

(No Model.)

6 Sheets—Sheet 1.

G. F. DURANT, W. W. DEAN & W. A. CHILDS.
TELEPHONE SYSTEM.

No. 565,968.

Patented Aug. 18, 1896.

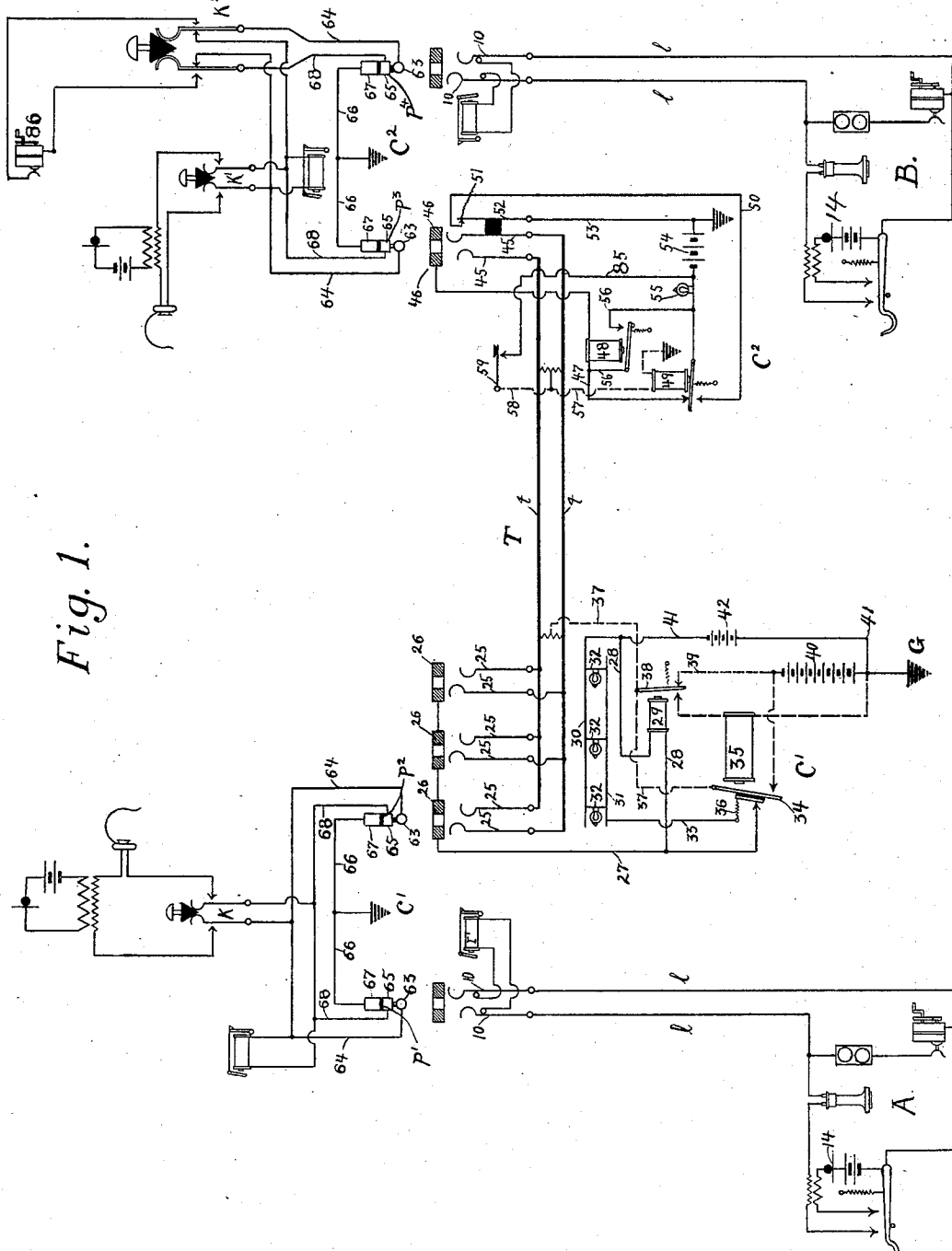


Fig. 1.

Witnesses.

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Inventors.

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By *John & Thomas Ott*

(No Model.)

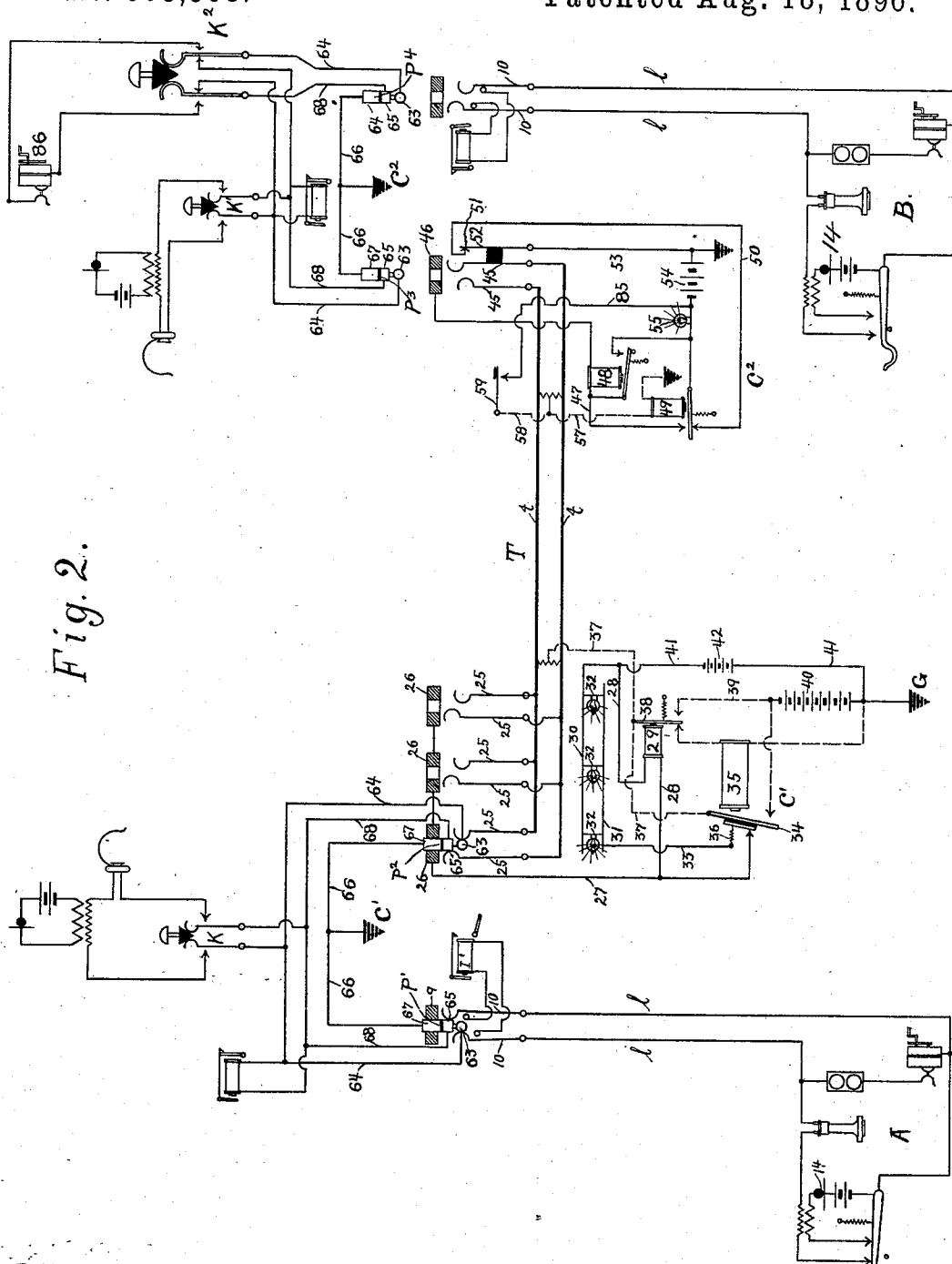
6 Sheets—Sheet 2.

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Fig. 2.



Witnesses.
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6 Sheets—Sheet 3.

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TELEPHONE SYSTEM.

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Fig. 4.

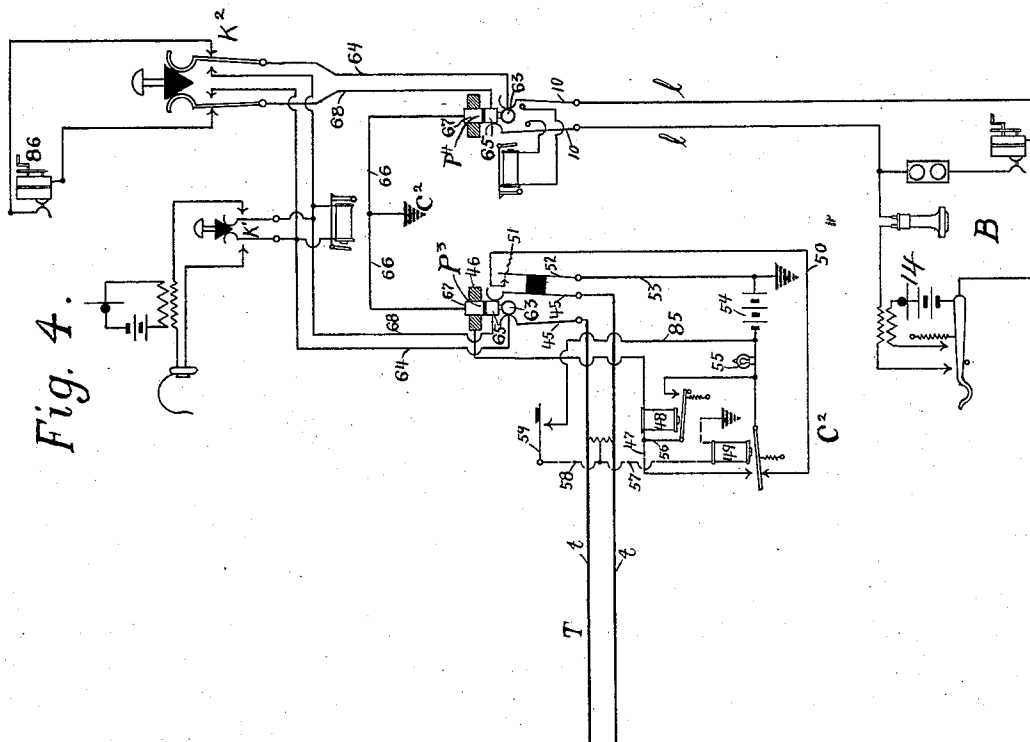
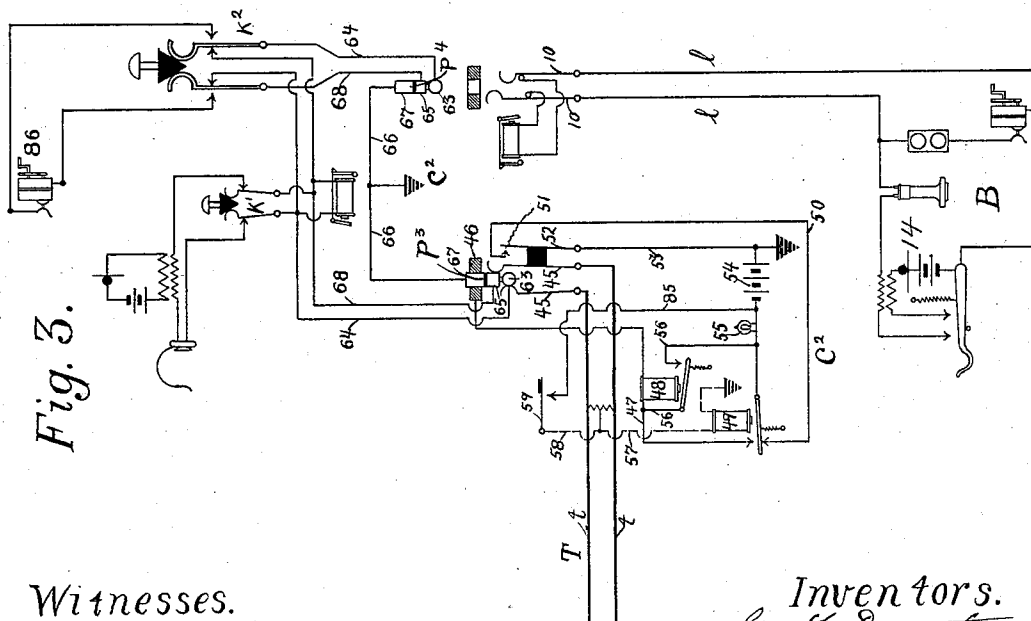


Fig. 3.



Witnesses.
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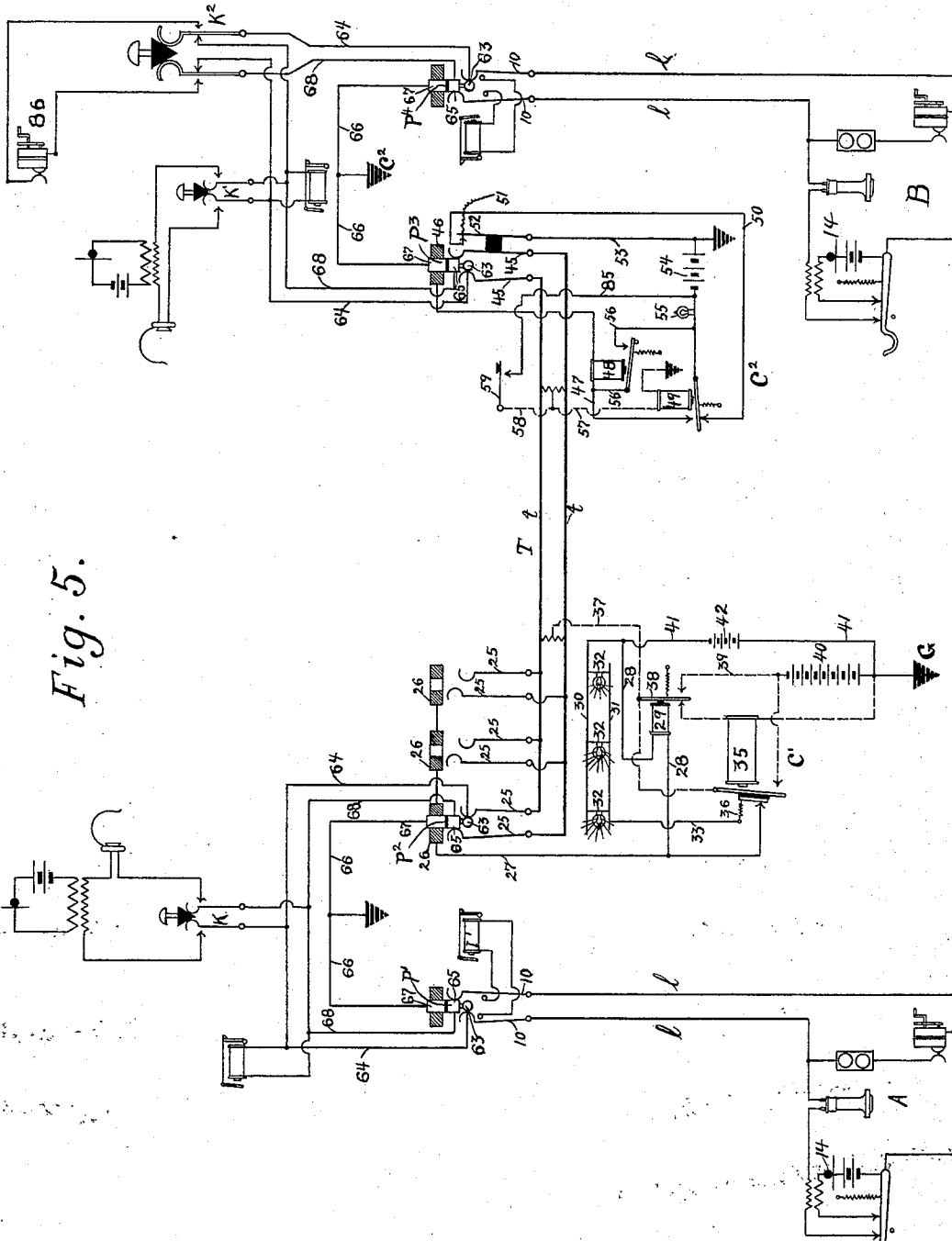
6 Sheets—Sheet 4.

G. F. DURANT, W. W. DEAN & W. A. CHILDS.
TELEPHONE SYSTEM.

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Fig. 5.



Witnesses.

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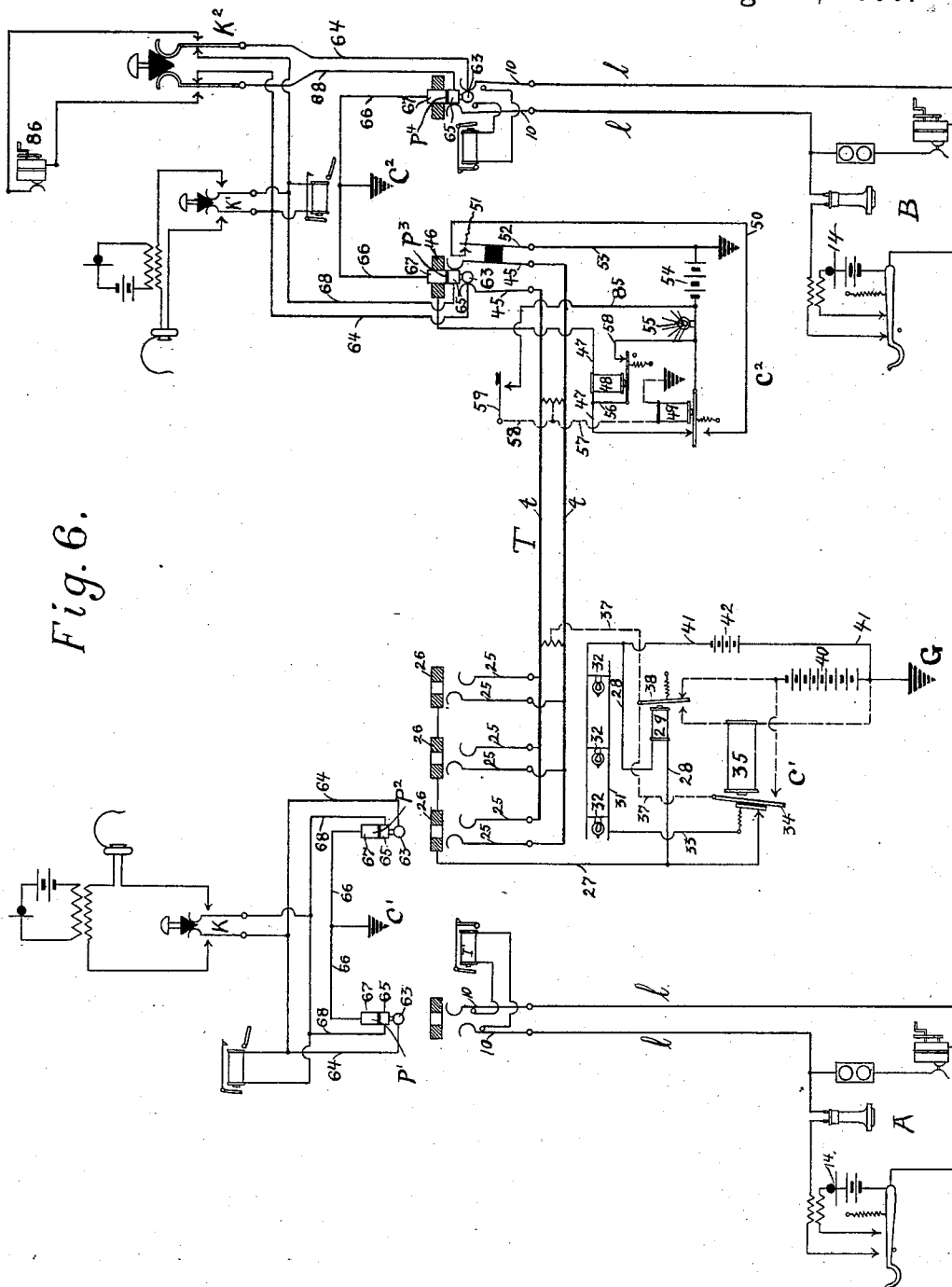
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TELEPHONE SYSTEM.

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Witnesses

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(No Model.)

6 Sheets—Sheet 6.

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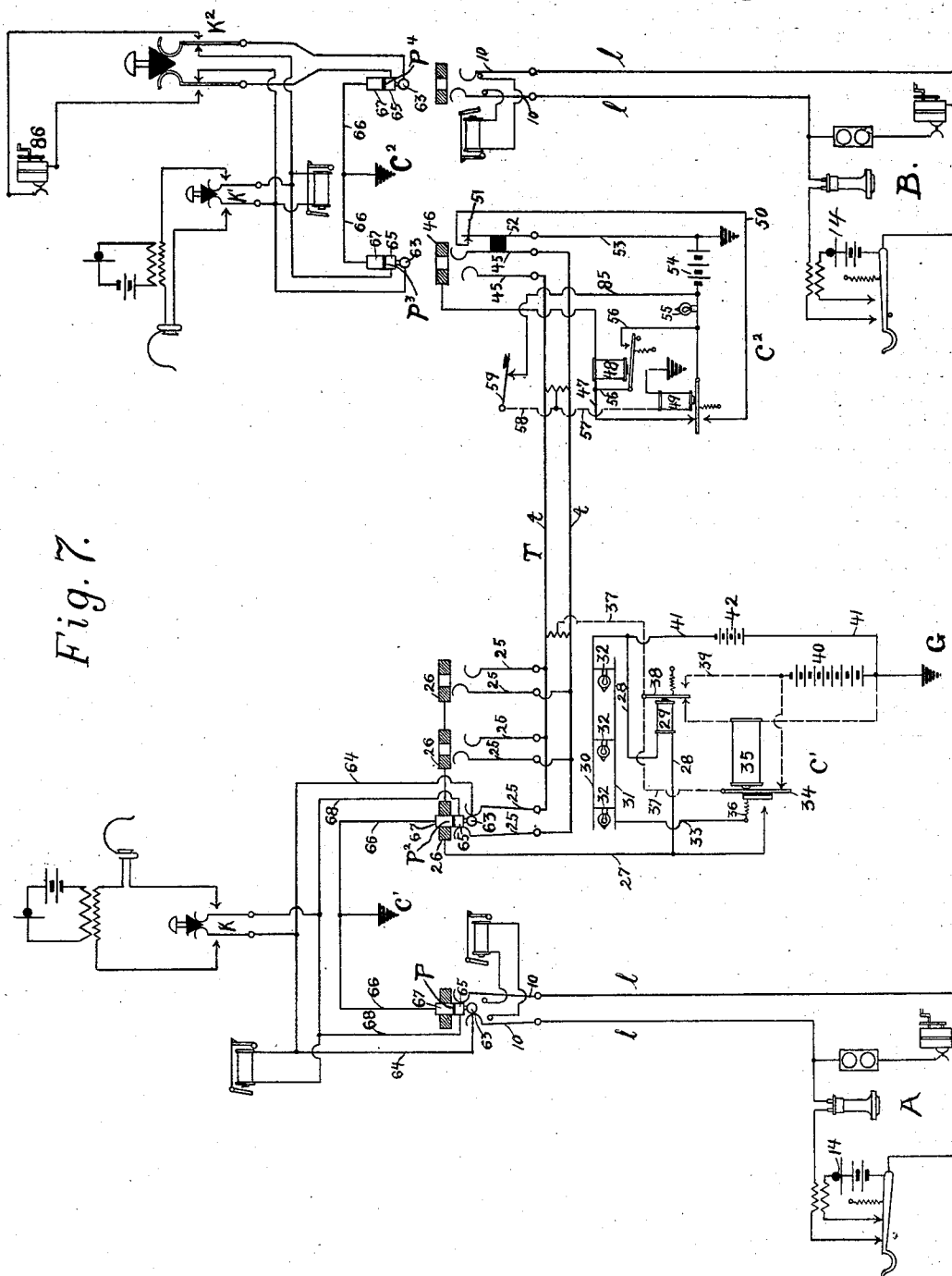


Fig. 7.

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UNITED STATES PATENT OFFICE.

GEORGE F. DURANT AND WILLIAM W. DEAN, OF ST. LOUIS, MISSOURI,
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BELL TELEPHONE COMPANY OF MISSOURI, OF ST. LOUIS, MISSOURI.

TELEPHONE SYSTEM.

SPECIFICATION forming part of Letters Patent No. 565,968, dated August 18, 1896.

Application filed April 10, 1896. Serial No. 586,965. (No model.)

To all whom it may concern:

Be it known that we, GEORGE F. DURANT and WILLIAM W. DEAN, residing at the city of St. Louis, in the State of Missouri, and WILLIAM A. CHILDS, residing at the city of New York, in the State of New York, citizens of the United States, have invented certain new and useful Improvements in Telephone Systems, of which the following is such a full, clear, and exact description as will enable any one skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification.

The invention relates to improvements in telephone trunking systems between central offices, whereby a subscriber at one central office may be conveniently and expeditiously connected with a subscriber belonging to another central office, and signals given to the operators at the two central offices of the condition of the trunking-wires.

The invention consists in features and combinations hereinafter set forth, and pointed out in the claims at the end of this specification.

In the accompanying drawings is shown the trunking system applied to a telephone system known as the "magneto system," but the invention is not confined to such system, as it is capable of use with any telephone system.

The invention will be best understood by referring to the accompanying drawings, which represent diagrammatically one form of the invention.

Figure 1 is a view showing such parts of the apparatus at and connected with two central offices as are necessary to illustrate the invention, all the parts in Fig. 1 being represented in their normal positions. Fig. 2 is a similar view to Fig. 1, wherein one of the subscribers has signaled to one of the central offices, the operator at which office has connected the terminals of such subscriber with the terminals at one end of the trunking system. Fig. 3 is a view similar to Fig. 2, but showing only the apparatus at and connected with the central office at the receiving end of the trunking system, and illustrating the po-

sition of the parts when the operator at said central office has plugged in upon the receiving-terminals of the trunking system in response to the signal sent her by the central-office operator at the sending end of the trunking system, plugging in upon the trunking system, and showing the listening-key of the receiving-operator connected with said receiving-terminal pushed down, thus placing her in telephonic communication with the operator at the sending central office. Fig. 4 is a view similar to Fig. 3, except that the central-office operator at the receiving end of the trunking system has plugged in upon the terminals of the subscriber wanted, the ringing-key of the receiving-operator, connected with the terminals of the subscriber wanted, being pushed down to ring up the subscriber wanted. Fig. 5 is a view similar to Fig. 2 after the connections have been made, as in Figs. 3 and 4, and showing that the subscriber wanted has responded, his telephone-hook being up, and the two subscribers are conversing over the connections made and the trunking system. Fig. 6 is a view similar to Fig. 5, except that the calling subscriber, being through talking, his telephone-hook is down, which fact having become known to the central-office operator at the sending end of the trunking system, said operator has disconnected her switch-plug from the terminals of the calling subscriber and from the terminals of the trunking system. Fig. 7 is a view similar to Fig. 6, except that the subscriber wanted is represented as being through talking, his telephone-hook being down, whereupon the central-office operator at the receiving end of the trunking system has disconnected her switch-plugs from the terminals of the lines of such subscriber and from the terminals of the trunking system and has pressed a signaling key to signal the operator at the other central office.

The same marks of reference indicate the same parts in the several views.

A represents the calling subscriber, and B the subscriber wanted; C, the central office connected with the calling subscriber and at the sending end of the trunking system, and C'

the central office connected with the subscriber wanted and at the receiving end of the trunking system.

T represents the trunking system between the two central offices.

l are the line-wires emanating from subscribers' to the central office. These lines each terminate at the central offices in a spring-jack. Each subscriber is provided with the usual telephonic appliances, including a microphone-transmitter 14, arranged in the ordinary way. These appliances need not therefore be particularly referred to.

tt are trunk-wires leading from the central office C' to the central office C². They are represented by full heavy lines. At the sending end of these trunk-wires are a series of multiple-board connections or spring-terminals 25, arranged in sets of two. There are as many trunk-wires as are necessary to transact the business between any two central offices, each set of trunk-wires having a series of terminals 25. Above the terminals 25 are arranged terminals 26 of a wire 27. This wire 27 branches into a wire 28, which contains in its path an electromagnet 29. The wire 28 passes to a wire 30, between which and a wire 31 is arranged in multiple arc a series of incandescent lamps 32, or other signaling devices, one of said lamps being allotted to each section of the multiple board, and represented in the drawings as located just beneath each set of terminals 25 and 26. From the wire 31 proceeds a conductor 33 to the armature 34 of a relay 35. This armature is normally held in position against its back contact by a spring 36. In electrical communication with the armature 34 of the relay 35 is a line-wire 37, (shown by a broken line,) which is connected at each side with the trunk-wires tt, so that the resistance at each side thereof is equal. The line-wire 37 is in communication with the armature 38 of the magnet 29. This armature 38 plays between two contacts, the front one of which is in electrical communication through the relay 35 with the ground G, and the back one of which is in communication with a wire 39, leading to ground by way of a battery 40. The front contact of the relay 35 is in electrical communication with the battery 40. Connecting the wires 28 and 30 with the ground is a wire 41, containing in its circuit a battery 42.

At the receiving end of the trunking-wires tt (central office C²) is arranged a set of spring-terminals 45, the same as the terminals 25 at the sending end of the trunking-wires. Above these terminals is arranged a terminal 46, which is connected with a conductor 47, containing within its circuit a magnet 48, connected to the front contact of the said relay 49. The back contact of the said relay 49 is in electrical communication with a wire 50, leading to a contact 51, which normally is in contact with a spring 52, that is connected to but insulated from one of the springs of the spring-terminals 45. The spring-contact 52

leads, by way of a wire 53, to the armature of the relay 49, and embraces within its circuit a battery 54 and an incandescent lamp 55 or other signaling device. The armature of the relay 49 is furnished with a spring, so that when the said relay is deenergized it will be thrown by said spring against its back contact.

Connected to the wire 47 at a point between the magnet 48 and the front contact of the relay 49 is a conductor 56, the circuit of which is made and broken by the armature of the magnet 48 by making contact with its front contact, the said armature being held in its normal position against its back stop by a spring. The other end of this circuit 56 is connected through the incandescent lamp 55 or other signaling device and the battery 54 to earth.

The relay 49 is in the circuit of a line-wire 57, (shown by a broken line,) which is connected at one end to ground and at each side of the other end to the trunking-wires tt, the resistance at each side of that end of the line-wire 57 being equal. From that end of the line-wire 57 connected between the trunk-wires tt is a conductor 58, leading to a key 59.

58 is a conductor, one end of which is connected in front of the battery 54 and the other end of which terminates in cooperative proximity to the key 59.

If the central office C² wishes to have the central office C' connect one of C² subscribers with a subscriber belonging to central office C', the connections in that case are made over a different set of trunking-wires, and for this purpose the central office C² is provided with a sending trunking apparatus like the central office C', and the central office C' with a receiving trunking apparatus like the central office C². As many sending and receiving trunking apparatus are respectively provided for the different central offices as may be necessary to transact the business between the two offices.

Having described the apparatus at the subscribers' stations, and also the construction and arrangement of a trunking system made after the invention, the devices whereby communication is established between subscribers and the trunking system will now be explained. Normally in the circuit of each of the line-wires l at each central station is the usual indicator I. P' and P² are plugs at central office C' by which connections are made, and P³ and P⁴ plugs at central office C² for the same purpose. These plugs are all alike. Each consists of a terminal knob 63 and two contacts 65 and 67. They are connected together in sets of two. At the central station C' the terminal knobs 63 of a set are connected together by a wire 64, the contacts 65 of a set being likewise connected together by a wire 68, and the contacts 67 by a wire 66, which is suitably grounded. In a derived circuit from the wires 64 and 68 is arranged central-office operator's (C') talking

and listening key K, which is adapted to put in circuit her microphone-transmitter and her head telephone-receiver. In a derived circuit from the wires 64 and 68 at central office C' is also an operator's indicator of the ordinary kind.

At central office C² the arrangement of the plug connections is slightly different, because it is required that central-office operator C² have a ringing-key K² as well as a listening and talking key K'. The contacts 67 are both grounded, as before stated, by a wire 66. The terminal knob 63 of the plug P³ is in communication by way of wire 64 with one of the back contacts of ringing-key K², the other back contact thereof being in electrical connection with contact 65 of plug P³ via wire 68. The terminal knob 63 and contact 65 of plug P⁴ are respectively connected to the spring-terminals of the ringing-key K². In derived circuits across the wires 64 and 68 is an operator's talking and listening key K', the same as before referred to, as well as an operator's indicator. The ringing-key K² puts to the subscribers' lines the current generated by a small magneto-machine 86.

Having fully set forth the construction and arrangement of the apparatus, the operation thereof will now be explained.

In Fig. 1 is shown the normal position of all parts. In the trunking system the battery 40 is normally to the trunking-lines *tt* by way of armature 38 of the magnet 29 and the wire 37. The current after leaving the trunking-wires passes over the conductor 57 through the relay 49 to ground, and by way of the ground returns to the other pole of the battery 40. This draws upward the armature of the relay 49 against its front contact. Normally the lights 32 are out at the sending end of the trunking system, as well as the light 55 at the receiving end of the trunking system, as shown in Fig. 1. Let us suppose that subscriber A in Fig. 1 has removed his telephone from its hook and thereby signaled the central-office operator C' by means of his indicator I', as illustrated in Fig. 2. The central-office operator C' now plugs in upon the terminals 10 of the subscriber A with her switch-plug, as shown in Fig. 2, and the subscriber A advises the operator of the number of the subscriber wanted. Let us suppose that the subscriber wanted belongs to another central office, say central office C². The central-office operator C' then plugs in upon a set of the terminals 25 and 26 of the trunking system, as illustrated in Fig. 2. This completes the circuit of the grounded battery 42 via wire 30 by way of incandescent lamps 32, wire 31, armature 34 of relay 35, to wire 27, to terminal 26, to switch-plug contact 67, to cord 66, and returning by way of ground to the other pole of the battery 42. This lights the incandescent lamps 32, and serves to thereby warn the other operators at central office C' that that trunking-circuit is in use and must not be plugged in upon, but

that other trunking-wires in which the incandescent lamps 32 are not lighted, if any there be, are to be used.

The current from the battery 42, passing to the wire 30, reaches the wire 28 and divides, part going through said wire 28 and vitalizing the magnet 29, and after traversing said magnet and circuit 28 is reunited to the other part of the current on the wire 27 and pursues the course hereinbefore outlined.

The magnet 29 in becoming vitalized draws up its armature 38, breaking the contact with its back contact in communication with the battery 40. This takes said battery 40 off the trunk-wires and grounded conductor 57 at the receiving end of the trunking system, which permits the armature of the relay 49 to be drawn down by its spring against its back contact, Fig. 2. This closes the circuit of the battery 54 through the incandescent lamp 55 by way of the following local circuit: from battery 54 to lamp 55, to armature of the relay 49, to conductor 50, to contact 51, to spring 52, and returning to battery, which causes the incandescent lamp 55 to be lighted.

The operator at the central office C², seeing the lamp 55 lighted, knows that a connection is desired, and plugs in with one of her switch-plugs upon the terminals 45 and 46, as shown in Fig. 3. The insertion of this plug forces back the spring 52 and breaks the circuit of the lamp 55, which has just been traced between the contacts 51 and 52, and the lamp 55 is extinguished. The operator at the central office C² then pushes down her listening-key K', connected with the plug which is inserted in the terminals of the trunk-wires, as shown in Fig. 3, so as to put her in talking communication with the central-office operator C' at the sending end of the trunking-wires. It should be stated here, however, that the central-office operator C' at the sending end of the trunking system, after having plugged in upon the trunking system, also pushes down her listening-key K connected with that plug, as shown in Fig. 3, so as to place her in talking communication with the central-office operator at the receiving end. Thus it will be seen that the two operators may, by suitably manipulating their talking and listening-keys, converse with each other. The operator C² at the receiving end of the trunking system, after having plugged in upon the terminals of the trunking system and suitably manipulated her talking and listening key, as stated, says to central-office operator C', "What number?" Central-office operator C' now advises central-office operator C² of the number of the subscriber wanted. The central office operator C² then plugs in upon the terminals of the subscriber wanted with her other switch-plug P⁴, as shown in Fig. 4.

Central-office operator C², after having plugged in upon the terminals of the subscriber wanted, pushes down her ringing-key K², Fig. 4. This puts the generator 86 to line and rings the call-bell of the subscriber

wanted. The circuit over which the two subscribers converse, after being connected together by the central-office operator through the trunking system, Fig. 5 is as follows:

5 from telephone-transmitter 14 of subscriber A, to telephone hook, to line-wire *l* of said subscriber connected with said hook, to contact 63 of the switch-plug P', inserted in the terminals of said line-wire, to cord 64 of plug P', to

10 cord 64 of plug P², to contact 63 of plug P², to the upper trunk-wire *l*, to contact 63 of plug P³, inserted in the terminals of the trunk-wires at the receiving end, to cord-conductor 64 of plug P³ via back contact of key K², to cord 68

15 of plug P¹, to contact 65 of plug P¹, inserted in the terminal of the subscriber wanted, one of the line-wires *l*, by way of telephone-hook of subscriber B wanted, to his telephone-receiver, to other line-wire *l*, to contact 63 of

20 plug P¹, to cord 64 via back contact to key K², to cord 68 of plug P³, to contact 65 of plug P³, to lower trunk-line *l* of the trunking system, to contact 65 of the plug P², to cord 68 of plug P², to cord 68 of plug P', to contact 65 of plug

25 P', to other line-wire *l* of the calling subscriber A and his telephone-receiver, thus completing the circuit.

It will be noted that the telephone apparatus of the central-office operators are not in circuit during the time that the subscribers

30 are conversing.

Let us suppose that the calling subscriber A is the first one to indicate to the central office by means of a clearing-out indicator that he is through talking and wishes to be disconnected. The central-office operator C' then immediately disconnects said subscriber by withdrawing both of the switch-plugs P' and P², as shown in Fig. 6. This breaks the

35 circuit of the battery 42 through the incandescent lamps 32 and through the magnet 29 between the conductor 27 and switch-plugs and puts out the incandescent lamps 32, indicating to the other operators C' that this set of trunk-lines is not now in use, and also permits the armature of the magnet 29 to be drawn by its spring against its back contact, as shown in Fig. 6. The battery 40 now passes

40 to the trunk-wires by way of the armature 38 and line-wire 37, as shown in Figs. 1 and 6, and as heretofore explained. The current from battery 40, after traversing the trunk-wires *l l*, goes to the conductor 57 through the relay 49 to ground. This, as explained with

45 reference to Fig. 1, draws up the armature of the relay 49 from the position shown in Fig. 5 to the position shown in Fig. 6 and closes the circuit of the battery 54 through the incandescent lamp 55 by way of the armature of the relay 49, the wire 47, the terminal 46,

50 connected therewith, the contact 67 of the switch-plug P³, to conductor 66, to ground, to other pole of battery 54. Within this circuit is also embraced the coils of the magnet 48, which is energized by the current passing

55 around its coils, and draws up its armature and completes the circuit of the battery 54

through the incandescent lamp 55, independently of the circuit, by way of the armature of the polarized relay, the circuit referred to being from the battery 54 through the incandescent lamp, through the wire 58, to the armature of the magnet 48, to the wire 56, to the conductor 47, terminal 46, contact 67 of the switch-plug P³, conductor 66, to ground, back to the battery 54. This latter-mentioned circuit remains closed independent of the position of the armature of the relay 49, but can only be closed by the armature of the relay 49 in the first instance. The lamp 55 is therefore lighted and remains lighted. This is a signal to the central-office operator C² to disconnect her switch-plug, it meaning to her that the central-office operator C' has withdrawn her switch-plug. "Switch-plug in at the receiving end and lamp lighted" means "Disconnect." This signal should not be confounded with the signal, "Switch-plug out at the receiving end and lamp lighted," as heretofore explained, which latter signal means "Connect."

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The object of having the circuit of the incandescent lamp 55 and its battery 54 maintained closed after being closed by the armature of the polarized relay 49 is to prevent a false signal being given. For instance, suppose that after the central-office operator C' had disconnected her switch-plug another operator at the central office C', seeing the incandescent lamps 32 at the central office C' extinguished, should plug in upon the terminals of these trunk-wires before the operator C² at the receiving end of these trunk-wires had disconnected her switch-plug from these trunk-wires. This, as heretofore explained, would energize the magnet 29 and take the battery 40 off the trunk-lines, as heretofore explained (see Figs. 2 and 3) and allow the armature of the relay 49 to drop to its lower position. Thus the circuit of the battery 54 through the incandescent lamp would be broken by the armature of the relay 49 and by the contacts 51 and 52, and the lamp 55 would be extinguished. If now the central-office operator C² happened to be attending to some other matters and looked away from the lamp 55 in the meantime, and did not see that the lamp 55 had been lighted and extinguished again, but found it extinguished, she would naturally suppose that it had remained extinguished all the while and that the first-mentioned central-office operator C' still had her switch-plug connected to the trunking system, and that the two subscribers were still conversing, for the signal, "Light out and switch-plug inserted at the receiving end," means "Do not disconnect." The central-office operator C² would therefore leave her switch-plug connected with the trunk-wires, whereas a connection with another subscriber would now be desired. To prevent this false signal, the magnet 48 is employed to maintain the circuit of the battery 54 through the lamp 55, so that if the central-office operator C'

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disconnects her switch-plug and, before the central-office operator C² has disconnected, another operator plugs in upon the trunking-terminals at the sending-office C', the lamp 55 will nevertheless stay lighted and signal the central-office operator C² to disconnect.

If the lamp 55 does not go out when the operator C² withdraws her switch-plug, this indicates to the central-office operator C² that a central-office operator C' has again plugged in on the trunk-wires and that another connection is desired, and she plugs in again on the terminals of the trunking-wires, as shown in Fig. 3, and operates her listening-key, as illustrated in Fig. 3, ascertaining from the other operator what subscriber is wanted now, and proceeds to make the connection with the other subscriber wanted, as heretofore explained and illustrated.

Let us suppose that the subscriber B wanted is the first one to indicate to the central office that he is through talking and desires to be disconnected, as indicated in Fig. 7. The central-office operator C² disconnects her two switch-plugs from said subscriber's terminals and from the terminals of the trunk-wires. This disconnection would not put out the lamps 32 at the central office C' and would light lamp 55 at central office C², indicating that another connection was desired, all as illustrated in Fig. 2, and would not therefore indicate to the central-office operator C' that the subscribers are through talking and that disconnection is desired. To accomplish this and to enable central-office operator C² to signal central-office operator C' that subscriber B is through conversing, the central-office operator C² touches the key 59, connected with the line-wire 58. This throws the current of the grounded battery 54 on the trunking-wires *tt* and line-wire 57 over the following route: from one pole of battery 54, through key 59, wire 58, said current dividing at this point, one part of said current going through the line-wire 57, through the relay 49, to ground, and back to the other pole of the battery 54. This current passing through the relay 49 lifts the armature thereof, Fig. 7, breaking the circuit of the battery 54 through the incandescent lamp 55 by way of said armature and its lower contact, thus extinguishing the lamp 55.

The other part of the current from the battery 54, dividing at the wire 58, passes to the trunk-wires *tt*, to the central office C', and travels down the wire 37, through the armature 38 of the magnet 29, to the front contact of said magnet, Fig. 7, through the relay 35, to ground, and returns to the other pole of the battery 54. This current so passing through the relay 35 draws up the armature thereof against its front contact. The armature 34 of the relay 35 in so doing breaks contact with the wire 27, and therefore puts out the incandescent lamps 32 at central office C', breaking the circuit of said incandescent lamps between said armature and said wire 27, so that the

central-office operator C², by touching the key 59, signals the central office C' to disconnect, the signal, "Central-office operator's (C') plug in and lights out," meaning "Disconnect." When the central-office operator C' disconnects her plug in response to the signal sent her, the circuit of the magnet 29 is broken between the wire 27 and the said plug. Therefore the magnet 29 becomes deenergized and allows its armature 38 to drop against its back contact, throwing the battery 40 on the trunk-wires, as heretofore explained and shown.

To prevent the armature of the relay 35 from dropping back again away from its front contact as soon as the key 59 is released by central-office operator C² there is provided an arrangement whereby the said armature is held in the position placed by the current from the battery 40, so as to keep the lamps 32 from lighting after central-office operator's (C²) key is released.

If operator C' did not observe the lamps 32 go out and immediately light again, she would naturally suppose, from seeing them still lighted, that the operator C² had not disconnected, and thus a false signal would be given operator C'. To obviate this, there is provided the arrangement just referred to, which arrangement is specifically as follows: The front contact of the relay 35 is connected with one pole of the battery 40. The current from said battery 40 passes to the said front contact, to the armature of said relay 35 when against it, to the wire 37 as far as the armature 38 of the magnet 29, and by way of the front contact of said magnet 29, through the relay 35, to the other pole of said battery. This circuit holds the armature 34 of the relay 35 against its front contact, after it is once placed in this position, and central-office operator's (C') plug has not been disconnected. The central-office operator C', by withdrawing her plug from the trunking-terminals, breaks the circuit which holds the armature 34 of the relay 35 up against its front contact, the said circuit being broken between the armature 38 and its front contact. The armature of the relay 34 then resumes its original position, (shown in Fig. 1) and all the parts are in their normal condition. The closing of this local circuit from battery 40 through the relay 35 at the central office, Fig. 7, does not remove all the current of the battery 40 from the trunk-wires and line-wire 57, containing relay 49 at the receiving-office. Part of the current from battery 40 still passes to the trunk-wires via the front contact of the relay 35, its armature 34, and line-wire 37. This part of the current of the battery 40, passing over the trunk-wires, traverses the line 57 and relay 49, and is sufficient to keep the armature of said relay in its raised position, so that when the central-office operator C² releases her key 59, the armature of said relay 49 will be maintained in the position placed by the current from the battery 54, and thus the circuit of the lamp 55 will not be completed by

said armature touching its lower contact, as shown in Fig. 2. The lamp 55, therefore, will not light when the key 59 is released and a false signal will not be given the operator C².

Should another operator at central office C', seeing the lamps 32 out, plug in on the terminals of the trunk-wires before the operator at the central office C' had disconnected, the lamps 32 would not be lighted by the second operator C' so plugging in, because the lamps 32 cannot be lighted again until the armature 34 of the relay 35 resumes its normal position and leaves its front contact, and this cannot be effected until disconnection has been made by central-office operator C'. The second operator C', who has thus plugged in upon the trunking-terminals, knows that the lines are not clear, for the lamps 32 do not light when the trunking-terminals are plugged in upon, as they should. The second operator C' therefore plugs in upon the terminals of some other trunk-wires whose lamps 32 are not lighted.

Having fully set forth our invention, what we desire to claim, and secure by Letters Patent of the United States, is—

1. A telephone trunking system comprising trunk-wires, appliances connecting subscribers thereto, signaling devices at the sending end of said trunk-wires, a circuit and source of electrical energy for said signaling devices, which circuit is controlled by the appliances in connecting subscribers to and disconnecting them from said trunk-wires, a circuit leading from the sending-office to the receiving-office, a magnet in the first-mentioned circuit governing the second-mentioned circuit, and a signaling device at the receiving-office controlled by said second circuit.

2. A telephone trunking system comprising trunk-wires, appliances connecting subscribers thereto, signaling devices at the sending end of said trunk-wires, a circuit and source of electrical energy for said signaling devices, which circuit is controlled by the appliances in connecting subscribers to and disconnecting them from said trunk-wires, a circuit leading from the sending-office to the receiving-office, which circuit is governed by said appliances, a source of electrical energy normally energizing said latter circuit, a signaling device at the receiving-office, and a relay in the latter-mentioned circuit governing the circuit of the signaling device at the receiving-office.

3. A telephone trunking system comprising trunk-wires, appliances connecting subscribers thereto, signaling devices at the sending end of said trunk-wires, a circuit and source of electrical energy for said signaling devices, which circuit is controlled by the appliances in connecting subscribers to and disconnecting them from said trunk-wires, a circuit leading from the sending-office to the receiving-office and governed by said appliances, a source of electrical energy normally

connected to said latter circuit, a magnet in the first-mentioned circuit governing the latter circuit, a signaling device at the receiving-office, and a relay in said latter circuit at the receiving end of the trunk-wires and governing the circuit of the latter-mentioned signaling device.

4. A telephone trunking system comprising trunk-wires, appliances connecting subscribers thereto, signaling devices at the sending end of said trunk-wires, a circuit leading from the sending-office to the receiving-office and governed by the appliances in connecting subscribers to and disconnecting them from said trunk-wires, a signaling device at the receiving-office, a local circuit therefor, a magnet in the circuit leading from the sending to the receiving end of the trunk-wires and controlling said local circuit, and contact devices for said local circuit, adapted to be forced apart by the insertion of the subscriber-connecting appliances at the receiving-office.

5. A telephone trunking system comprising trunk-wires, appliances connecting subscribers thereto, signaling devices at the sending end of said trunk-wires, a circuit and source of electrical energy for said signaling devices, which circuit is controlled by the appliances in connecting subscribers to and disconnecting them from said trunk-wires, a circuit leading from the sending-office to the receiving-office and governed by said appliances, a relay at the receiving end in the latter-mentioned circuit, and a local circuit controlled thereby containing a source of electrical energy, a signaling device and contact devices for said local circuit, which contact devices are adapted to be forced apart by the insertion of the subscriber-connecting appliances at the receiving-office.

6. A telephone trunking system comprising trunk-wires, appliances connecting subscribers thereto, signaling devices at the sending end of said trunk-wires, a circuit and source of electrical energy for said signaling devices, which circuit is controlled by the appliances in connecting subscribers to and disconnecting them from said trunk-wires, a circuit leading from the sending-office to the receiving-office and governed by said appliances, a relay at the receiving end of the latter-mentioned circuit, and a local circuit controlled thereby, containing a source of electrical energy and signaling device, the said local circuit being established by the subscriber-connecting appliances at the receiving-office.

7. A telephone trunking system comprising trunk-wires, appliances connecting subscribers thereto, signaling devices at the sending end of said trunk-wires, a circuit and source of electrical energy for said signaling devices, which circuit is controlled by the appliances in connecting subscribers to and disconnecting them from said trunk-wires, a circuit leading from the sending-office to the receiving-office and governed by said appliances, a

relay at the receiving end of the latter-mentioned circuit, a local circuit controlled thereby having two branches, one connected to each contact of said relay, a source of electrical energy and a signaling device in said branches, and contacts for one of the said branches adapted to be forced apart by the subscriber-connecting appliances, the other branch of said local circuit being established by the subscriber-connecting appliances.

8. A telephone trunking system comprising trunk-wires, appliances connecting subscribers thereto, signaling devices at the sending end of said trunk-wires, a circuit and source of electrical energy for said signaling devices, which circuit is controlled by the appliances in connecting subscribers to and disconnecting them from said trunk-wires, a circuit leading from the sending-office to the receiving-office and governed by said appliances, a relay at the receiving end of the latter-mentioned circuit, a local circuit controlled thereby and containing a source of electrical energy and a signaling device, the said local circuit being established by the subscriber-connecting appliances, a magnet in said local circuit, and a shunt controlled thereby and adapted to short-circuit the armature of said relay after the closing of said local circuit by said armature.

9. A telephone trunking system comprising trunk-wires, appliances connecting subscribers thereto, signaling devices at the sending end of said trunk-wires, a circuit and source of electrical energy for said signaling devices, which circuit is controlled by the appliances in connecting subscribers to and disconnecting them from said trunk-wires, a circuit leading from the sending-office to the receiving-office and governed by said appliances, a relay at the receiving end of the latter-mentioned circuit, a local circuit controlled thereby having two branches, one connected to each contact of said relay, a source of electrical energy and a signaling device in said branches, contacts for one of said branches adapted to be forced apart by the two subscriber-connecting appliances, the other branch of said local circuit being established by the subscriber-connecting appliances, a magnet in the latter branch of said local circuit, and a shunt controlled thereby and adapted to short-circuit the armature of said relay after the closing of said branch by said armature.

10. A telephone trunking system comprising trunk-wires, appliances connecting subscribers thereto, signaling devices at the sending end of said trunk-wires, a circuit and source of electrical energy for said signaling devices, which circuit is controlled by the appliances in connecting subscribers to and disconnecting them from said trunk-wires, a

magnet in said circuit, a circuit leading from the sending-office to the receiving-office and governed by said magnet, a source of electrical energy normally connected to said latter circuit by way of the back contact of said magnet, a second magnet connected to the front contact thereof and controlling the circuit of the signaling devices, a relay at the receiving end of the circuit leading from the sending-office, a local circuit controlled thereby and having a signaling device and source of electrical energy connected therewith and adapted to be made and broken by the subscriber-connecting appliances, a key, and suitable battery connections at the receiving-office adapted to be placed in communication with the circuit leading from the sending to the receiving office.

11. A telephone trunking system comprising trunk-wires, appliances connecting subscribers thereto, signaling devices at the sending end of said trunk-wires, a circuit and source of electrical energy for said signaling devices, which circuit is controlled by the appliances in connecting subscribers to and disconnecting them from said trunk-wires, a magnet in said circuit, a circuit leading from the sending-office to the receiving-office and governed by said magnet, a source of electrical energy normally connected to said latter circuit by way of the back contact of said magnet, a relay connected to the front contact thereof and controlling the circuit of said signaling devices and the circuit leading from the sending to the receiving office, a local circuit from said last-mentioned source of electrical energy through said relay, said local circuit being governed by said magnet and relay, a relay at the receiving end of the circuit leading from the sending-office, a local circuit controlled thereby having a signaling device and source of electrical energy connected therewith and adapted to be made and broken by the subscriber-connecting appliances, a key, and suitable battery connections at the receiving-office adapted to be placed in communication with the circuit leading from the sending to the receiving office.

In witness whereof we have hereunto set our hands and affixed our seals.

GEO. F. DURANT. [L. S.]
WILLIAM W. DEAN. [L. S.]
WM. A. CHILDS. [L. S.]

Witnesses for Geo. F. Durant and William W. Dean:

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Witnesses for Wm. A. Childs:

CHARLES SHAW,
J. H. ADAMS.