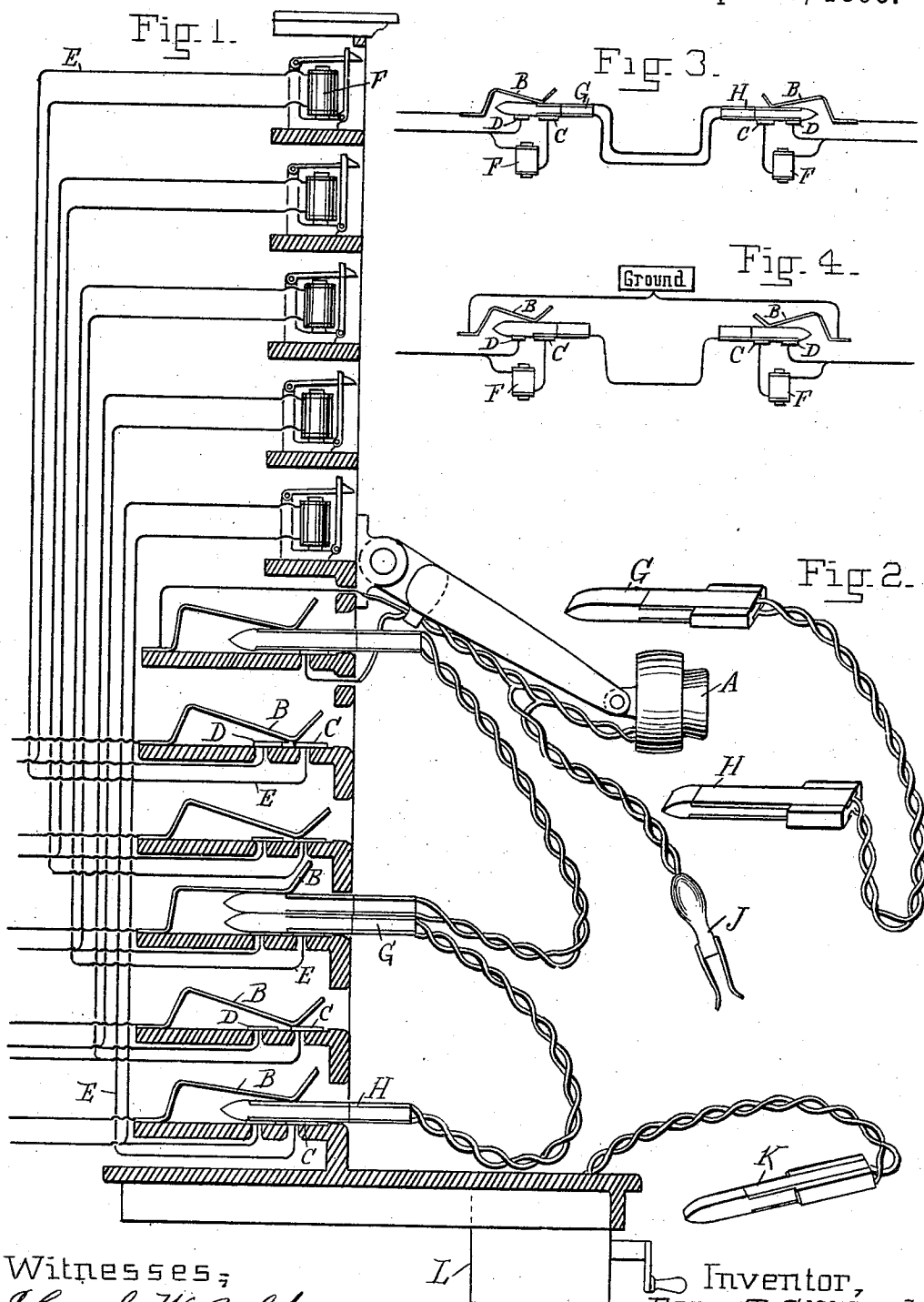


(No Model.)

E. T. GILLILAND.
TELEPHONE CENTRAL OFFICE SYSTEM.

No. 538,327.

Patented Apr. 30, 1895.



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TELEPHONE CENTRAL-OFFICE SYSTEM.

SPECIFICATION forming part of Letters Patent No. 538,327, dated April 30, 1895.

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To all whom it may concern:

Be it known that I, EZRA T. GILLILAND, a citizen of the United States of America, residing at Pelham Manor, county of Westchester, State of New York, have invented certain new and useful Improvements in Telephone Central-Office Systems, of which the following is a specification.

The system herein described is particularly adapted for use with small exchanges and a magneto telephone system. It is of great importance that the apparatus should be simplified as much as possible and that the line should be kept as clear as possible so as to make the fullest use of the current developed by the voice, for its strength is necessarily limited and should be utilized to its full advantage. With these two objects in view I provide a system in which when two subscribers are connected the annunciator drop of one of them is retained in the circuit as a clearing out drop while the other is shunted out. Special clearing out drops are therefore unnecessary. To effect this I attach to an ordinary spring-jack an additional or auxiliary contact plate which is connected with the subscriber's leading-in wire before it passes through the drop, and I provide a pair of plugs on the opposite ends of two strands of wire, one of the plugs having a plate which contacts with the additional contact and excludes the drop from the circuit, the other having a plate which contacts only with the contact that is connected to line through the drop, thereby including the drop in the circuit. When two subscribers are connected through their spring jacks and such a pair of plugs, the result is that the annunciator drop of one of the subscribers is in the circuit and the annunciator drop of the other subscriber is out of the circuit. This apparatus embodies the main feature of my invention.

In the accompanying drawings which form part of this specification: Figure 1 is a vertical section of a telephone exchange arranged for a complete metallic circuit in which my invention is embodied. Fig. 2 shows in perspective two strands of wire with plugs attached by which any pair of spring jacks can be connected. Fig. 3 is a diagram of circuits of the complete metallic circuit arrangement

of Fig. 1. Fig. 4 is a diagram of circuits showing a modified system in which the wires are grounded.

The plan upon which I propose to work my system is that the subscriber shall call up the central office and in doing so drop the annunciator bearing his number. The central office operator shall then connect the central office telephone with the calling subscriber and upon learning the number of the subscriber wanted shall connect the two subscribers together. The calling subscriber shall then ring up the subscriber whom he wishes to call. This he will naturally do by a long ring which will be easily distinguished from the short ring that announces to the central office that the conversation is completed. I also provide means whereby the central office operator can put his telephone in the circuit with two communicating subscribers, the central office telephone being inserted in circuit in series or multiple arc, as preferred, and I also provide means whereby the central office operator can call any subscriber.

Referring now particularly to Figs. 1, 2 and 3, a row of six spring jacks and five drops are shown. One of the spring jacks is connected with the central office telephone A and has no corresponding drop. Each of the other spring jacks is connected with a subscriber's telephone circuit through one of the drops, there being one drop for each jack. Each spring jack consists of a spring B, and a contact plate C placed immediately below it. These two parts are normally in contact. There is also a second plate D which is insulated from both B and C. One of the line wires of each subscriber is connected to the spring B of his spring jack, and through it with the plate C connected by a wire E through his annunciator F to his return wire. Hence, when a subscriber calls, the current passes along one of the wires of his circuit serially through spring B, plate C, wire E, annunciator magnet F, and back over his other wire. The other contact plate D, connected with each spring jack, is also connected to the same return wire to which the annunciator is directly connected. To state this another way, if the circuit be followed along one wire of each substation circuit, the two wires of which I shall

herein denominate the two conductors of the substation circuit it will be seen that one conductor divides, and that one of its branches produced by such division leads through the annunciator to the contact plate C while the other branch leads round the said annunciator to the associated contact plate D. The other circuit conductor connects directly to the spring B as stated above. Thus the spring B, and the plate C form the terminals of the conductors of the circuit and the associated plate D forms an auxiliary terminal of the said conductors.

All the subscribers' lines are connected to their respective spring jacks and annunciators in the central office, in the manner above described. To connect two subscribers I provide a pair of plugs on the ends of two strands of wire as shown in Fig. 2. These plugs are similarly shaped, so that either one will go into any spring jack, and each is provided with two plates separated from each other by insulation. Each of the plates on each plug is connected to one of the plates on the other plug by one of the two wires that unite the plugs. These plugs differ from each other in that the plug G has two short plates and the plug H has two long plates. It will be seen that if these two plugs are inserted in the spring jacks of two subscribers' circuits, the circuits will be connected as follows: Starting with the leading-in wire of a subscriber into whose spring jack a plug G is inserted, the circuit passes serially through his annunciator wire E, plate C, one of the plates of the plug G, one of the wires connecting the plugs, to one of the plates, or contact surfaces of plug H, to the jack spring B of the other subscriber, and over one of the conductors of the circuit of such other subscriber to the substation thereof. Returning thence the compound circuit formed by the insertion of the two jacks is to be traced from the said second substation by way of the remaining circuit to its plug socket or spring jack plates C and D, the second plate of plug H, and the second flexible or other cord conductor to the remaining plate of plug G and from thence to and from the substation of the first circuit, which completes the said compound metallic circuit. Of course, either subscriber can ring off after the conversation is finished, since both instruments are in circuit with the annunciator without regard to which subscriber's circuit the annunciator magnet belongs.

It will be seen from the foregoing circuits that the current which passes through a plate C and spring B will include the corresponding annunciator magnet unless the current also passes through the plate D. This is true whether a plug is inserted in the spring jack, or the spring jack is closed by the contact of spring B and plate C.

In tracing the above circuits which include the plugs it is assumed that the plugs G and H were inserted in the spring jacks so that as indicated in the drawings the upper contact

plate of G is electrically connected through the flexible conductor with the lower contact plate of plug H thus uniting the spring of one subscriber's spring jack or plug socket to the plates C and D of the others; and the plate C of one to the spring of the other. If, however, either plug is inverted then the spring of one spring jack will be connected with the spring of the other, but this will not change the result.

It will be clear that with the springs B placed as they are it is not necessary to have two long plates on the plug H, as a short plate would reach the spring B; but if one of the plates were long and the other short it would be necessary to insert a plug H with the long plate down, and as it is desirable to give the office operator as little trouble as possible it is preferable to make both plates long so that the plug H shall be strictly reversible.

The upper spring jack to which the central office telephone A is connected, differs from the others in that it lacks the plate D, and in that the spring B does not contact with the plate C when no plug is inserted in the spring jack. This is insured by making the spring B somewhat shorter in this spring jack than in the others. Were this not so the central office telephone would be normally short circuited through its spring jack. This is to be avoided for several reasons and among others because it is intended for convenience to provide several spring jacks with which the central office telephone is connected.

The central office operator will be expected always to keep one plug of a pair in a central office spring jack. The plates on plug G should of course be sufficiently long to reach the spring B of any central office spring jack. As soon as a call is received he will take the other plug of the pair in his hand and insert it in the spring jack which corresponds to the annunciator operated. This puts the central office telephone in circuit with the calling subscriber, substantially as set forth respecting the connecting of two subscribers. As soon as the operator finds out what number is wanted he will withdraw the plug from the central office spring jack and insert it in the spring jack corresponding to the subscriber wanted. This connects up the subscribers. The central office operator will then insert one of the plugs of another pair in a central office spring jack so as to be ready for the next call. Should, however, the central office operator wish to take part in the conversation he has only to insert one plug of a pair in a central office spring jack and the other plug of the pair in the spring jack of one of the communicating subscribers. In order to enable him to do this the mouths of the spring jacks are made wide and he will normally push the second plug into the subscriber's spring jack above the plug already there. This gives the connection indicated in the drawing in which there are two subscribers' telephones and the central office telephone all in series, there be-

ing but one annunciator magnet in the circuit as before; for if the plug which is inserted in a subscriber's spring jack to connect the central office telephone be inserted above the other plug in the spring jack the connections of the annunciator branches with the circuit will not be altered.

The central office operator may also connect himself up in multiple arc with the communicating subscribers by means of a clip J which will now be described. This is to be used instead of the pair of plugs, the use of which has just been described. The clip J has two contact plates which are mounted on one end of a handle and form springy jaws. These two plates are connected to opposite sides of the central office telephone, so as to put the two plates in circuit with the coils of the telephone. To connect up the central office telephone by means of this clip it is merely necessary to slip it on to one of the plugs in a subscriber's spring jack. In order to make it possible to do this the plates of the plugs are extended back to the end of their handles. With the clip slipped over one of these plugs and its plates in contact with the plates of the plug, the central office telephone is either connected in series with a single subscriber, if but one of the plugs of a pair is inserted in a subscriber's spring jack, or is connected in multiple with two subscribers if both of the plugs of a pair are inserted in subscribers' spring jacks. This manipulation of the clip J is somewhat more rapid than that of the pair of plugs.

It must be understood that any other suitable form of subscriber's switch may be substituted for the spring jacks shown, and any suitable plugs may be used in conjunction with the spring jacks, the only necessary point being that in co-operation with the spring jacks they shall effect the exclusion of the annunciator of one of the two substitution circuits concerned in a connection, and the inclusion of that of the other.

Should it be desired to ring up any subscriber from the central station a plug K with short plates similar to one of the plugs G, and having its plates connected up with a magnetogenerator L, is inserted in the spring jack of the subscriber whom it is desired to call. When the generator is turned the current traverses the subscriber's circuit, including the subscriber's drop.

Fig. 3 requires no further explanation. It is merely a diagrammatic representation of the circuit shown in Fig. 1 and is inserted to render that figure more readily intelligible.

Fig. 4 illustrates, in the same manner as Fig. 3, a modification of the circuit of Fig. 1, in which the subscribers' lines are grounded instead of having complete metallic circuits. Each subscriber then has only a single line. His wire at the central office branches to his annunciator and to the plate D of his spring jack as before, and the branch to the annunciator passes through it and the wire E to the

plate C as before. The spring contact B of the spring jack is connected directly to ground. Two such circuits are shown which are both alike, as all of the subscribers will be connected to the central office in the same way. The plugs will be different from those before described, in that they will have only one contact plate each. As shown this contact plate is on the lower side, and the spring B is simply removed from the circuit on the insertion of the plug. These plug plates are connected by a wire, and one of the plates is short and the other long enough to reach into the second contact point D as before.

Having now described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. In a telephone switch apparatus, the combination of an annunciator and an associated plug socket switch for each subscriber's line, each switch having two contact pieces connected with the same main line circuit conductor but at different sides of the annunciator magnet thereof; with a pair of plug connectors adapted to enter and engage with the plug socket switches of any two lines, and thereby to unite the said two lines into a through circuit, the said plugs being respectively constructed to connect with but one of the said contact pieces in one socket switch, and with both in the other socket switch, whereby the associated magnet of one of the said lines is included in, and that of the other excluded from the said through circuit, substantially as described.

2. In a telephone central office system the combination of telephone circuit annunciators, and associated spring jack switches, each circuit switch being provided with two contact pieces connecting with the same line conductor, one of them being connected therewith at a point inside, and the other at a point outside of the annunciator magnet; and a pair of connecting plugs complementing and adapted to be inserted in the spring jacks of any two circuits, one having a conducting plate which connects with the former contact piece only and the other having a conducting plate which connects with and electrically unites the two contact pieces whereby one of the annunciators may be left in, and the other shunted from the circuit, substantially as described.

3. In a telephone switchboard, a spring jack comprising two normally united but separable contact pieces, forming respectively the terminals of the direct and return circuit conductors, and a third contact point insulated from the others, connected with that conductor which includes the call annunciator at a point external to said annunciator, the mouth of the said spring jack being sufficiently capacious to admit two plugs therein at once; substantially as described.

4. In a telephone central office system, the combination substantially as specified, herein, of subscribers' annunciators and switches, each subscriber's switch being provided with

three contact points, two of which are so connected in the circuit that through them the associated annunciator magnet can be included in the circuit and the third point so connected
5 that through it the circuit can be closed round and excluding the said magnet; plugs to engage the subscribers' switches to connect two substations, and the central station telephone in circuit, the switches and plugs being so
10 constructed that after one plug has been inserted, a second can be inserted without altering the connections which determine the inclusion or exclusion of the said magnet.

5. In combination with two spring jacks of
15 two lines, each containing two switch contacts of said lines; a pair of similarly shaped or formed plugs organized to complement and

co-operate with the said spring jacks, both provided with suitable contact surfaces, the said contact surfaces of the said two plugs being united by a cord-conductor, and being arranged differently, so that they are respectively adapted to register and connect with one of the contacts of either jack, and the two contacts of the other jack, thereby connecting the sub-stations of the corresponding subscribers, substantially as described.

Signed by me, in Pelham Manor, New York,
this 2d day of June, 1894.

EZRA T. GILLILAND.

In presence of—

THOMAS EWING, Jr.,
HAMPTON D. EWING.