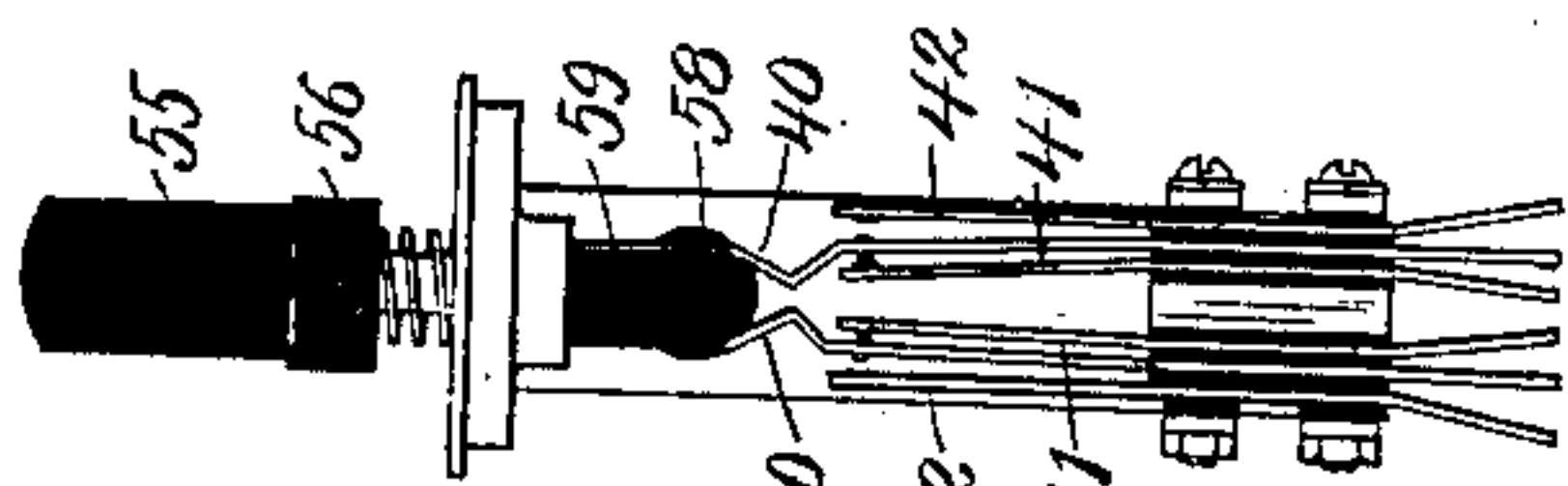
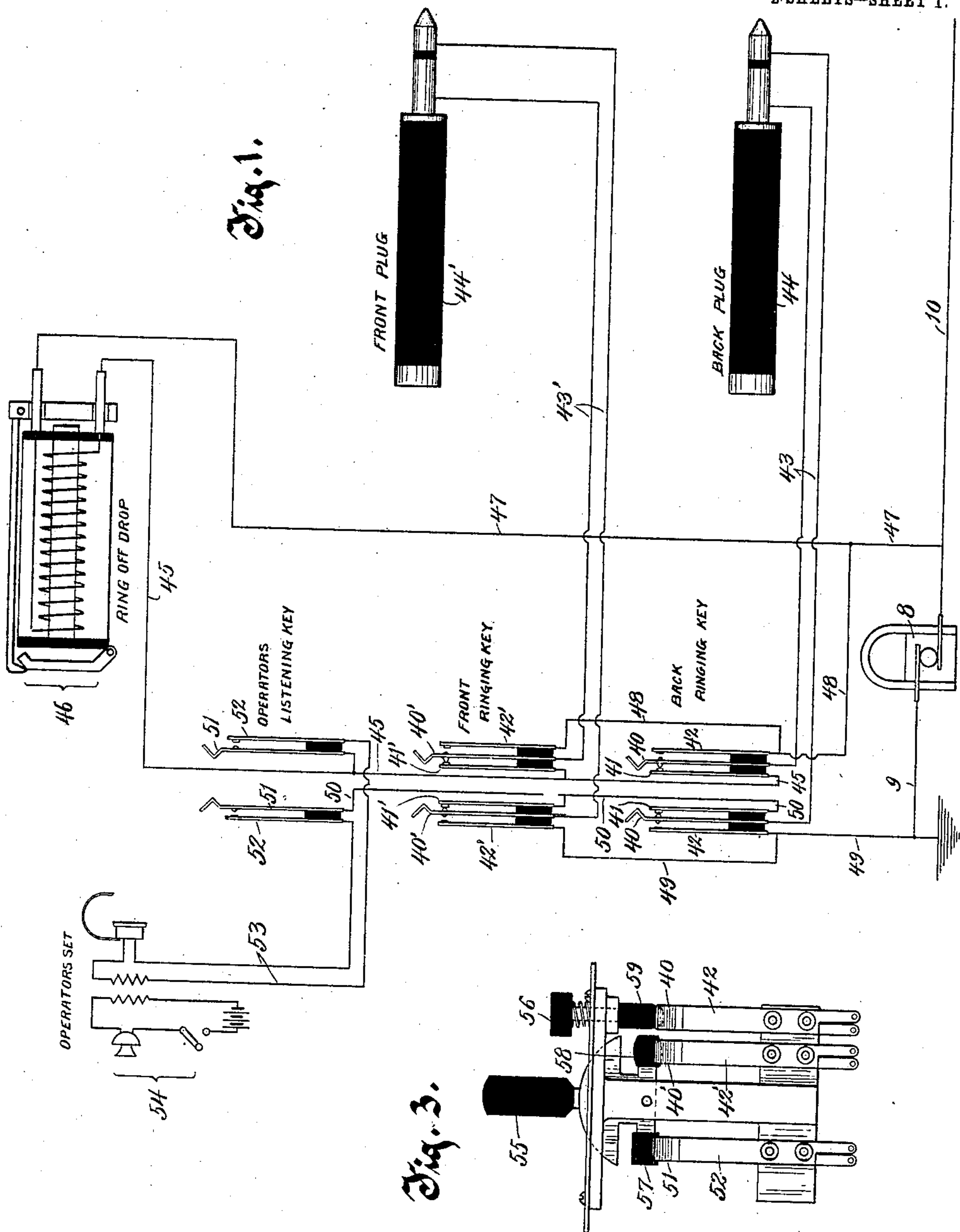


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PATENTED AUG. 20, 1907.

H. M. ELDRED.
TELEPHONE SIGNAL SYSTEM.
APPLICATION FILED MAR. 19, 1906.

2. SHEETS--SHEET 1.



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2 SHEETS—SHEET 2.

Fig. 5.

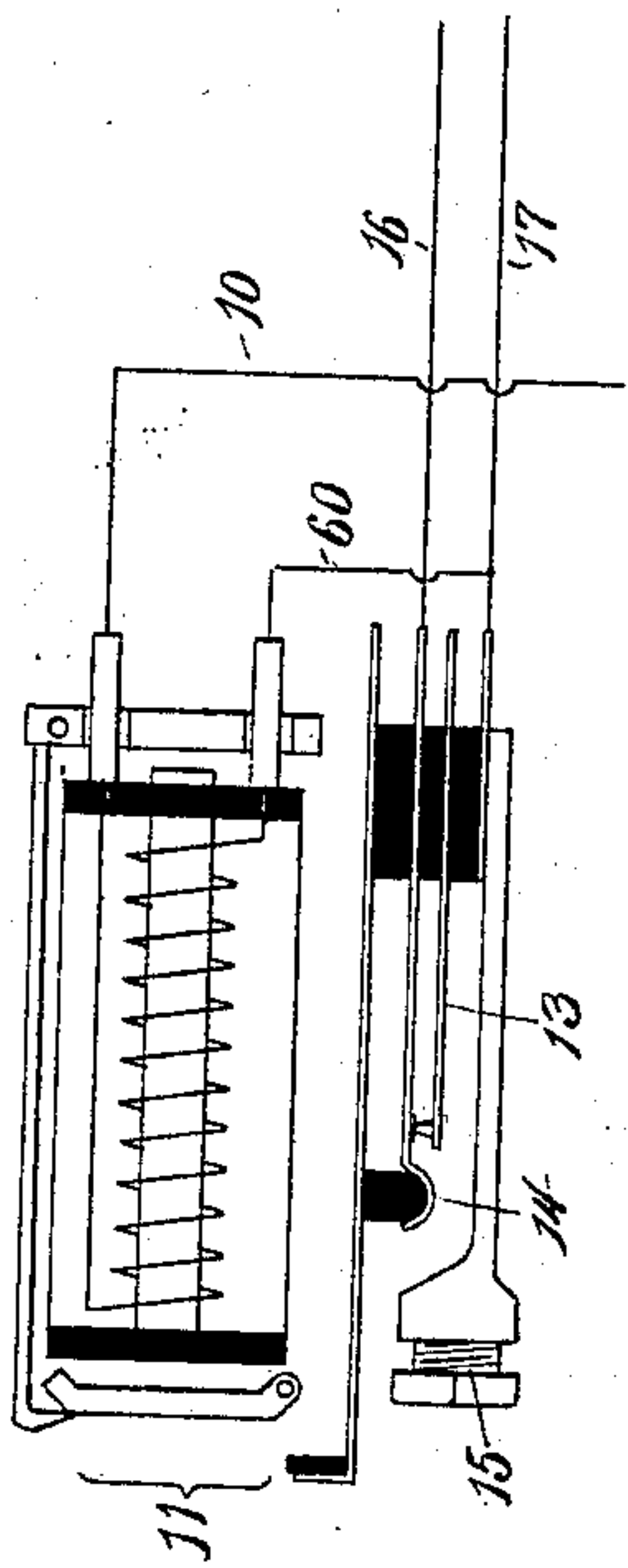
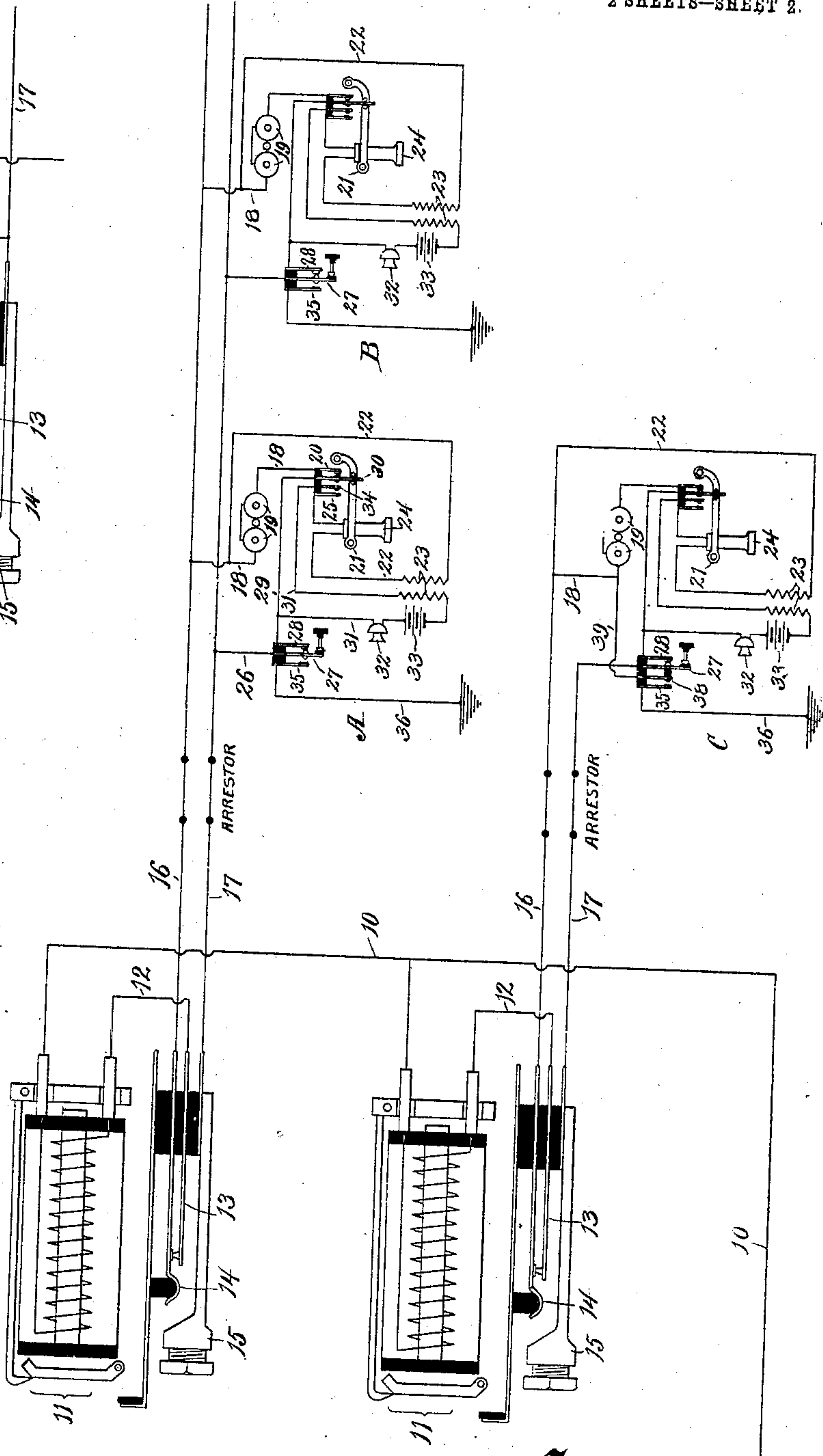


Fig. 2.



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UNITED STATES PATENT OFFICE.

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TELEPHONE SIGNAL SYSTEM.

No. 863,705.

Specification of Letters Patent.

Patented Aug. 20, 1907.

Application filed March 19, 1906. Serial No. 306,756.

To all whom it may concern:

Be it known that I, HOWARD M. ELDRED, residing in Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented new and useful Improvements in Telephone Signal Systems, of which the following is a description, reference being had to the accompanying drawings, which are a part of this specification.

This invention relates to telephone signaling systems and has for its object to dispense with the generators at the subscribers' stations, and thus materially reduce the expense in telephone construction.

The invention, as shown in the accompanying drawings, introduces a bridging party line or individual line employing a metallic talking circuit and having no generators at the subscribers' stations, there being a grounded power generator at or near the switching station or central adapted to serve for ringing purposes when ground connections are made at the subscribers' stations where push buttons are provided for that purpose, the ringing from the central station being accomplished in the usual manner and the ring-off signal being produced from the subscribers' stations by the operation of the push buttons as for calling central.

With the above and other objects in view the invention consists in the telephone signaling system as herein claimed, its parts and combinations of parts and all equivalents thereof.

Referring to the accompanying drawings in which like characters of reference indicate the same parts in the several views:—Figure 1 is a portion of a diagram of a telephone system constructed in accordance with this invention; Fig. 2 is another portion of the same diagram illustrating the jacks of the central station switch board and the subscribers' stations connected therewith; Fig. 3 is a side elevation of an operator's ringing and listening key, such as is represented in diagram in Fig. 1; Fig. 4 is an end elevation thereof; and, Fig. 5 is a diagram of an annunciator drop and jack, illustrating a modified method of wiring.

In these drawings 8 represents a power generator, which is located at or near the central station and has one terminal connected directly with the ground by wire 9 and the other terminal connected by wire 10 with one end of the magnet winding of each of the ordinary annunciator drops 11, as shown in Fig. 2. The other end of the magnet winding of each annunciator drop is connected by means of a wire 12 with the anvil spring 13 of the ordinary jack beneath. The tip spring 14 and the sleeve 15 of each jack are connected with the line wires 16 and 17 respectively of a telephone circuit, which may be either a party line or an individual line, the upper line illustrated in Fig. 2 being a party line containing subscribers' stations A and B, and possibly others not shown, and the lower

line being an individual line containing the single subscriber's station C.

The wiring of the subscribers' stations of a party line is somewhat different from that of a subscriber's station on an individual line and the former will be first explained. The line wire 16 is connected by a wire 18, including the bell 19, with the bell contact 20 of the hook switch which is controlled by the receiver hook 21 as usual. A wire 22, including the secondary winding of the induction coil 23 and the receiver 24, connects line wire 16 with the receiver contact 25 of said hook switch. A wire 26 leads from the other line wire, 17, and connects with the intermediate or tongue member 27 of a two-point push button switch, the contact 28 thereof which is normally engaged by the contact 27 being connected by a wire 29 with the line contact 30 of the hook switch. A wire 31, including the transmitter 32, the local battery 33, and the primary winding of the induction coil 23, connects the wire 29 with the local contact 34 of the hook switch. The other contact, 35, of the push button is normally out of engagement with contact 27 and is connected by a wire 36 with the ground. The weight of the receiver on the receiver hook normally holds the line contact 30 in engagement with the bell contact 20, leaving the receiver contact 25 and local contact 34 open. Thus the bell 19 is normally bridged across the line, by means of wire 18, engaged contacts 20 and 30, wire 29, engaged contacts 28 and 27 of the push button and wire 26, while the receiver and local circuits remain open and the ground connection of the push button stands open.

When a subscriber desires to call central, it is only necessary for him to press his push button so as to make the ground connection, thus establishing a ground on the line wire 17 through wire 26, engaged contacts 27 and 35 of the push button, and wire 36. Line wire 17, however, does not connect directly with the generator 8, as it runs to the open sleeve of the jack at the central station switch board, but it does connect there with indirectly, through the bells of the other subscribers' stations and the line wire 16, which is normally in connection with the annunciator drop 11 of the central station through the contact of the anvil spring and the tip spring of the jack, said annunciator drop being connected by the wire 10 with the generator. Thus, the circuit established by the pressing of the push button at any subscriber's station causes the ringing of the bells at all of the other subscribers' stations on that line and releases the annunciator drop of that line on the central station switch board. Obviously the release of the annunciator drop may be accomplished by a push button or other similar means for grounding the line wire 16, but this will not produce the ringing of the bells of the other subscribers'

stations on that line and serve as a notice that the line is in use.

With the individual line the ground signaling connection can not be established through the bells of other subscriber's stations as with the party line, and its wiring must be slightly modified for this reason. Here the push button is provided with an additional contact 38 which is located between the ground contact 35 and the contact 27, being insulated from the latter and spaced from the former and adapted when the push button is pressed to directly connect the line wire 16 with the ground, since it is connected by a wire 39 with the wire 18 leading from said line wire 16. Otherwise the wiring of the individual subscriber's station is the same as the wiring of the subscribers' stations in the party line. The operation of the push button for calling central is to break the bell circuit which is normally bridged across the line and connect the line wire 16 with the ground as above described. In this method of wiring, as in that of the party line subscriber's station, the bell of the subscriber does not ring when he is calling central.

At the central station switch board the wiring is much as usual and the method of receiving calls and making connections does not differ from the established practice. Briefly described, the set of instruments for this purpose includes front and back ringing keys and the operator's listening key, with connections shown in diagram in Fig. 1, and whose mechanism is illustrated in detail in Figs. 3 and 4. The back ringing key comprises a pair of spring contacts 40 located between inner contacts 41 and outer contacts 42 and normally in engagement with the former. Flexible connecting wires 43 connect the spring contacts 40 with the sleeve and tip respectively of a plug 44, known as the "back plug." A similar plug 44', known as the "front plug," is similarly connected to the front ringing key, having its tip and sleeve connected by flexible conductors 43' with corresponding spring contacts 40' between inner contacts 41' and outer contacts 42', said contacts 40' being normally in engagement with the inner contacts 41'. One of each of the inner contacts 41 and 41' of the ringing keys connects to a wire 45 which leads to a ring-off drop 46, and a wire 47 connects said ring-off drop with the wire 10 leading to the generator 8. The outer contacts 42 and 42' of the ringing keys on the same side with the inner contacts just mentioned are connected by a wire 48 with the wire 47 leading to the generator. The other outer contacts 42 and 42' of the ringing keys are connected by a wire 49 with the other terminal or the ground connection of the generator. The inner contacts 41 and 41' of the ringing keys, which are on the same side as the outer contacts 42 and 42' last mentioned, are connected by a wire 50 which leads to one of a pair of inner contacts 51 of an operator's listening key, the other of said inner contacts 51 being connected to the wire 45 above mentioned. The outer contacts 52 of the operator's listening key, which are normally out of engagement with the inner contacts 51, are connected by wires 53 with the induction coil and receiver of the operator's set 54.

The front and back ringing keys and the operator's listening key are preferably of the usual construction, shown in Figs. 3 and 4, wherein a single operating lever

55 is first employed for closing the operator's listening key and then for closing the front ringing key, and a push button 56 is employed for operating the back ringing key. The lever 55 has an insulating head 57 on one of its outstanding arms to be forced between the spring contacts 51 of the operator's listening key when the lever is thrown forwardly, or to the left in Fig. 3, this operation causing the engagement of the contacts 51 with the contacts 52, and the head being flattened on its sides the lever is capable of remaining in this position. An insulating head 58 is also provided on the oppositely extending arm of the lever to be forced between the contact springs 40' of the front ringing key when the lever 55 is forced rearwardly, or to the right in Fig. 3, and this operation forces the said spring contacts 40' out of engagement with the inner contacts 41' and into engagement with the outer contacts 42'. This insulating head, however, is rounded so as to be incapable of remaining in its closed position, by reason of the pressure of the inclined surfaces of the contact springs 40' thereagainst.

The spring pressed push button 56 carries an insulating stem 59, which when pressed inwardly is adapted to be forced between the spring contacts 40 of the back ringing key to press them outwardly, out of engagement with the inner contacts 41 and into engagement with the outer contacts 42. The push button 56 is also incapable of remaining in its closed or inner position by reason of its spring pressure and by reason of the rounded end of its insulating head bearing against the inclined surfaces of the spring contacts 40. This combined front and back ringing key and operator's listening key forms no part of the present invention, except in combination with the other parts, and its description is for the purpose of explaining the operation of the signaling system.

In operation, a subscriber on a party line desiring to have communication with another subscriber calls central by pressing the push button of his instrument. The closing of the push button closes a ringing circuit from the generator 8 which is grounded on one side, through wire 10 and the annunciator drop 11, wire 12 and the engaged spring contacts 13 and 14, through the wire 16 and the wires 18 of all of the subscribers' stations, except the one at which the push button is pressed, so as to ring the bells at all of said subscribers' stations, across the engaged contacts 20 and 30 of said subscribers' stations and the wires 29 leading therefrom, through the engaged contacts 28 and 27 of the push buttons of said subscribers' stations and the wires 26 to the line wire 17, and finally through the wire 26 of the subscribers' station at which the push button was pressed and through the engaged contacts 27 and 35 of said push button and the wire 36 to the ground. This circuit, besides ringing the bells of all of the other subscribers on the line, to notify them that the line is in use, also serves to release the annunciator drop 11 at the central station switch board, to notify the operator that some one on this line desires a connection. The operator places the back plug 44 into the jack of the annunciator which has been dropped, thereby automatically restoring the drop in the usual manner and establishing electrical connection between the line wires of this party line and the ringing keys, by the tip of the plug bearing upon the tip spring 14 and holding it out of contact with

the anvil spring 13 and the sleeve of the plug engaging with the sleeve 15 of the jack. Now the operator closes the operator's listening key by swinging lever 55 forwardly, or to the left in Fig. 3, when the operator's set is bridged across the line wires 16 and 17 of the party line. This circuit extends from the wire 16 through the tip contact 14 and the tip of the back plug, through one of the wires 43 to the left hand contact spring 40 of the back ringing key, through the left hand contact 41 which is in engagement therewith and the wire 50 to the left hand contact spring 51 of the operator's listening key, through the contact 52 which is engaged thereby and the wires 53 including the receiver and the induction coil of the operator's set, back to the right hand contact 52 of the operator's listening key, through the contact spring 51 in engagement therewith and the wire 45 to the right hand contact 41 of the back ringing key, through the spring contact 40 in engagement therewith and the other wire 43 to the sleeve of the back plug, and through the sleeve 15 of the jack with which it is engaged to the wire 17. Thus the operator's set is in circuit with the telephone set of the subscriber, who has in the meantime removed his receiver from the hook and has thereby established his local talking connections in the usual manner, the hook switch serving to break the bell circuit by disengaging contacts 20 and 30 and establishing the receiver circuit and local circuit by engaging the contacts 30, 34 and 25. The line circuit through the subscriber's telephone set is then from wire 16 through wires 18 and 22, including the secondary winding of the induction coil and the receiver, across the engaged contacts to wire 29, and through the engaged contacts 28 and 27 of the push button and the wire 26 to the line wire 17, the telephone sets of the subscriber and the operator being in a through metallic circuit.

When the operator has been informed of the subscriber with whom communication is desired, the front plug is placed in the jack belonging to the line of such subscriber and the front ringing key is closed by swinging the operating lever 55 rearwardly, or to the right in Fig. 3, the necessary number of times to produce the call of the desired subscriber. By swinging the operating lever 55 to its upright position the operator's listening key was opened and by moving it in the opposite direction to close the front ringing key, ringing is produced by all of the bells in the line being called. The ringing circuit starts from the generator 8 and passes through wires 9 and 49 to the left hand outer contact 42' of the front ringing key, through contact 40' which is then in engagement therewith and one of the wires 43' to the tip of the front plug, through the tip spring which is in engagement therewith and the line wires 16 and 17 and all of the bells 19 which are bridged between the wires 16 and 17, back through the sleeve 15 of the jack, through the sleeve of the plug inserted therein and the other wire 43' to the right hand spring contact 40', and through the contact 42' in engagement therewith and wires 48, 47 and 10 to the other side of the generator. When the called subscriber responds by removing his receiver from the hook his telephone set is in a through metallic circuit with the set of instruments of the calling subscriber, for the wires 43' which connect with his line wires 16 and 17 through the jack are in connection with the connecting wires 43

which connect through the jack with the line wires 16 and 17 of the line of the calling subscriber's station, since the spring contacts 40' of the front ringing key are in engagement with the contacts 41', which are connected by means of the wires 45 and 50 with the corresponding contacts 41 of the back ringing key, engaged with the spring contacts 40 thereof, to which the wires 43 of the back plug are connected.

When the communication has ended, either subscriber may give the ring-off signal by pressing his push button, thus establishing a circuit through the ring-off drop 46 by placing a ground on the line wire 17. The ring-off circuit established by the ground connection at either subscriber's station may be traced as follows; Starting from the grounded generator 8, the circuit passes through wire 47 to the ring-off drop 46 and through wire 45 to the right hand contacts 41 and 41' of the front and back ringing keys, through the contact springs 40 and 40' in engagement therewith and the wires 43 and 43' to the wires 17 of the respective lines, through the wire 26 and the engaged contacts 35 and 27 of the operated push button, and by way of wire 36 to the ground. The release of the ring-off drop at the central station switch board indicates to the operator that the connection is no longer desired and the front and back plugs are accordingly removed, restoring the system to its original condition.

The operation as above described does not differ with the individual station C, except in calling central as previously explained.

In Fig. 5, is shown a modified method of wiring the jack and annunciator drop, in which a wire 60 takes the place of wire 12 of the other method of wiring, and connects the annunciator drop directly with line wire 17. With this method of wiring, the calling circuit established by the ground connection, which is made when one of the push buttons of the subscribers' stations is pressed, does not include the line wire 16 and the bells of other subscribers, as before, but extends from said ground connection through line wire 17 direct to the annunciator drop through wire 60, and by way of wire 10 to the generator. This method of wiring lacks the feature of signaling other subscribers' stations when central is called.

From the foregoing it will be understood that by the signaling system of this invention the usual generators are dispensed with at each subscriber's station, and as these generators constitute one of the most expensive features of the installation, a great saving in expense results. This is accomplished without materially modifying the construction or method of operation of the switch board at the central station and without sacrificing any of the usual features of advantage, the ground connections only being relied upon for signaling purposes and a through metallic talking circuit being maintained.

What I claim as my invention is:—

1. In a telephone signal system, a pair of line wires, subscribers' sets bridged across the line wires, means for grounding one of the line wires at each subscriber's station, comprising a switch for opening the bell circuit of that subscriber's set and for establishing a ground connection with one of the line wires, a jack having its sleeve connected to that line wire with which the grounding connections are made and its tip spring connected with the other line wire, an annunciator connected with the anvil

spring of the jack, and a generator with one terminal grounded and the other terminal connected with the annunciator, whereby the grounding connection produced by the switch at any subscriber's station establishes a signaling circuit through the bells of the other subscribers' stations but not through the bell of that subscriber's station, through the engaged tip and anvil springs of the jack, the annunciator and the generator.

2. In a telephone signal system, a pair of line wires, a subscriber's set bridged across the line wires, means for grounding one of the line wires at the subscriber's station, comprising a switch for opening the bell circuit of the subscriber's set and for establishing a ground connection with one of the line wires, a jack having its sleeve connected to the line wire with which the grounding con-

nection is made and its tip spring connected with the other line wire, an annunciator connected with the anvil spring of the jack, and a generator with one terminal grounded and the other terminal connected with the annunciator, whereby the grounding connection produced by the switch at the subscriber's station establishes a signal circuit through the engaged tip and anvil springs of the jack, the annunciator and the generator, but not through the bell of the subscriber's set.

In testimony whereof, I affix my signature, in presence of two witnesses.

HOWARD M. ELDRED.

Witnesses:

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ANNA F. SCHMIDTBAUER.