO THE BELL TELEPHONE COMPANY OF MISSOURI, OF SAME PLACE.

ELECTRIC SWITCHING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 559,792, dated May 12, 1896.

Application filed January 24, 1896. Serial No. 576,649. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM W. DEAN, a citizen of the United States, residing at St. Louis, in the State of Missouri, have invented a certain new and useful Improvement in Electric Switching Apparatus, (Case No. 6,) 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 switching apparatus of the kind usually employed at switchboards of telephone-exchanges in connecting and disconnecting the telephone-lines.

Speaking generally, my invention comprises a spring-jack switch consisting of line-springs, in this instance four in number, between which are placed contact posts or anvils; also a plug adapted to be inserted through a metallic thimble placed in front of the free or movable ends of the springs of the spring-jack, the plug being constructed when inserted to spread or wedge the springs apart and separate them from their normal contacts with the intervening posts or anvils and form new contacts between said springs and the contacts of the plug. The plug is provided with three contact portions, to each of which a separate conductor of the cord-circuit is connected. Two of these contact-terminals constitute outer portions of the tubular shank of the plug, while the other contact consists of a pin placed centrally in the tubular shank, as will be hereinafter more particularly described. My switching apparatus may be adapted for use in various systems of telephone-exchange. I have, however, found it of particular advantage on those systems in which local transmitter-circuits of a large number of subscriber-stations are adapted to be supplied with current from the central station. Such a system is shown in my Patent No. 546,731, granted September 24, 1895. I will accordingly describe my invention as applied to such a telephone system.

In the drawings, which are illustrative of my invention, Figure 1 is a plan view of my spring-jack. Fig. 2 is a side view thereof. Fig. 3 is a bottom view thereof. Fig. 4 is a front elevation of the spring-jack. Fig. 5 is a plan view of my spring-jack with my con-

necting-plug inserted therein. Fig. 6 is a plan view of the connecting-plug. Fig. 7 is a sectional plan view of the connecting-plug. Fig. 8 is an end elevation of the connecting-plug, looking toward the tip. Fig. 9 is a sectional view thereof on line 9 9 of Fig. 5. Fig. 10 is a diagram illustrating two telephone-lines connected together through the medium of my improved switching apparatus.

Like letters and numerals refer to like parts throughout the several figures.

I will first describe in detail the mechanical construction of the terminal plugs and the spring-jacks in which the same are adapted to be inserted. The central or core portion *a* is provided with a binding-screw *a'*, adapted to secure one of the strands of the cord-circuit in electrical engagement therewith. Coaxially about this core portion *a* are arranged the insulating-sleeve *b*, metallic sleeve *c*, insulating-sleeve *d*, and metallic sleeve *e*, through all of which is passed an insulating-pin *f*, adapted to secure these portions of the plug in fixed relation with each other. The metallic sleeve *c* is provided with an offset or shoulder *c'* to secure a uniform diameter of the shank. Insulating-sleeves *b* and *d* are provided with like offsets to follow the contour of the metallic sleeve *c* upon its inner and outer surfaces.

The metallic sleeve *c* is provided with a binding-screw *c'*, adapted to electrically unite a second cord-strand therewith. The metallic sleeve *e* is adapted to be electrically united with a third cord-strand. That portion of the metallic sleeve *e* which is handled by the operator is provided with an insulating-jacket *e'*, which is made of a length sufficient to permit of the insertion of the plug to a proper extent within the spring-jack switch. Portions of the metallic sleeves *c* and *e* and the insulating-sleeve *d* are removed, as shown most clearly in Figs. 5 and 7, to provide sufficient space to accommodate the cord-strands connected to the portions *a* and *c*.

Referring to Fig. 10, the telephone-lines extend in limbs *g g'* from the substations A and B to the central station, limbs *g' g'* terminating in line-springs *g² g³*, normally resting upon contacts *g⁴ g⁵*, which are both connected through individual indicators *h h*, preferably

incandescent lamps, and the battery *l* to ground, while limbs *g g* terminate in line-springs *g⁶ g⁷*, normally resting upon contacts *g⁸*, likewise connected with indicators *h h*, battery *l*, and ground.

The sleeve *c* engages with the line-springs *g²* and *g³* when the plug is inserted and removes the same from their respective contacts *g⁴* and *g⁵*, thereby breaking the connection that previously existed through the medium of said contacts between said line-springs and the individual indicator *h*, the individual indicator being thereby removed from circuit with the subscriber's line. The core *a* of the plug is adapted to separate the line-springs *g⁶ g⁷* from their contact *g⁸*, sufficient space being provided between said core and the insulating-sleeve *b*, interposed between the same and sleeve *c*, to permit of sufficient range of movement of the springs *g⁶ g⁷*. The connection of the springs *g⁶ g⁷* with the indicator *h* is also broken by their removal from the contact *g⁸*. The spring-jack is preferably constructed as shown in Figs. 1, 2, 3, 4, and 5. The various springs and contacts are preferably mounted upon a strip of insulating material *i*, upon which strip is provided a shoulder *i'* to secure the fixed ends of the springs, a clamping-plate *i²* being secured upon said shoulder above said springs to prevent the vertical displacement thereof. An additional shoulder or separate strip *i³* is provided, in which are placed the thimbles *k*, the axes thereof being preferably in line with the central contacts *g⁸*. The contacts *g⁴ g⁵ g⁸* are extended through the insulating-strip *i* and are riveted to metallic strips *i⁴ i⁵ i⁸*, which are extended to the rear of the insulating-strip *i*. The metallic thimble *k* is riveted to the metallic strip *i⁷*, which likewise extends to the rear of the insulating-strip *i*.

Subscriber A, desiring conversation with subscriber B, removes his receiving-telephone from its hook, thereby establishing circuit from ground *m* in parallel over the limbs *g g'*, line-springs *g² g³*, and contacts *g⁴ g⁵*, through the lamp *h* and battery *l* to ground, and also line-springs *g⁶ g⁷*, contact *g⁸*, lamp *h* to ground. The operator, upon noticing that the lamp *h* burns, inserts the answering-plug 1 into the spring-jack corresponding with the line of subscriber A, ascertains the connection desired by bringing her telephone set into circuit with the subscriber's line, and completes said connection by inserting the mate 2 of said plug into the spring-jack switch of the called-for subscriber. Upon the plug being thus inserted the indicating-lamp *h* is cut out of circuit with the subscriber's line; but at the same time it is included in a normally-open local grounded circuit which may be traced from the battery *l* and its ground through the lamp *h*, strip *i⁷*, thimble *k*, conductor *n*, armature *n'*, and the grounded contact *n²*, the circuit through the lamp being open at this contact during the time that the

subscriber's telephone is removed from its hook. During the time that the subscriber's telephone is removed from the hook circuit is maintained from the ground at the subscriber's station in parallel over the lines *g g'*, line-springs *g⁶ g⁷* and core *a*, and line-springs *g² g³* and sleeve *c*, through the cord-strands connecting said core *a* and sleeve *c* with the coil *o'* of the repeating-coil *o*, thence through the connection *p'*, relay *p*, battery *l* to ground, whereby the armature *n'* is removed from its contact *n²*. When the subscriber replaces the telephone upon its hook, relay *p* is deenergized, the local grounded circuit through the indicator *h* being thereby closed, indicating to the operator that conversation has been finished, whereupon the operator withdraws the terminal plugs of the cord-circuit from the spring-jacks of the connected subscribers.

It should be observed that the resistance of the bells at the subscribers' stations being high the current from battery *l*, derived through the lamps *h h*, will not be sufficient to light them during the time the telephones at said stations are hung up.

While I have shown my improved form of switching apparatus as being applied to a particular telephone-exchange system, it is obvious that it may be applied to other systems. I do not desire to limit myself to the precise construction shown; but,

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

1. The combination with an electric connecting-plug provided with a core of conducting material and a sleeve surrounding the same to form an annular space about said core, of a spring-jack switch provided with four springs having their free ends in the same plane, said plug being adapted to be inserted in said spring-jack, the core of said plug being adapted to wedge apart the two inner springs of the spring-jack switch and form contact therewith, and the sleeve of the said plug being adapted to wedge apart the outer of said springs and form contact therewith, substantially as and for the purpose specified.

2. In a switching apparatus, the combination of suitable contact-springs with a plug provided with a core adapted to engage with and move one or more of said springs, and a sleeve adapted to engage with and move one or more of said springs, a space intervening between said core and sleeve in which the spring or springs engaged by said core enter; substantially as described.

3. In a telephone-switchboard, the combination with a connecting-plug provided in the end with a pin or core forming one terminal or contact of the plug, an annular space being provided in the end of the plug surrounding said pin or core, of a spring-jack switch carrying a pair of line-springs between the ends of which said pin or core is adapted to be wedged when the plug is inserted in the

spring-jack switch to form electrical connection between said line-springs and said pin or core, the ends of the line-springs entering the annular space surrounding the pin or core; substantially as described.

4. In a telephone-switchboard, the combination with a connecting-plug provided with a tubular sleeve upon the end forming one of the plug-contacts, and with a centrally-located pin or core situated within said tubular sleeve and forming another of the plug-contacts, of a spring-jack switch comprising a pair of line-springs between the ends of which said tubular sleeve is adapted to be wedged when the plug is inserted in the spring-jack to complete electrical connection between said tubular sleeve and the said line-springs, and a pair of line-springs between the ends of which said pin or core is adapted to be wedged when the plug is inserted to complete electrical connection between the said line-springs and said pin or core; substantially as described.

5. In a telephone-switchboard, the combination with a connecting-plug provided upon the end with a tubular sleeve forming one of the plug-contacts and with a second sleeve situated to the rear of said tubular sleeve, insulated therefrom and forming a second plug-contact, said plug being also provided with a centrally-located pin or core situated

within said tubular sleeve, said core forming a third plug-contact, of a spring-jack switch comprising a pair of line-springs, each normally resting against a contact point or anvil, the tubular sleeve carried upon the plug being adapted to be wedged between the ends of said spring when the plug is inserted in the spring-jack to move said springs out of contact with their respective anvils and to complete electrical connection between the line-springs and said tubular sleeve, a pair of line-springs each normally resting against a contact point or anvil, between the ends of which springs the centrally-located pin or core is adapted to be wedged when the plug is inserted to move said line-springs out of contact with their respective anvils, and to complete electrical connection between said line-springs and said pin or core, and a ring or thimble, situated in front of said line-springs with which thimble the sleeve upon the plug situated to the rear of said tubular sleeve is adapted to make electrical contact when the plug is inserted; substantially as described.

In witness whereof I hereunto subscribe my name this 20th day of January, A. D. 1896.

WM. W. DEAN.

Witnesses:

W. L. FARRELL,

ALBERT PIETCOCH.