

**No. 639,528.**

**Patented Dec. 19, 1899.**

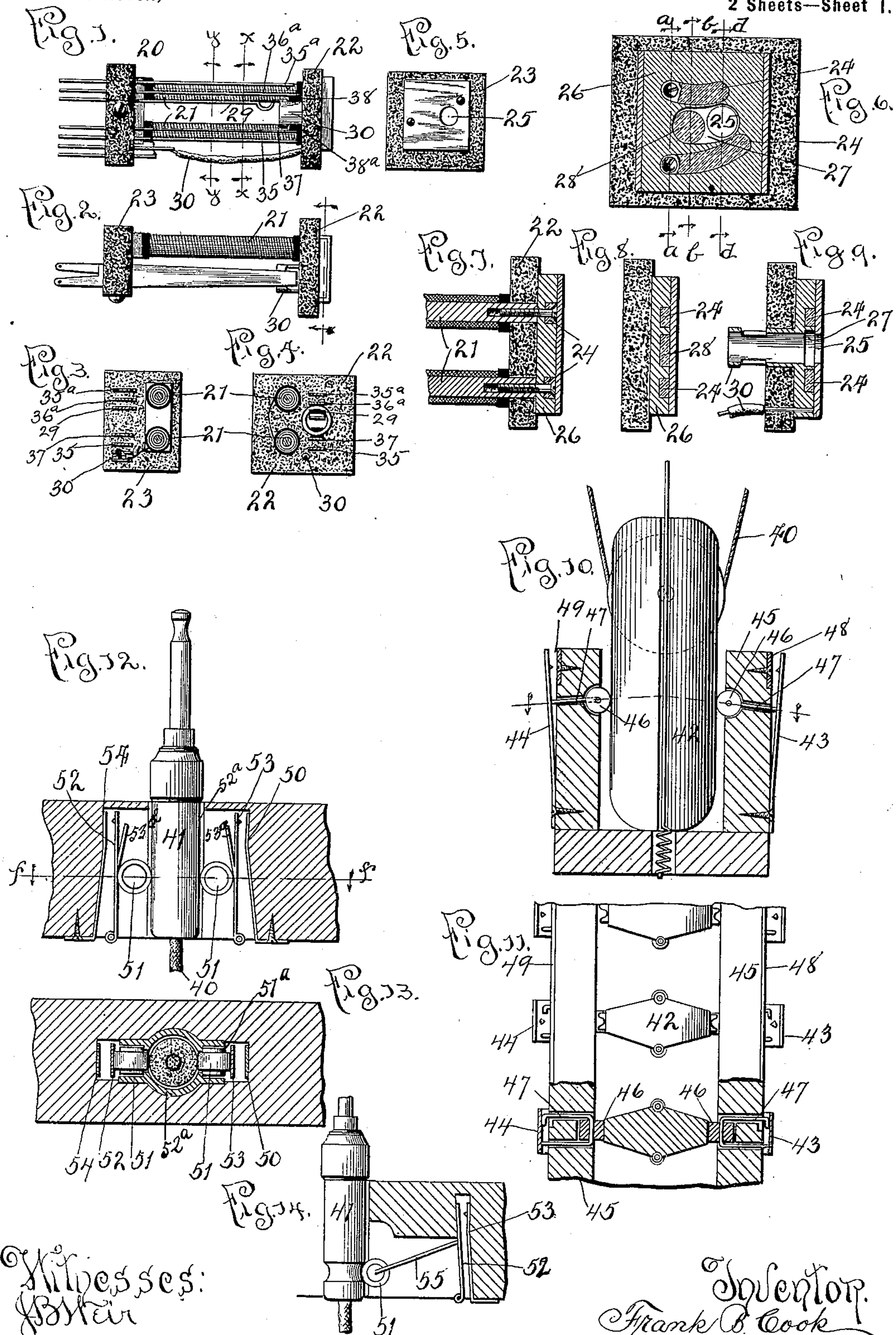
**F. B. COOK.**

**TELEPHONE TRANSFER BOARD.**

(Application filed Dec. 22, 1896.)

(No Model.)

**2 Sheets—Sheet 1.**



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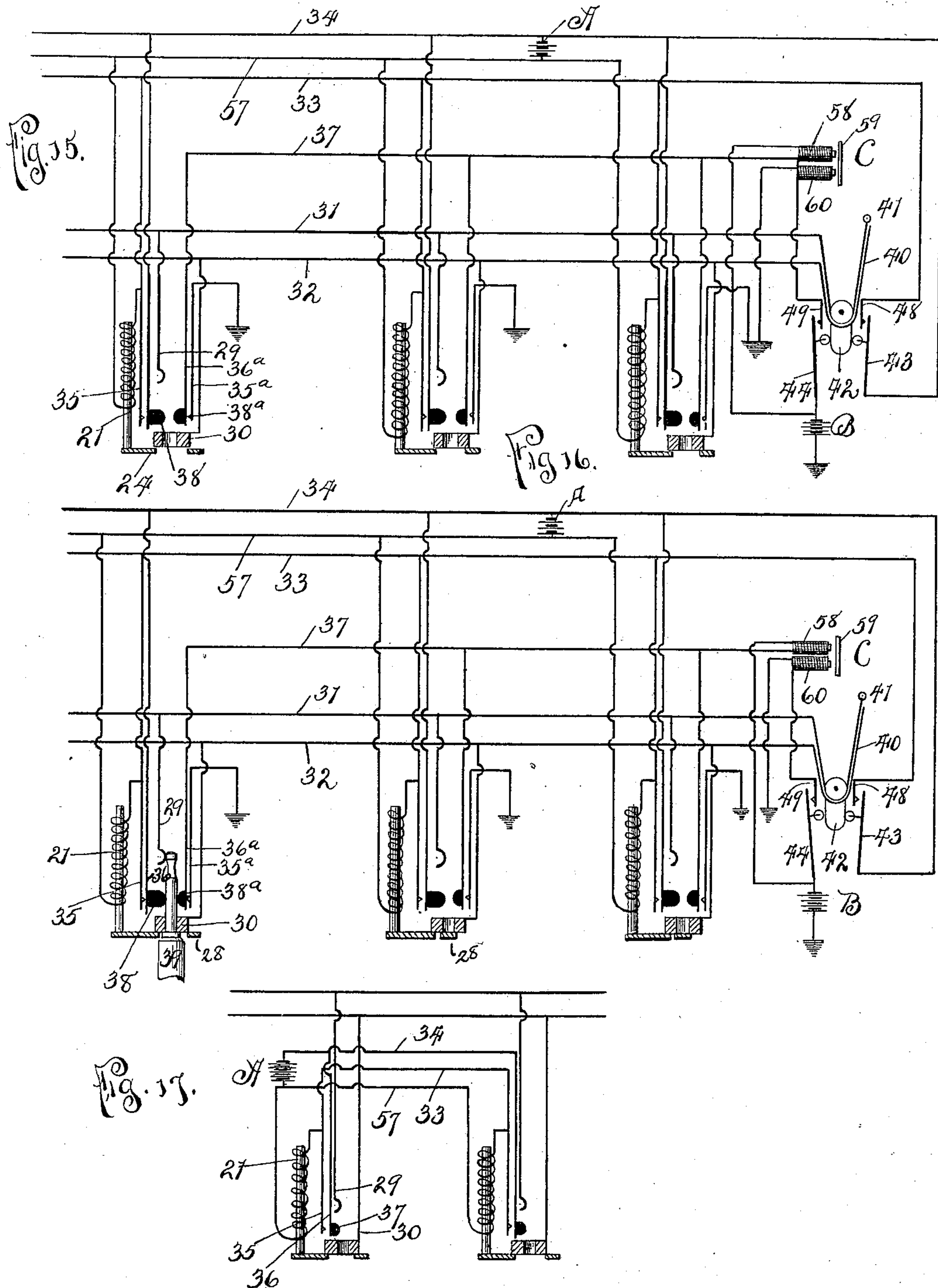
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# UNITED STATES PATENT OFFICE.

FRANK B. COOK, OF CHICAGO, ILLINOIS.

## TELEPHONE TRANSFER-BOARD.

SPECIFICATION forming part of Letters Patent No. 639,528, dated December 19, 1899.

Application filed December 22, 1896. Serial No. 616,637. (No model.)

*To all whom it may concern:*

Be it known that I, FRANK B. COOK, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Telephone Apparatus, of which the following is a specification.

My invention relates to switchboards for telephone-exchanges, and more particularly to certain improvements in what are known as "trunking" or "transfer" systems, by which connections are established between switchboards or between different sections of a switchboard. In trunking or transfer systems the different sections of switchboards or different exchanges are connected together by trunk-lines, which are used for completing the circuits between subscribers' lines at different sections of switchboards or at different exchanges.

The object of my invention is to provide means whereby when any given trunk-line is in use at any one section it becomes impossible to establish connection with that line at any other section while that line is in use, this result being accomplished in the act of inserting a plug in a jack at any one of said sections.

My invention has certain other objects in view; and it consists in certain arrangements, construction, and details about to be described, reference being now had to the accompanying drawings, in which—

Figure 1 is a side view of an improved form of jack used in conjunction with certain circuit arrangements to effect the desired end. Fig. 2 is a plan view of the same. Fig. 3 is a cross-section on the line Y Y of Fig. 1. Fig. 4 is a cross-section on the line X X of Fig. 1. Fig. 5 is a front elevation of the jack. Fig. 6 is an enlarged front elevation of the jack with the face-plate removed. Fig. 7 is a section on the line A A of Fig. 6. Fig. 8 is a section on the line B B of Fig. 6. Fig. 9 is a cross-section on the line D D of Fig. 6. Fig. 10 is a detail view, partly in section, of a switch operated by a pulley-weight. Fig. 11 is a plan view, partly in section, showing a number of pulley-weights and switches operated thereby. Fig. 12 is a detail view showing a switch operated by a plug. Fig. 13 is a section on the line F F of Fig. 12. Fig. 14 is a

view of another means of operating the switch by the plug. Fig. 15 is a diagrammatic view of my improved arrangement, showing the jacks open at each section to receive a plug, the trunk-line not being in use. Fig. 16 is a like view showing a plug inserted in a jack at one section, all the other jacks on that trunk-line at other sections being closed and the trunk-line in use. Fig. 17 is a like view showing a different circuit arrangement for use in conjunction with multiple switchboards independent of the trunking system, in which the jack differs in construction from the form shown in Figs. 1 and 2.

In carrying out my invention I provide spring-jacks of peculiar construction, having electromagnets mounted thereon, which act upon what may be termed "shutters," causing the shutters to assume a position in front of the opening of the jack when attracted by the magnets, and thus closing the jack against insertion of a plug, the shutter returning by gravity into a position away from said opening of the jack to open the jack to the insertion of a plug. The shutters are normally in a position away from the opening of the jack, and therefore a plug may be inserted in any one of them.

The act of inserting a plug into any one of the jacks closes two local circuits, which include a signal device, a source of current-supply, and the electromagnets of all the jacks of that circuit, thus operating a signal and energizing all of the electromagnets of the jacks, which in turn are closed to the insertion of any plug, thus preventing any other operator from encroaching upon that line while it is in use.

One form of spring-jack (designated at 20) consists of an electromagnet 21, held between the insulating frame-pieces 22 and 23, which has extended pole-pieces 24, the ends of which terminate near the opening 25 of the jack. Formed on the face-plate 26 of the jack is an inclined recess 27, in which is disposed a circularly-formed shutter 28, capable of being attracted by a magnet adapted to normally rest in the position shown in Fig. 6 away from the opening 25, thus leaving the entrance of the jack normally unobstructed.

The line-contacts 29 and 30 of the jack are connected with the leads 31 and 32 of the



main talking-circuit, and the leads 33 and 34 of the local shutter-closing circuit are connected with the spring-strips 35 and 36 of the jack. The spring-strip 35<sup>a</sup> is connected to  
 5 earth or a common return-wire. The spring-strip 36<sup>a</sup> is connected to the lead 37 of the local signaling-circuit. The spring-strips 36 and 36<sup>a</sup> carry abutments 38 and 38<sup>a</sup>, of insulating material, extended into the path of  
 10 the plug 39, Fig. 16, and adapted to be engaged thereby to force said spring-strips 36 and 36<sup>a</sup> against the spring-strips 35 and 35<sup>a</sup> to close the local circuits.

A battery A is included, as shown, in the  
 15 local shutter-closing circuit.

A battery B is included, as shown, in the local signaling-circuit. Also included in this local signaling-circuit is a differential signaling device or relay, (indicated at C.)

20 Each main or talking circuit with which the several jacks at the different sections of the board are connected terminates in a cord 40, which cord terminates in a plug (designated at 41) which when the plug is raised for  
 25 insertion into a jack serves to establish two local circuits, one of which is through one of the coils of the differential signaling device. The other again closes the local shutter-closing circuit for a purpose to be described.

30 In Figs. 10 and 11 I have shown the form of construction by which the pulley-weight) designated at 42) is utilized to close the local circuit through the coil of the signaling device and the local shutter-closing circuit, consisting of spring contact-strips 43 and 44, mounted  
 35 upon the side of a wooden frame 45. The springs 43 and 44 normally tend to spring inwardly and are held out of contact when the weight is in its lowermost position by means of the rollers 46 and the arms or pins  
 40 47, the pulley-weight 42 connecting between the rollers in the manner shown. When the pulley-weight is raised out of the frame 45, the rollers 46 are released, and the springs 43  
 45 and 44 then move inwardly toward the frame and engage their respective contacts 48 and 49.

In Figs. 12 and 13 I have shown a construction by which the plug may accomplish the same result and consisting of a frame or shelf  
 50 50, within which the rollers 51 are disposed, which rollers are engaged by the plug 41. The spring contact-strips 52 and 53 normally tend to move toward each other and are separated in the raising of the plug 41 by means of the  
 55 roller 51, which travels upward with the plug, pressing the springs 52 and 53 against their respective contacts 54 and 54<sup>a</sup>. It is apparent that when the plug is reseated the rollers are then engaged and caused to move downwardly, permitting the springs to move away  
 60 from their respective contacts. It will be observed that the rollers 51, having hubs 51<sup>a</sup>, ride upon the face of the plug, the rollers projecting through the slots of a sleeve 52<sup>a</sup>. Extended from the springs 52 and 53 and secured thereto are the spring-arms 53<sup>a</sup> and 53<sup>b</sup>. As  
 65 the plug is removed the rollers move on the

plug, their hubs being clear of the sleeve. When the plug is removed, the rollers hold the contact-springs in a closed position by engagement between the spring-arms 53<sup>a</sup> and  
 70 53<sup>b</sup> and the hubs 51<sup>a</sup>, which now rest on the sleeve 52<sup>a</sup>, the spring-arms providing a greater resiliency between the contact-springs and the rollers. By this means an absolutely positive  
 75 contact is forced and maintained instead of depending upon the resiliency merely of the spring-contacts to force and maintain the contact.

In Fig. 14 I have shown a modified form of  
 80 connections between the rollers 51 and the springs 52 and 53, consisting of a connecting bar or arm 55, secured at one end to the roller 51 and at the other end secured to the spring 52.

Having thus described the general construction of the apparatus and arrangements of the  
 85 circuits, I will now proceed to point out the manner of operation of the same.

Referring to Fig. 15, it will be observed that all of the shutters of the jacks are away from  
 90 the opening, and consequently a plug may be inserted in any one of them. Under the foregoing circumstances it is evident that the local circuits comprised of the leads 33, 34, and 37 are normally open at each jack and  
 95 that the main or talking circuit is also normally open at all points. Referring to Fig. 16, it will be observed that upon the insertion of the plug 39 in one of the jacks—for instance, as shown at the extreme left hand  
 100 of the figure—the plug 39 engages against the abutments 38 and 38<sup>a</sup>, thereby forcing the spring-strips 36 and 36<sup>a</sup> over into contact with the spring-strips 35 and 35<sup>a</sup>, which spring-strips, except the spring-strip 35, which  
 105 is connected to ground, respectively connect with the leads 33, 34, and 37 of the local circuits, and by this means the said circuits are closed, one through the electromagnets of each jack, the electromagnets, as shown, being  
 110 in parallel and connected, respectively, with the leads 33 and 37 and the other through one coil of the differential signaling device. When the local circuits are thus closed, a signal is displayed by the signaling device C,  
 115 and all of the electromagnets 21 are energized, which magnets thereby attract their respective shutters 28 and draw the same into position in front of the opening 25 of the jack, thus closing the entrance to every one  
 120 of the jacks except the one in which the plug is inserted. It is evident that in operating the signal by one of the coils 58 of the signaling device C the armature 59 is attracted and remains in a position displaying a signal until  
 125 the operator shall have raised the plug 41 to make the connection. The operator, either before or after receiving her instructions to make a particular connection with the plug 41, raises the said plug and inserts the same into  
 130 some one of the jacks with which it is desired to effect a connection, and in the act of raising the plug from its seat also releases the contact spring-strips 43 and 44 in the man-



ner described to permit the establishment of the connection with the contacts 48 and 49. When the contact-strip 43 is brought against the contact 48, it will be observed that the local shutter-closing circuit is again closed at this point in addition to the closing of the same circuit by the plug 39. When the contact-strip 44 is brought against the contact 49, it will also be observed that a branch from the local signaling-circuit is established to the other coil 60 of the signaling device C, which neutralizes the effect of the coil 58, releases the armature, and the signal is no longer displayed. The further inward movement of the plug 39 causes its end to engage the line-strip 29, which is connected with the lead 31 of the main talking-circuit, which latter extends and is connected with the tip of the plug 41 through its flexible conducting-cord 40. The lead 32 of the other side of the main talking-circuit is connected with the frame of the jack 30 at one end and at the other to the stem of the plug 41 through the flexible conductor 40. When the conversation is completed and the clearing-out signal of the subscriber has been extended in the ordinary way, the operator withdraws the plug 39, thus breaking the connection between the contact-strips 35 and 36 and 35<sup>a</sup> and 36<sup>a</sup> of that jack. Circuit through the lead 37 now being disrupted, the coil 58 of the signaling device C loses its neutralizing power and the coil 60 attracts the armature 59, thus displaying a signal for disconnection. The operator at this part of the board then removes the plug from the jack and returns it to a normal position by the action of the pulley-weight, thus opening the circuit between the spring 48 and contact 49, so that coil 60 is no longer energized to attract the armature 59, and the signal is no longer displayed. This same action of the pulley-weight also breaks the contact between the spring 43 and contact 48. This opens the local shutter-circuit, and as the electromagnets are no longer energized all the shutters 28 of that circuit roll by gravity to normal positions, and the trunk-line is ready for another connection. It will thus be observed that the trunk-line is guarded against any other connection from the time a trunk-line connection is initiated by inserting the plug 39, during all the time consumed in completing the connection by means of the plug 41, and during conversation between subscribers, while withdrawing plug 39 to disconnect, completing disconnection by withdrawal of plug 41, and until said plug is restored to its normal position.

While I have herein shown and described a jack with double local circuit-closing contacts and in the circuit arrangement shown two sets of batteries, the trunking system may be operated with one set of batteries and a jack constructed with only one local circuit-closing contact; but I prefer the other arrangement, as shown and described. It is also evident that this lock-out system may be used for multiple switchboards independ-

ent of the differential signaling device and switches operated by the pulley-weight or plug. Such an arrangement is shown in Fig. 17 and will be readily understood without further explanation.

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

1. In a switchboard, a spring-jack, a plug-opening therein, a magnet or magnets in proximity to said opening and a shutter-armature normally away from said opening directly attracted by the magnet to close the jack-opening.

2. In a telephone transfer system, a trunking-circuit and a series of spring-jacks, each one of which is provided with an electromagnet and a jack-locking device, comprising a loop revoluble armature and a track upon which the armature revolves adapted to lock or unlock the jack-openings and thereby prevent or permit the insertion of a plug into the jack, together with a source of current-supply which energizes the electromagnet to operate the jack-locking device of all the jacks, upon the insertion of a plug, except that jack-locking device of the jack in which the plug is inserted, whereby all of the jacks of the circuit in use are positively locked, preventing any encroachment upon that circuit.

3. In a switchboard, a spring-jack, a plug-opening therein, a magnet or magnets in proximity to said opening and a shutter-armature normally away from said opening, so disposed, positioned and arranged relative to the magnet as to be always within the inductive influence thereof whereby said shutter may be directly attracted by the magnet to close the jack-opening.

4. A plurality of spring-jack switches, comprising main-line contact-strips connected to main leads, local circuit-closing contact-strips, an electromagnet for each jack, a movable armature for each electromagnet in combination with local circuits connecting like parts of each jack and electromagnet and including a battery for operating said local circuits, together with a differential signaling device also located in a local circuit and switches located in the local circuits and a pulley-weight or plug operating said switches to close and open the said local circuits.

5. A plurality of spring-jack switches comprising main-line contact-strips connected to main leads, local circuit-closing contact-strips, an electromagnet for each jack, a movable armature for each electromagnet, which armature, when the electromagnet is energized, serves to lock the jack-opening, together with local circuits connecting like parts of each jack and electromagnet, and including a battery for operating said local circuits.

6. A spring-jack switch, comprising main-line spring contact-strips insulated from each other, local circuit-closing spring contact-strips also normally insulated from each other and from the main-line spring contact-strips,



an electromagnet mounted upon said jack, the pole-pieces of which are in close proximity to the opening in the jack, a movable armature which is adapted to close the opening of the jack while the electromagnets are energized, and to open said opening when the magnets are not energized.

7. In a spring-jack switch, an electromagnet mounted upon said switch or in close proximity thereto, the movable shutter-armature of which is adapted to be moved in front of the opening in the spring-jack to prevent the insertion of a plug.

8. In a circuit-closing switch, contact-springs and contact-points, a plug and intermediate members between the plug and the contact-springs, whereby, as the plug is removed, the intermediate members are drawn

into an engaging position and the spring forced against the contact-points, and which when said plug is removed, engage against the springs and effect and maintain a positive contact.

9. In a circuit-closing switch, contact-springs and contact-points, a plug and rollers between the plug and contact-springs which rollers are drawn by the plug in its removal into engaging position to hold the spring-contacts against the contact-points.

In testimony whereof I have hereunto set my hand, this 2d day of December, 1896, in the presence of two witnesses.

FRANK B. COOK.

Witnesses:

CHAS. C. BULKLEY,  
L. M. BULKLEY.