

(No Model.)

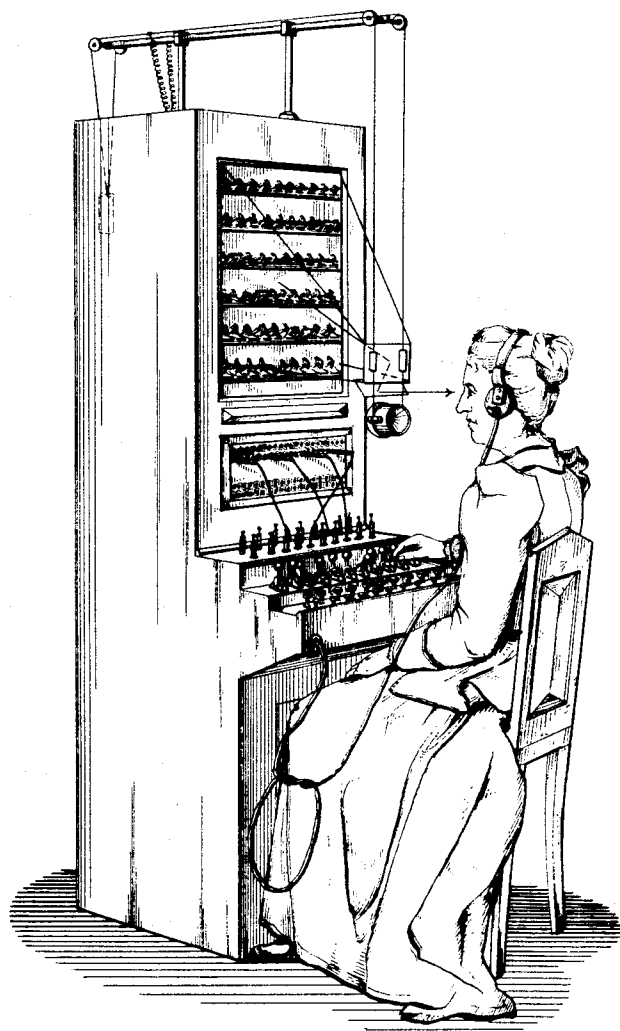
10 Sheets—Sheet 1.

G. D'ADHÉMAR.
TELEPHONE CENTRAL STATION.

No. 540,012.

Patented May 28, 1895.

Fig. 1.



WITNESSES:

H. R. Brunner
George W. Janel

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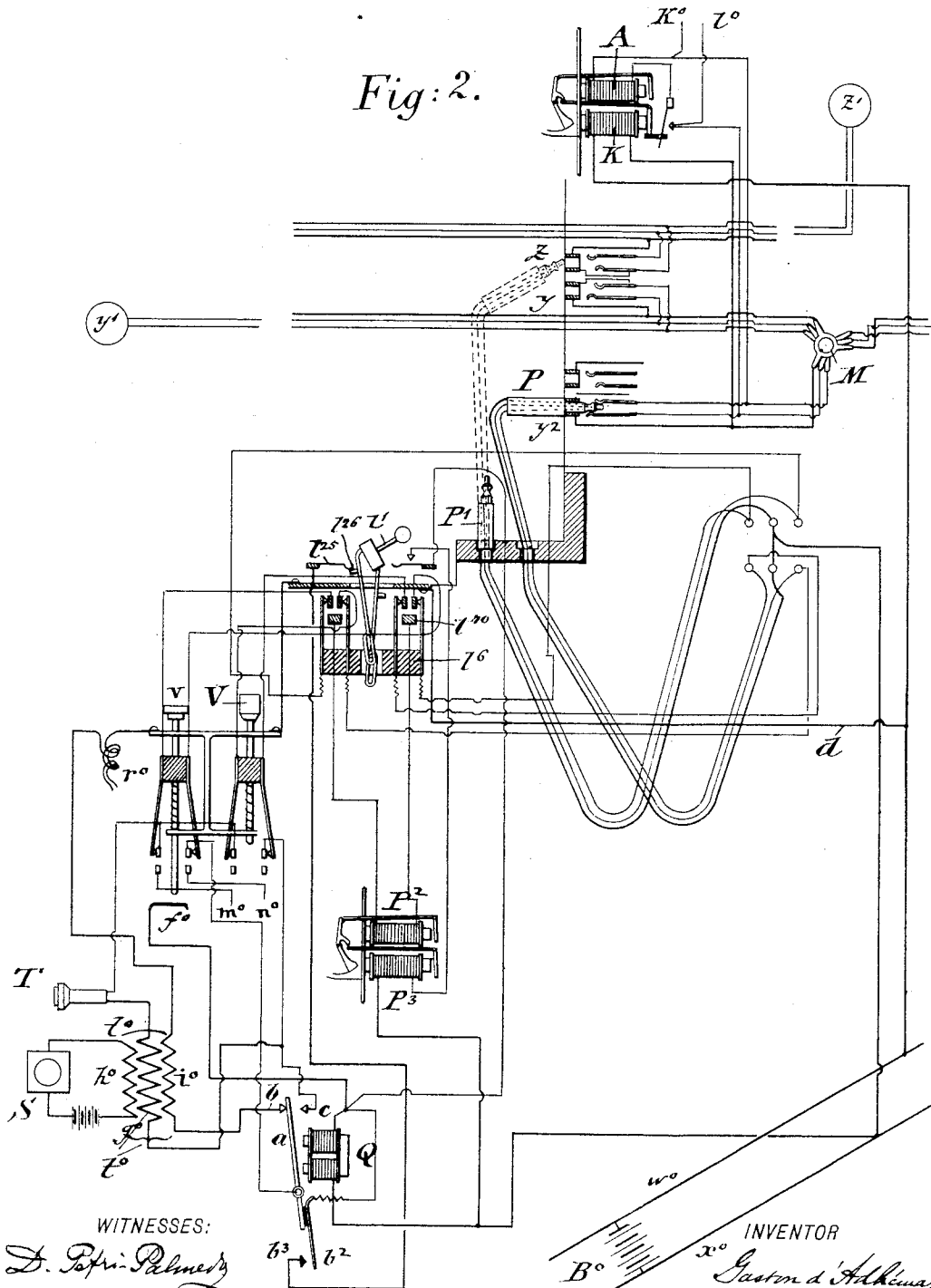
Gaston d'Adhémar
BY *Ernest J. Piquet*
ATTORNEYS.

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TELEPHONE CENTRAL STATION.

No. 540,012.

Patented May 28, 1895.

Fig: 2.



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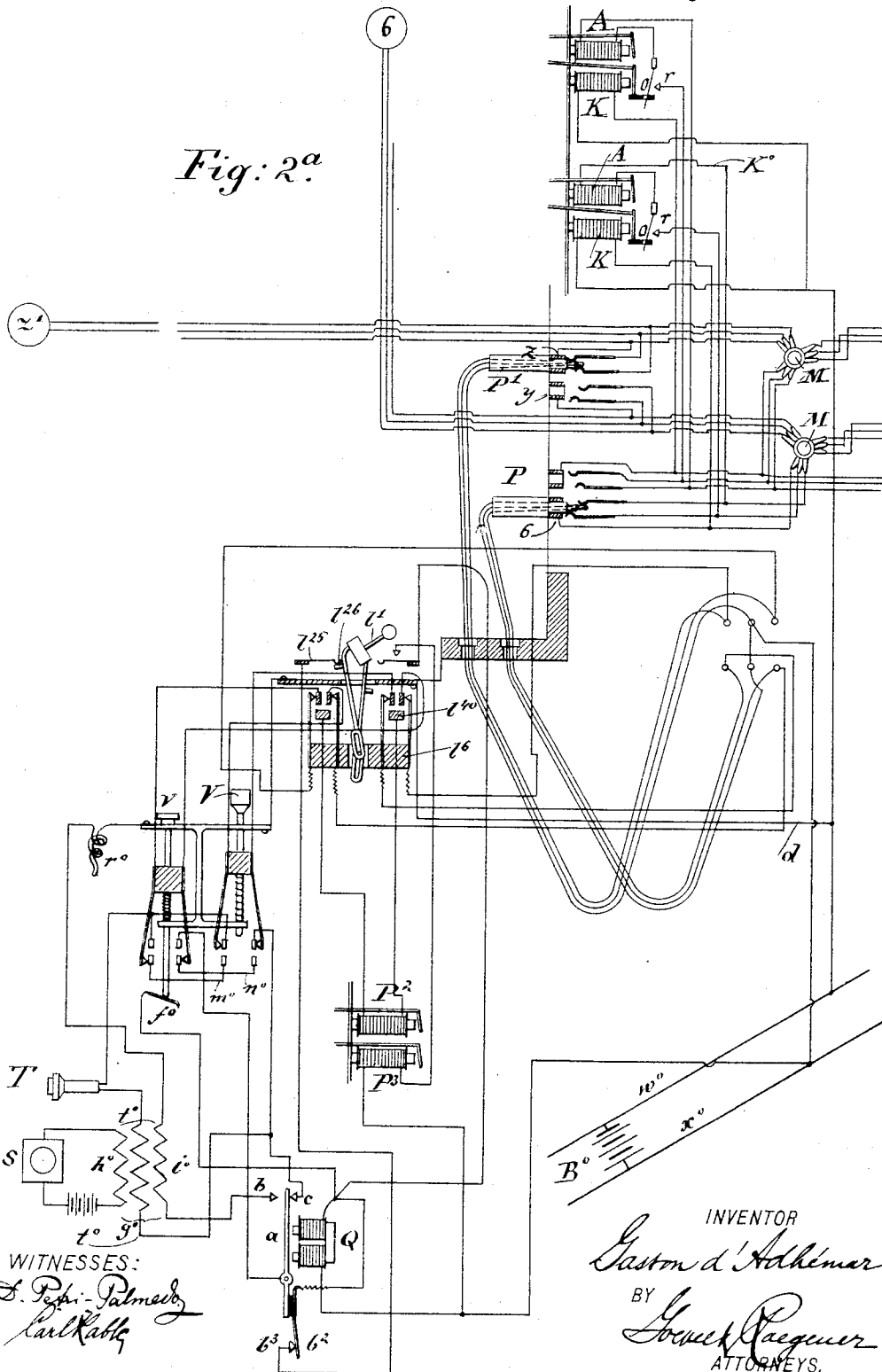
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Fig: 2^a



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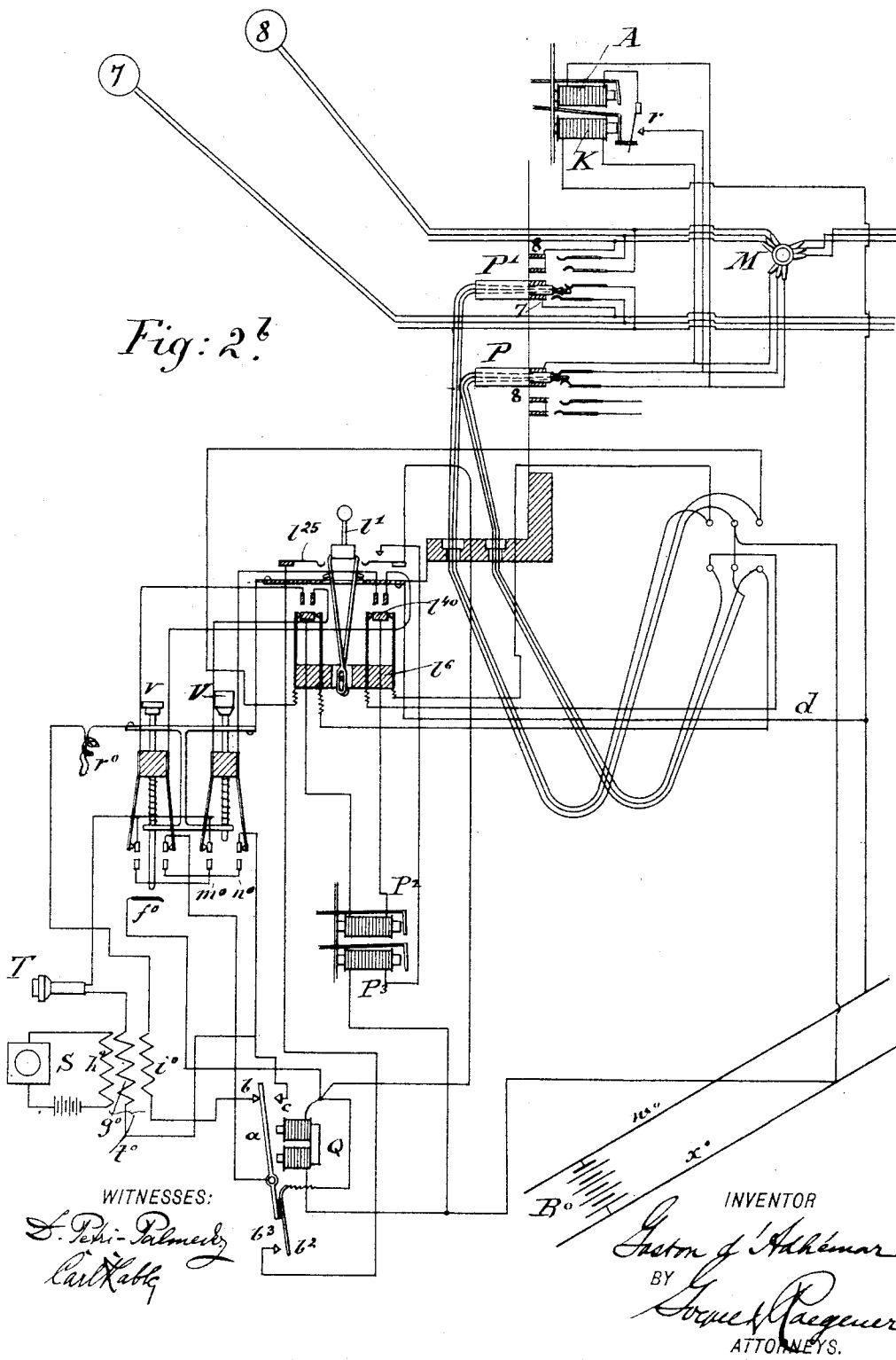
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TELEPHONE CENTRAL STATION.

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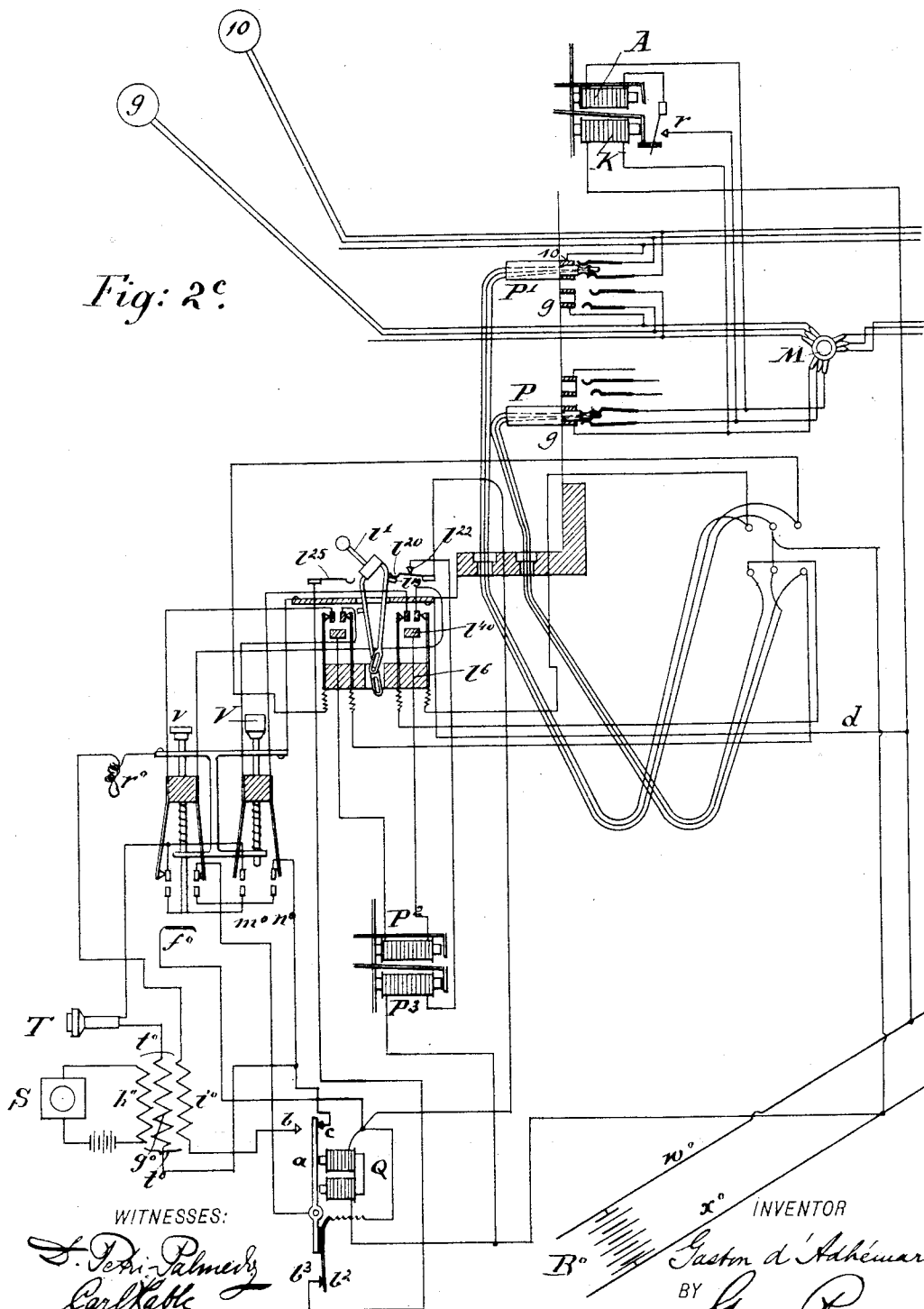


G. D'ADHÉMAR.
TELEPHONE CENTRAL STATION.

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Fig: 2^c



WITNESSES:

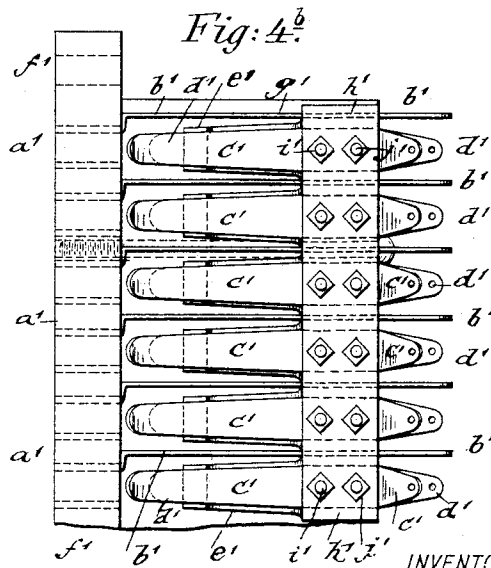
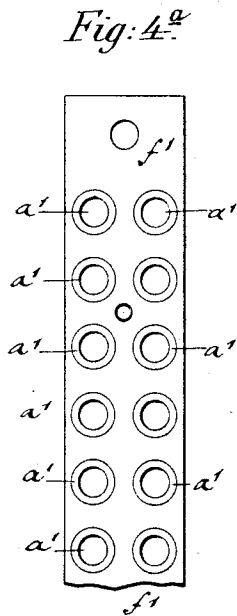
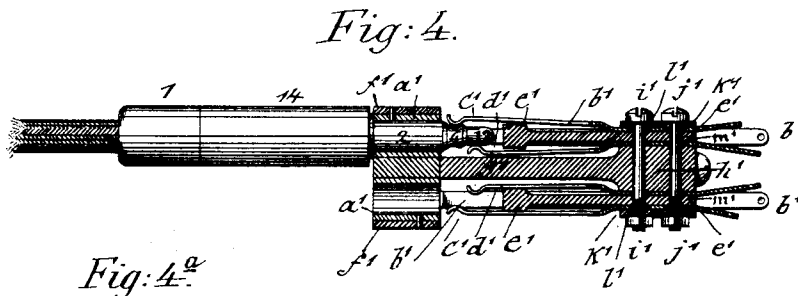
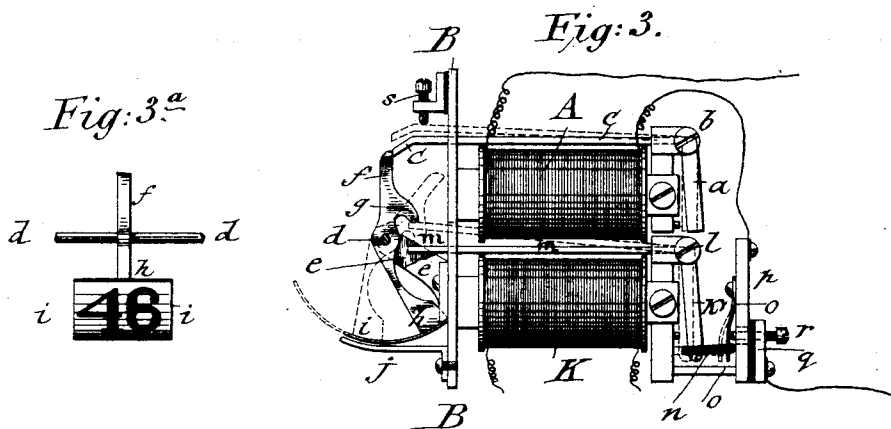
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Fig: 5.

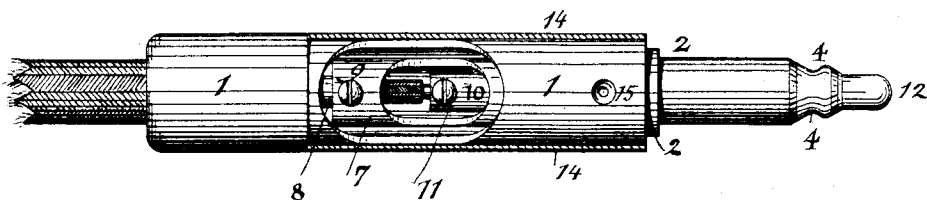


Fig: 5.^a

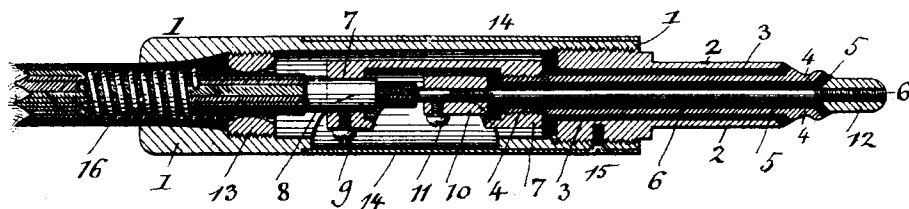
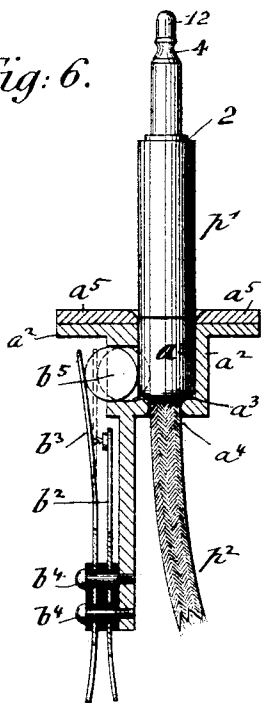


Fig: 6.



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(No Model.)

10 Sheets—Sheet 8.

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TELEPHONE CENTRAL STATION.

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Fig: 7.

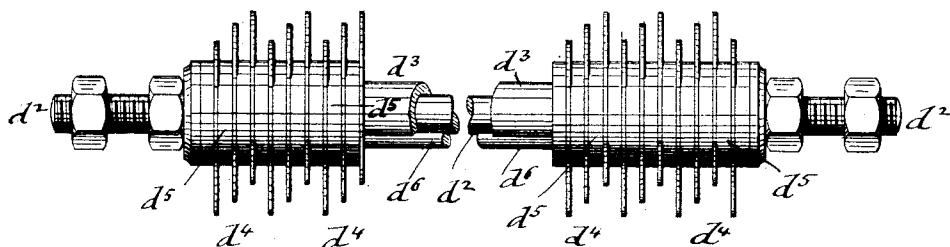


Fig: 7.6

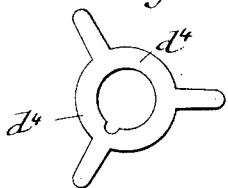


Fig: 7^a

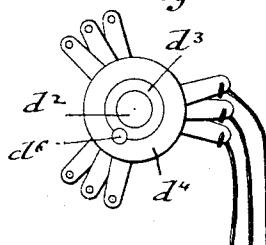
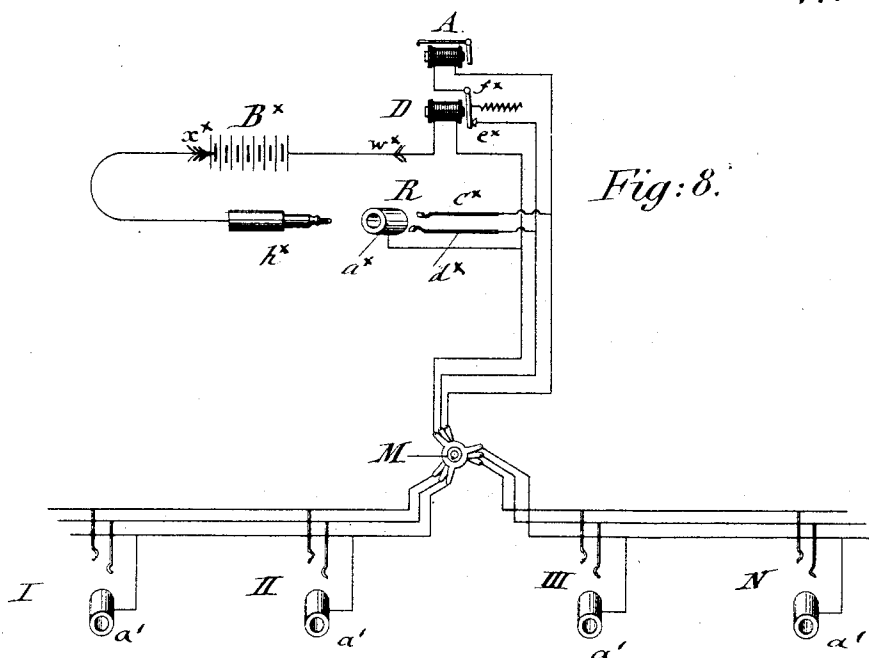


Fig: 8.



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No. 540,012.

Patented May 28, 1895.

Fig: 9.

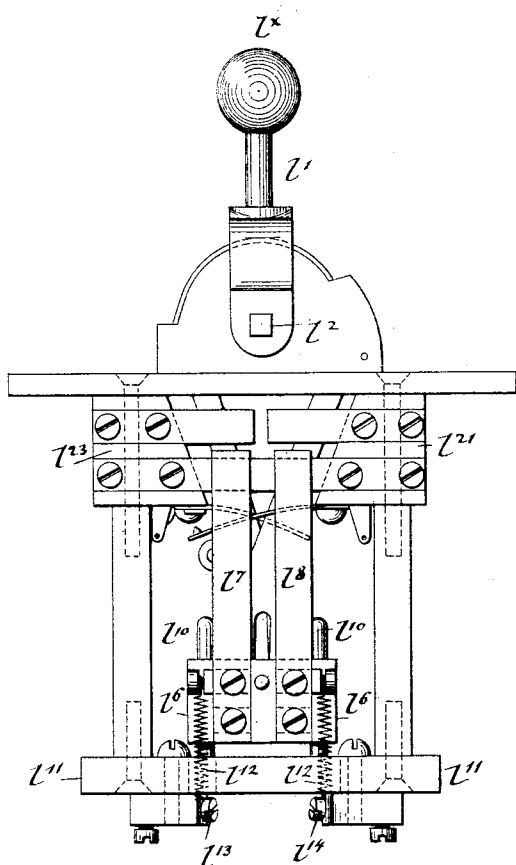
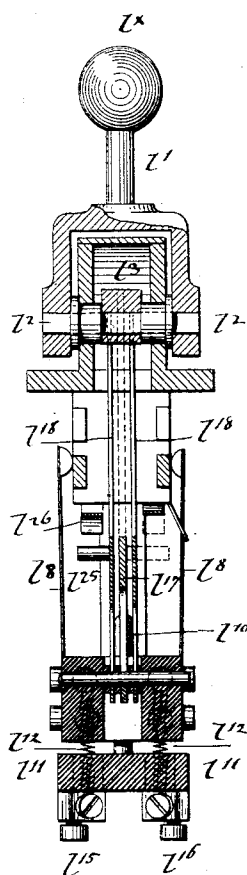


Fig: 10.



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TELEPHONE CENTRAL STATION.

No. 540,012.

Patented May 28, 1895.

Fig: 11.

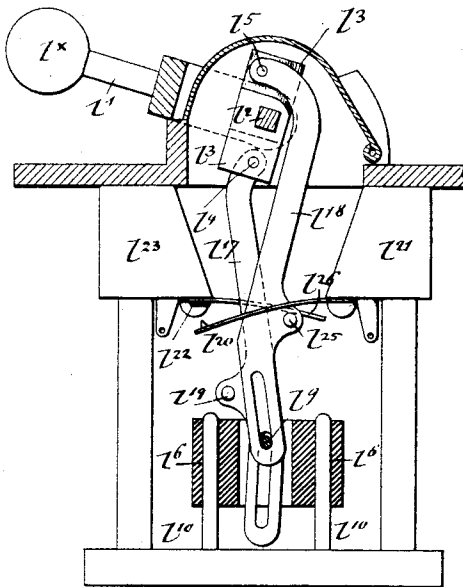


Fig: 12.

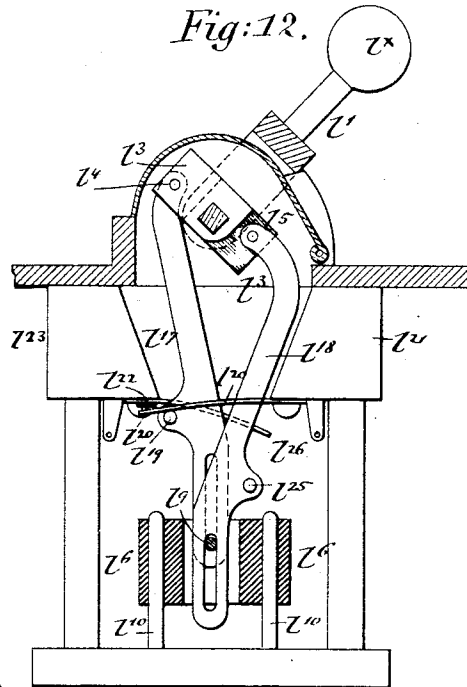
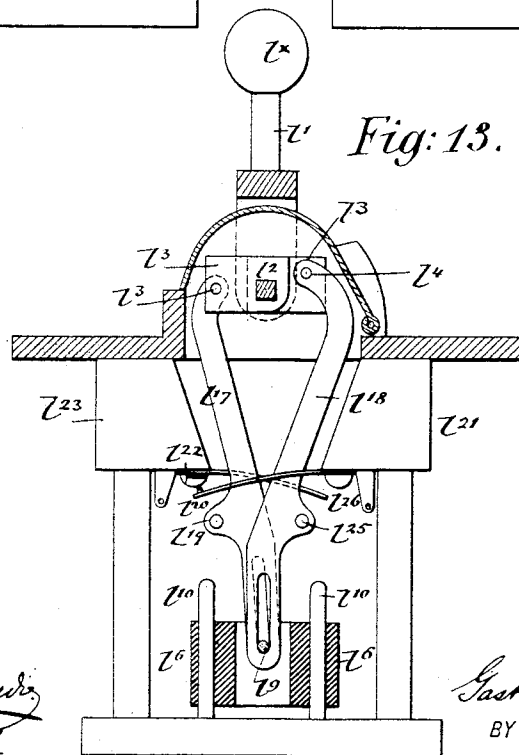


Fig: 13.



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UNITED STATES PATENT OFFICE.

GASTON D'ADHÉMAR, OF PARIS, FRANCE.

TELEPHONE CENTRAL STATION.

SPECIFICATION forming part of Letters Patent No. 510,012, dated May 28, 1895.

Application filed June 20, 1894. Serial No. 515,150. (No model.) Patented in France May 10, 1893, No. 230,380.

To all whom it may concern:

Be it known that I, GASTON D'ADHÉMAR, a citizen of the Republic of France, residing at Paris, in said Republic of France, have invented certain new and useful Improvements in Telephone Central Stations, (for which Letters Patent were granted to me in France, No. 230,380, dated May 10, 1893, and a certificate of addition thereto, dated December 28, 1893,) of which the following is a specification.

This invention relates to certain improvements in telephone central stations and apparatus for the same, by which a greater number of subscribers can be connected with each station and attended to with greater facility by a smaller number of employés than the telephone central stations heretofore in use, and the invention consists of a telephone central station which comprises primarily, an improved annunciator, a switch board arranged below said annunciator and provided with rows of jacks having metallic sockets and contact springs, separated by insulating blocks, a local circuit connected with said jacks and containing an electro-magnet, the armature of which cuts out the electro-magnet of an annunciator while the line is occupied, said local circuit also acting on the telephone of the operator at the moment of calling in such a manner that no electric communications can take place between the telephones of the different operators.

The invention consists, further, in the construction of the plugs by which the connection with the subscribers' jacks is established, next in the construction of a combined key for conversation and listening, and in the combination of the latter with the calling-up keys, an induction coil, a relay and a local circuit, as will be fully described hereinafter and finally defined in the claims.

The general object and nature of my invention being thus indicated, I will now proceed to describe particularly the different apparatus of which my improved central station is composed and the circuits by which said apparatus are connected and by which they are operated in practice.

In the accompanying drawings, Figure 1 is a perspective view of my improved telephone central station with its annunciators, jacks, plugs, and keys, and showing the relative posi-

tion of the operator to the station and the receiving and transmitting telephones. Figs. 2, 2^a, 2^b, and 2^c are diagrams showing the different apparatus which compose my improved telephone central station and the circuits connecting them with each other and with the lines of the subscribers. Fig. 3 is a side elevation, drawn on a larger scale, of an annunciator by which the number of the subscriber who desires to communicate with another subscriber is indicated. Fig. 3^a is a detail front view of an annunciator-drop. Fig. 4 is a vertical longitudinal section of a portion of the switch-board, showing a plug inserted into one of the jacks. Fig. 4^b is a plan of Fig. 4; Fig. 4^a, a front view of the perforated front plate for the jacks. Figs. 5 and 5^a represent, respectively, a side elevation and a vertical longitudinal section of one of the plugs used with the jacks in my improved central station, said figures being drawn on a larger scale. Fig. 6 is a sectional side elevation showing one of the plugs in a position of rest when not connected with a subscriber's line. Fig. 7 is a side elevation of the multiple-wire connection by which the line of every subscriber is connected with the central station. Figs. 7^a and 7^b are details of Fig. 7. Fig. 8 is a diagram showing the local circuits for each jack. Figs. 9 and 10 are respectively a side elevation and a vertical transverse section of the compound key by which the operator makes or establishes connection, and Figs. 11, 12, and 13 are vertical longitudinal sections showing the three different positions into which the compound key can be placed for making proper connections.

Similar letters and figures of reference indicate like parts in all the drawings.

The annunciator is arranged above the switch-board, and in such a position that any drop can be readily seen and read by the operator. An annunciator is arranged for each subscriber, and provided with a drop, carrying number of the subscriber. The annunciator and its drop are shown in detail in Figs. 3 and 3^a, and it consists of an electro-magnet A, which is attached to an upright plate B at the upper front part of the station, and of an armature a, which is pivoted at b and provided with a forward-extending rod c, that moves with the armature. In front

of the plate B is pivoted at *d* to suitable lugs *e*, a piece *f, g, h*, to the lower end of which is attached a drop *i*, which is formed of a convex plate of metal and on which is engraved or otherwise produced, the number of one of the subscribers, as shown in Fig. 3^a. The piece *f, g, h*, is so balanced on its pivot *d*, that it assumes, when released, the position shown in dotted lines in Fig. 3, in which position the number on the drop *i*, is exposed to view. The piece *f, g, h*, however, is held ordinarily in the position shown in full lines in Fig. 3 by the rod *c*, which engages the upper end *f*, of said piece and retains thereby the drop in its inward position so that its face is covered by the forward projection bracket-plate *j*, which is attached to the front-plate B. A second electro-magnet K is attached to the front-plate B, below the electro-magnet A and provided at its rear-end with an armature *k'*, which is pivoted at *l* and provided with a forward-extending arm *m*, the front-end of which is located below the projecting nose *g* of the piece *f, g, h*. A plate *n*, of hard rubber or other suitable insulating material, is attached to the armature *k'* and provided with an opening which is engaged by a spring *o*, that is attached to a plate *p*. Adjacent to the upright plate *p* is arranged a plate *q*, which is insulated from the plate *p* and which carries a contact-screw *r* against which the spring *o* abuts when in a state of rest. One end of the coils of the electro-magnet A is connected with a binding-screw on the upright plate *p*, while the other end of said coils is connected with a line-wire, the plate *q* being connected by a binding-screw with the second line-wire of a subscriber. The coils of the electro-magnet K are connected with a local circuit, which will be described hereinafter.

By the action of the magneto-call of the subscriber the electro-magnet A is excited, and its armature *a* attracted, so that the rod *c* is raised and the piece *f, g, h*, permitted to turn on its axis, whereby the drop *i*, on which the number of the subscriber is arranged, is moved forward beyond the bracket-plate *j*, so as to be seen by the operator. The rod *c* is stopped by a contact-screw *s*, which is supported by an insulated lug attached to the front-plate B, as shown in Fig. 3, and which screw closes the local circuit of a call-bell. On the other hand, when a current is passed through the coils of the electro-magnet K, its armature *k'* is attracted so that the forwardly-extending rod *m* of the same engages the nose *g* of the piece *f, g, h*, so as to return it into its initial position, the numbered drop *i*, being likewise moved and covered by the bracket-plate *j*. The plate *n*, which connects the armature *k'* with the spring *o*, moves the spring *o*, away from the contact-screw *r*, cuts the electro-magnet A out of the circuit of the subscriber's line, and returns the armature *a* and rod *c* into their former position. As soon as the current ceases in the electro-magnet K, its

armature *k'*, and rod *m* are returned into their former position under the action of the spring *o*, so that the latter again forms contact with the contact-screw *r*, while the piece *f, g, h*, is retained in its normal position by the contact of the rod *c*, with its upper end *f*. If desired, a second spring *o*, and contact-screw *r* may be used without changing the general arrangement described, so as to produce in the same manner, the throwing in or out of circuit of the second line wire of the electro-magnet A.

It is most advantageous to arrange the annunciators above the switch-board, so as to have as much place as possible available for the jacks, which have to be arranged as conveniently as possible to the hands of the operator. By this arrangement of the annunciators, the numbers of the subscribers are conveniently visible to the eye of the operator, without requiring any change of position of the head. It is also possible to arrange, while preserving the position of the drops of the annunciators, to render the numbers visible to the operator by means of inclined mirrors, which are arranged in front of the operator, so as to reflect in the direction of the eyes of the same, when sitting in front of the switch-board, said mirrors reflecting the number of any annunciator-drop as shown in Fig. 1. In this case, however, the number has to be inscribed on the drop in reversed figures, so as to appear in its proper position in the mirror. By this arrangement, the operator can give all her attention to the proper supervision of the jacks on the manipulating table.

The connecting-plug.—One of the connecting-plugs is shown as inserted into a jack in Fig. 4, and inside elevation and in longitudinal section respectively in Figs. 5 and 5^a. It consists of a metallic tube 1, into one end of which is screwed a hollow cylindrical piece 2, which incloses an insulating tube 3 that surrounds a metallic tube 4, which is again separated by a second insulating tube 5, from the central cylindrical rod or core 6 of metal. A tube 4, is screwed into the front-end of a piece 7, the rear end of which is perforated and connected by a screw 9, with the terminal tube of a flexible conducting cord, in which the conducting wires are arranged. The central rod 6, is screwed into a metallic cylinder 10, in which another conducting wire of the flexible cord is firmly held by a screw 11. Onto the opposite end of the rod 6, is screwed a cylindrical piece of metal 12, which forms the terminal of the interior conductor of the flexible cord. The tube 1, has an opening at its middle portion, so as to permit the insertion of the screws 9 and 11. This opening is closed by a sleeve 14, which is securely held in position by the screw 15. The flexible cord contains an interior conductor of fine wire, which terminates in the piece 10 and which is covered by an insulating layer of suitably prepared silk or cotton. Around the central wire a second conductor is formed by suitably

covered conducting wires, which terminate in the small tube 8, and which are likewise covered by an insulating layer of suitably prepared silk or cotton. The two insulated conducting wires are arranged concentrically to each other and pass freely through the opening of the piece 13, and then through a flexible tube or cover 16, formed of a helically-wound wire, which is again covered by a braided layer of silk, cotton or linen. The exterior coiled wire 16 forms a conductor, which terminates in the body of the plug and which is placed thereby in electric connection with the tubes 1 and 2.

15 *The jacks.*—The plugs are inserted into a series of jacks, which are shown in vertical section in Fig. 4, in plan in Fig. 4^a, while Fig. 4^b, is a front-view of the front-plate of a double series of jacks. Each jack is composed of a metallic socket *a'*, which is connected with a backwardly-extending metallic plate *b'* to which the conducting wire is soldered and of two metallic springs, *c'*, *d'*, which are made of unequal length and which are separated by a block *e'* of hard rubber or other suitable insulating material. The different parts are supported on a bracket *f'*, *g'*, *h'*, which is made of hard rubber or other insulating material, and in general form of the letter T, and which carries two rows of jacks, which are symmetrically arranged on the T-shaped bracket and which permit the grouping of a large number of jacks in comparatively small space. The corresponding pieces of the second row of jacks are indicated by the same letters as those of the first row. The springs *c'* and *d'* are attached to the lower part of the T-shaped bracket by means of screws *i'* and *j'*, which are insulated from the springs by plates *k'* and short tubes *l'* and *m'* of hard rubber or other suitable insulating material. The backwardly-extending plates *b'* are retained in place and insulated from the springs *c'* *d'* by the blocks *e'* and plates *k'*.

45 In Fig. 4, a plug is shown as being inserted into one of the jacks, so that the tube 2 of the plug is in contact with the socket *a'*, the tube 4 with the contact-spring *c'* and the piece 12 of the plug with the spring *d'* of the jack.

50 In Fig. 7, are shown the arrangements of a number of star-shaped plates which are mounted on a supporting cylinder, said plates having three arms each, to which the wires for the common jacks and the wires of the jacks used for replying, are attached. Fig. 7^a, shows an end-elevation of a group of three star-shaped plates and Fig. 7^b, a single detached plate. These star-shaped plates are punched from suitable metal and locked by means of a key to the supporting rod on which all plates are assembled, as shown in Fig. 7, a sufficient number being arranged so that the wires connected thereto can be united into one cable. The interior rod is covered with an insulating sleeve *d*³ on which are placed alternately the star-shaped plates *d*⁴ and the separating collars *d*⁵ which are retained on

the sleeve *d*³ by the key *d*⁵, which engages notches in the sleeve, plates and collars, as shown in Figs. 7 and 7^a. The three star-shaped plates of each group on the supporting rod *d*² are shifted relatively to each other, so that they assume the position shown in Fig. 7^a, whereby the stringing of the wires for each group of plates *d*⁴ is greatly facilitated.

75 In Fig. 8, is shown the electric connections of the metallic circuit of a subscriber with the common jacks on the different switch-boards I, II, III, N, of a central station, the replying jack R and the annunciator A. The two wires of the metallic circuit of a subscriber are connected with the springs *c*^x and *d*^x of the different jacks and are then connected with the annunciator, one of the wires passing to the contact *e*^x, *f*^x, which is controlled by an electro-magnet D^x. The sockets *a* of the different jacks of the same circuit are connected with each other and with the electro-magnet D^x, which latter is connected with one pole of a battery B^x, while the other pole is connected with the body of the plug, as indicated at *h*^x, Fig. 8. In the switch-board on which the annunciator and the replying-jack are arranged together with the circuit just described, the connection of the three wires of the replying jack with the three wires of the common jacks is made by a group of star-shaped plates, arranged on the cylinder M, as before described. The two wires, which come from the station of the subscriber are connected either with the springs of the jack on the switch-board I, or with those of the switch-board N, the extremities being selected for this connection so that the wires can readily be extended to new switch-boards in case such should be necessary. The battery B consists of primary or secondary cells and may be replaced by any other source of electricity, by which the current for all the different local circuits of the station is supplied in such a manner, that all the electro-magnets, such as D^x, are connected at W^x with one pole, while the other pole of the battery is connected at X^x with the body of the plugs. When a plug such as *h*^x is inserted into a jack, the local circuit of the battery is closed and the current passes from the battery through the plug to the socket *a* of the jack and to the electro-magnet D^x. The armature of the electro-magnet D^x is attracted, the contact is broken at *e*^x and the annunciator A is placed out of circuit during the time that the plug remains inserted in the jack. As soon as the plug is withdrawn, the armature of the electro-magnet D^x is dropped and the contact *e*^x *f*^x is re-established, so that the annunciator A is replaced in the circuit of the subscriber. In Fig. 8, for the sake of clearness the two wires of the metallic circuit of the plug are not shown, but they are shown in Fig. 2 and will be described later on.

The local circuit, the effect of which on the electro-magnet D^x has just been described, is also combined with other accessories in the

central station, which forms a testing circuit that is entirely independent of the telephone of the operator.

The combined conversing and listening key.—Figs. 9 to 13 show the construction of the combined key for conversing and listening. Fig. 2 shows the relative position of the combined conversing and listening key to the other parts of the station. Fig. 13 shows the position of the key when in its normal position of rest; Fig. 11, when it is set for conversation, and Fig. 12, when it is set for listening; the last three figures showing merely the different positions of the key so as to render its operation clearer. The lever l' is keyed to a square pivot l^2 , to which is also applied a block l^3 , which carries two concentric pivots l^4 and l^5 . At the lower part of the key-frame is arranged a movable insulating block l^6 , to which are attached two pairs of flat switch-springs l^7 and l^8 , the block being open in its center part and carrying a transverse pin l^9 . The insulating block l^6 is guided in its vertical movement on two pins l^{10} which are attached to the transverse insulating bottom-piece l^{11} of the key-frame. Two pairs of helical springs l^{12} are arranged at opposite sides of the block l^6 , and exert a tension on the block, which holds the same in the position shown in Figs. 9 and 10, the lower ends of the springs being attached to binding-posts l^{13} and l^{14} at the under side of the insulating-bar l^{11} . The current passes from the binding-posts l^{13} and l^{14} , by means of connecting-screws l^{15} and l^{16} to the respective switch-springs. A connecting-strap l^{17} is applied at its upper end to the pivot l^4 while its lower slotted end enters into the central opening of the block l^6 and is engaged by the fixed transverse pin l^9 . A second connecting-rod or strap l^{18} is formed of two pieces of exactly the same shape as the strap l^{17} , said pieces being applied to the pivot l^5 of the block l^3 while their lower slotted ends are extended into the central opening of the movable block l^6 and are likewise engaged by the fixed transverse pin l^9 . The connecting-strap l^{17} is provided with a laterally-extending pin l^{19} , which serves to raise a contact-spring l^{20} , which is attached at one end to the insulated block l^{21} , and the free end of which forms contact with a stud l^{22} on the insulating-block l^{23} . The connecting-strap l^{18} carries a similar pin l^{25} , which forms contact with a contact-spring l^{26} which is attached to the insulating-block l^{23} . The pins l^{19} and l^{25} are connected by their straps l^{17} and l^{18} , plug l^3 and lever l' with the metallic supporting-plate of the keys, said plate being electrically connected with the pole w^0 of the battery B^0 . The lever l' which is provided with a knob or button l^x is retained in the position of rest, shown in Fig. 13, by the tension exerted on the connecting-straps l^{17} and l^{18} by the helical springs l^{12} . By taking hold of the button l^x of the lever l' and moving the same over into the position shown in Fig. 11, the connecting-

rod l^{18} is lifted, owing to the movement of the pivot l^5 in upward direction so that the block l^6 , together with the switch-springs l^7 l^8 is raised and at the same time the pin l^{25} forms contact with the spring l^{26} . The connecting-strap l^{17} is moved in a downward direction following the oscillating motion of the block l^6 , but without exerting any special effect. As the pivot l^5 is moved beyond the dead-center of the axis of the lever l' , the lever is retained in the position shown in Fig. 11, until it is returned into the position shown in Fig. 13.

In passing the lever l' from the position shown in Fig. 13, to the position shown in Fig. 12 or into the listening position, the inverse effect is produced namely, the connecting-strap l^{17} is raised, also the block l^6 with its switch-springs, while simultaneously the pin l^{19} makes contact with the spring l^{20} and presses the latter in contact with the stud l^{22} ; but as the position for listening is necessary only for a moment, it is not necessary to move the pivot l^4 beyond the dead-center of the axis of the lever l' , so that as soon as the lever l' is released, it is returned again into the normal position shown in Fig. 13.

The diagrams, Figs. 1, 2, 2^a and 2^b, show the application of the key in combination with the circuits, which participate in the functioning of the different parts. By the contact-spring l^{20} and the disposition of the relay Q , the armature of which carries an insulated contact-spring b^2 that abuts on a contact-point b^3 , and by the combination of the listening and conversation keys into one member, a single relay only is required, and thereby the construction of the central station considerably simplified. In Fig. 2, the combined-key l' is shown in the position of conversation. P shows the plug of the calling subscriber, and P' the plug of the subscriber that is called up. Fig. 2, shows further the connections of the different members of the central station. y and z indicate the connecting-jacks of two subscribers y' and z' . They are connected with similar jacks on the other switch-boards, as was before described. y^2 is the special jack required for replying to the subscriber y' , which is connected by means of the star-shaped plates M with the wires of the common jacks. A is the annunciator of the subscriber y' and K its local electro-magnet. The special jack of the subscriber y' and his corresponding annunciator are supposed to be located on another switch-board. P is the plug of the calling subscriber and P' the plug of the subscriber called up, which is placed into its normal position of rest, on the table below the switch-board. The flexible cords of the plugs are made in the usual manner and are held on proper tension by weighted pulleys (not shown) which move over the cords. For each pair of plugs such as P and P' is required a combined conversation and listening key l' , an annunciator P^2 , for indicating the end of the conversation, with a local electro-magnet

P³. This latter is made of exactly the same construction as the local electro-magnet K of the annunciator A, but is not provided with a contact-spring.

5 Each operator attends to a certain number of pairs of plugs, with a combined conversation and listening key, a pair of calling-up keys V and v, a telephone-receiver T, an induction-coil t^o, a microphone-transmitter S and a local
10 relay Q. The calling-up keys V and v are similar in construction, their construction and arrangement being clearly understood from the diagram, Fig. 2, in which the key v is mounted above a supplementary contact-
15 plate f^o, which is not necessary for the key V.

The induction-coil t^o comprises three coils, the coil g^o for the telephone, the microphone-coil h^o and the testing-coil i^o. The latter is
20 always in open circuit except in the moment when the line already occupied is tested. A resistance r^o is placed in the circuit of the latter coil for weakening the current. w^o and x^o
25 are the wires of the primary or secondary battery, dynamo or other source of electricity B, which supplies by branch-wires the necessary current for the electro-magnet of the annu-
30 nciator P³ for indicating the end of the conversation and for the local relay Q. The poles of the calling battery are indicated by the letters m^o and n^o.

Figs. 2, 2^a, 2^b and 2^c show the different positions of the circuits during the four operating stages. In each of these figures the
35 circuits of two subscribers only are shown for the purpose of simplifying the description. It is understood, however, that each subscriber has a general jack in each table and a special jack and a calling-annunciator in one of the sections.

40 Referring to Fig. 2 it is assumed that the subscriber y' has called which is indicated by the annunciator A. The operator then places the plug P into the jack y². This produces the current from the pole x^o of the battery B^o
45 that passes through the body of the plug P to the socket of the jack y² and from the same to all the corresponding jacks in the other sections. The current passes then to the electro-magnet K which is excited and then back
50 to the other pole w^o of the battery B^o. The armature of the electro-magnet K is attracted, the contact o, r interrupted and thereby the coil of the calling-electro-magnet A placed out of circuit. The operator sets then the key V'
55 into position for conversation, takes the plug P' and touches with its core the socket of the jack z of the subscriber z' called up. The line of the subscriber z' thus called upon is shown as being already occupied in Fig. 2^a.
60 Consequently in this figure the body of the plug P' connects the socket of the jack z with the pole x^o of the battery B^o. Likewise in Fig. 2, the current of the battery enters into the core of the plug P', passes over the con-
65 versation-key V', the calling-key v, the armature a and the contact b to the relay Q, then

over the inducting-coils i^o, the resistance-coil r^o, the supporting-plate of the calling key, the supporting-plate of the conversation-key and over the wire d to the pole w^o of the battery B^o. The passage of the current to the inducting-coil i^o induces a current in the coil g^o which passes into the telephone T and produces a signal or click in the same.

It is obvious that if no plug is pressed into
75 the jack of the subscriber Z', the socket of all corresponding jacks are cut off from the pole x^o of the battery, so that at the moment of touching the socket no current passes through the plug P', so that the telephone re-
80 mains silent and indicates thereby that the line is free.

In Fig. 2^a, the operator having ascertained that the jack Z of the subscriber Z' is free, forces the plug P' into the jack, so as to es-
85 tablish communication with the subscriber 6. This figure shows the moment when in pressing down the key v the subscriber Z' is called up, which has the effect that the current of the battery m^o, n^o is sent through the plug P',
90 while at the same time by the contact v, f^o, the electro-magnet Q is cut out of circuit, the current passing the pole w^o of the battery B^o over the wire d, the supporting-plates of the conversation and calling-keys, over v, f^o and
95 the coils of the electro-magnet Q to the pole x^o of the battery B^o. This causes the armature a to leave the contact b and make contact with c. From this moment the core of the plug P' does not communicate any more with the in-
100 duction-coil i^o but with the core of the plug P. It is clear that as soon as the contact of the key v with the plate f^o is interrupted, the armature a remains still attracted, as the con-
105 tacts b², b³ close a new circuit for the current, which passes from the pole x^o over the coils of the relay Q, contacts b², b³, and over the contact l²⁵, l²⁶ to the supporting-plate of the key V' and over the wire d back to the pole w^o. Therefore
110 during the conversation of the operator with the subscribers Z' and 6, all parts remain in the positions described. It is obvious how-
115 ever, that as soon as the operator returns the key V' into its vertical position or position of rest, the contacts l²⁵ and l²⁶ are interrupted and the current does not pass any more through
120 the coils of the relay Q, so that the armature a leaves the contact c and drops back against the contact b. This latter position is shown in Fig. 2^b where the two subscribers 7 and 8
125 are in communication and in which the apparatus of the operator is cut out from the circuit of communication between the subscribers. In this position the cores of the plugs P and P' are in direct communication
130 with the contact l⁴⁰ of the conversation-key and in addition thereto the annunciator P² which indicates the end of the conversation, is in communication in the usual manner with the plugs P and P'.

When the annunciator P² indicates the end of the conversation, the operator verifies this

fact by placing the key V into the listening position, as shown in Fig. 2^c, which has the result that the telephone-circuit of the operator is switched in in place of the annunciator P^2 , while at the same time the parts l^{19} , l^{20} and l^{22} are placed in contact—that is to say, the communication of the two last contacts is established with the pole w^o over the wire d and the supporting-plate of the conversation-key. From the contact l^{22} the current passes over P^3 and then to the pole x^o , so that the signal P^2 is effaced. From the contact l^{20} the current passes through the coils of the relay Q to the pole x^o , so that the armature a is attracted and placed against the contact c , and thereby direct communication between the cores of the plugs P and P' is established. The operator then replaces the key V into its position of rest, by which the contacts l^{19} , l^{20} , and l^{22} are separated. The current can then neither pass over P^3 nor over the coils of the relay Q , so that the armature leaves the contact c and returns to the contact b by the action of its spring. It results from the foregoing description that it is not necessary to make any connection between the testing circuit and the earth, so that in consequence thereof the metallic circuits of the subscribers do not influence each other, nor is there any interfering noise that would impair the conversation. Further as the circuits of the telephones of the different operators have no connection with each other nor with the earth, these devices are entirely independent from each other and are not subject to any disturbance or confusion of sounds.

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

1. In a telephone central station, the combination, with a calling-annunciator of an electro-magnet, a local circuit for said electro-magnet, and means for automatically breaking the circuit of said electro-magnet of the annunciator and at the same time returning the drop of said annunciator, substantially as set forth.

2. In a telephone central station, the combination, with a calling-annunciator, of an electro-magnet in local circuit with said annunciator, means for automatically breaking the circuit of said electro-magnet and returning the drop of the annunciator, a plug formed of three concentric conductors, and a jack composed of a socket that is always isolated from the line and earth and two insulated contact-springs, substantially as set forth.

3. In a telephone central station, the combination of two series or rows of jacks, composed of a double row of sockets, two rows of contact-springs arranged back of said sockets, and separating blocks of insulating material provided with enlarged heads at their inner ends extending between the contact-springs of each row, and an insulating bracket arranged to support both rows of jacks, one

above and the other below said bracket, substantially as set forth.

4. In a telephone central station, the combination with a group of three star-shaped connecting-plates, shifted relatively to each other on their supporting axle, each plate being connected with the three wires in a subscriber's circuit, of jacks, composed each of a metallic socket, a pair of contact-springs and an insulating block for separating said contact-springs, and plugs formed of three concentric conductors, substantially as set forth.

5. In a telephone central station, the combination, of a combined conversation and listening key, provided with two pairs of auxiliary contacts, a local circuit connected with said auxiliary contacts, a relay in said local circuit, an armature for said relay provided with an insulated extension-arm, contacts for said armature and arm, and electric connections between said auxiliary contacts, the armature and its contacts, whereby the armature is attracted when the key is set for "conversation" or "listening" but dropped into normal or initial position when the key is placed into its position of rest, substantially as set forth.

6. In a telephone central station, the combination with the calling-up keys and the telephone of the operator, of a local circuit, a relay in said circuit, a pair of connecting-plugs of which the core of the plug of the subscriber called-up is in connection with the armature of the relay which armature is normally in said local circuit, and a special testing coil located in the induction-coil of the microphone and isolated from the line and earth, said armature being switched out of said local circuit when the relay is operated and connected with the core of the plug of the calling subscriber, substantially as set forth.

7. In a telephone central station, the combination of a combined conversation and listening key, having two pairs of auxiliary contacts, a key for the subscriber to be called up, an auxiliary contact-plate for said calling-up key, a relay, an armature for said relay having an extension-arm, a local circuit which comprises said auxiliary contacts, the coils of the relay and the contact-plate, contacts for the armature of the relay, and two connecting plugs, respectively for the calling and called-up subscribers, said auxiliary contact-plate closing the local circuit, so as to connect the cores of the plugs and attract the armature of the relay until the conversation-key is returned from its position of "conversation" or "listening" into its position of rest, substantially as set forth.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

GASTON D'ADHÉMAR.

Witnesses:

PAUL GOEPEL,
K. R. BRENNAN.