(No Model.) 4 Sheets—Sheet 1.

J. I. SABIN & W. HAMPTON.

TELEPHONE SYSTEM.

No. 536,233. Patented Mar. 26, 1895.

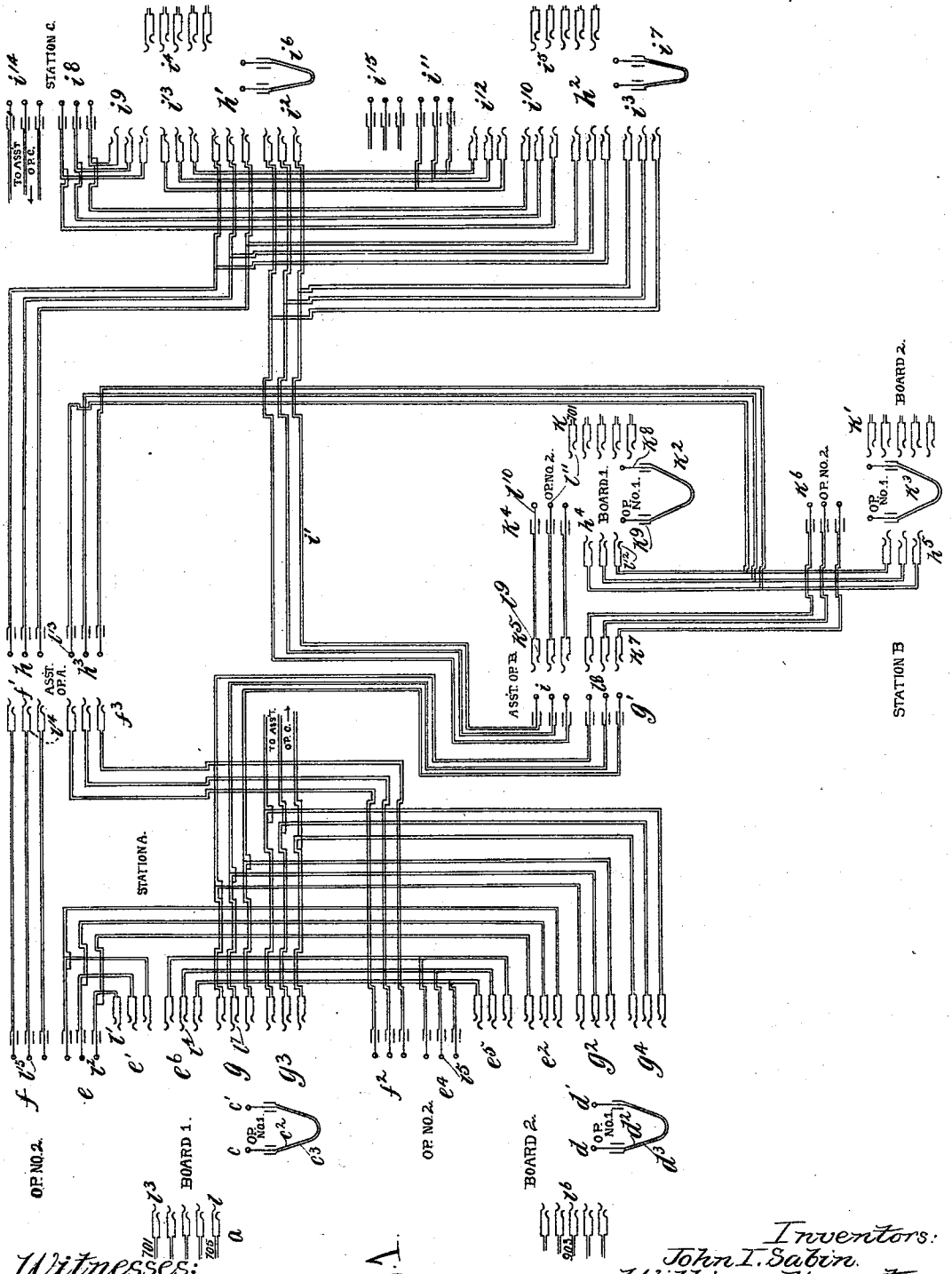


Fig. 1.

Witnesses:
George L. Cragg
De Witt C. Tanner.

Inventors:
John I. Sabin.
William Hampton.
By Borton & Brown
Attorneys.

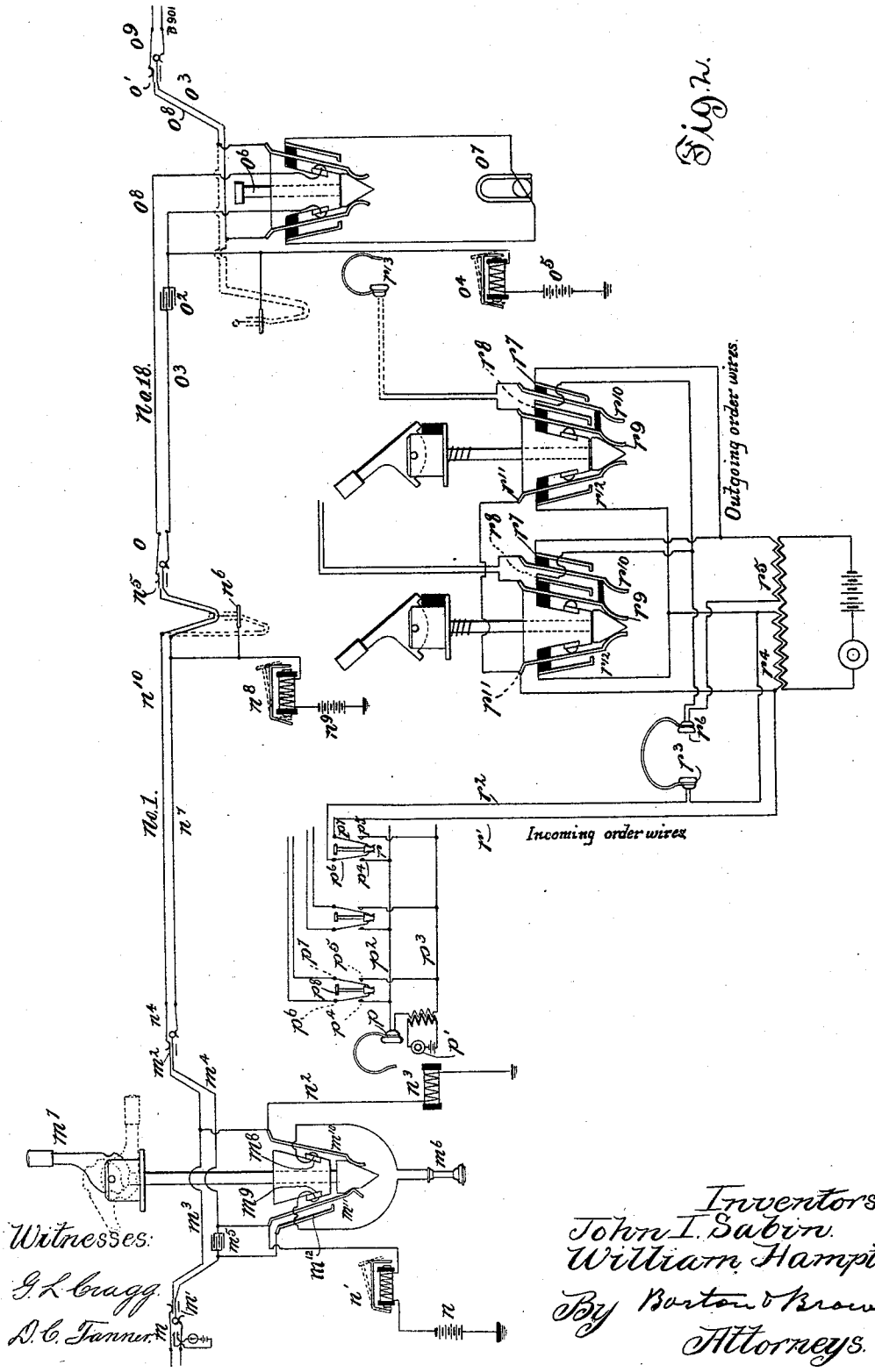
(No Model.) 4 Sheets—Sheet 2.

J. I. SABIN & W. HAMPTON.

TELEPHONE SYSTEM.

No. 536,233. Patented Mar. 26, 1895.

Fig. 2.



Witnesses:
G. L. Cragg.
D. C. Tanner.

Inventors:
John I. Sabin.
William Hampton.
By Burton & Brown
Attorneys.

(No Model.) 4 Sheets—Sheet 3.

J. I. SABIN & W. HAMPTON.

TELEPHONE SYSTEM.

No. 536,233. Patented Mar. 26, 1895.

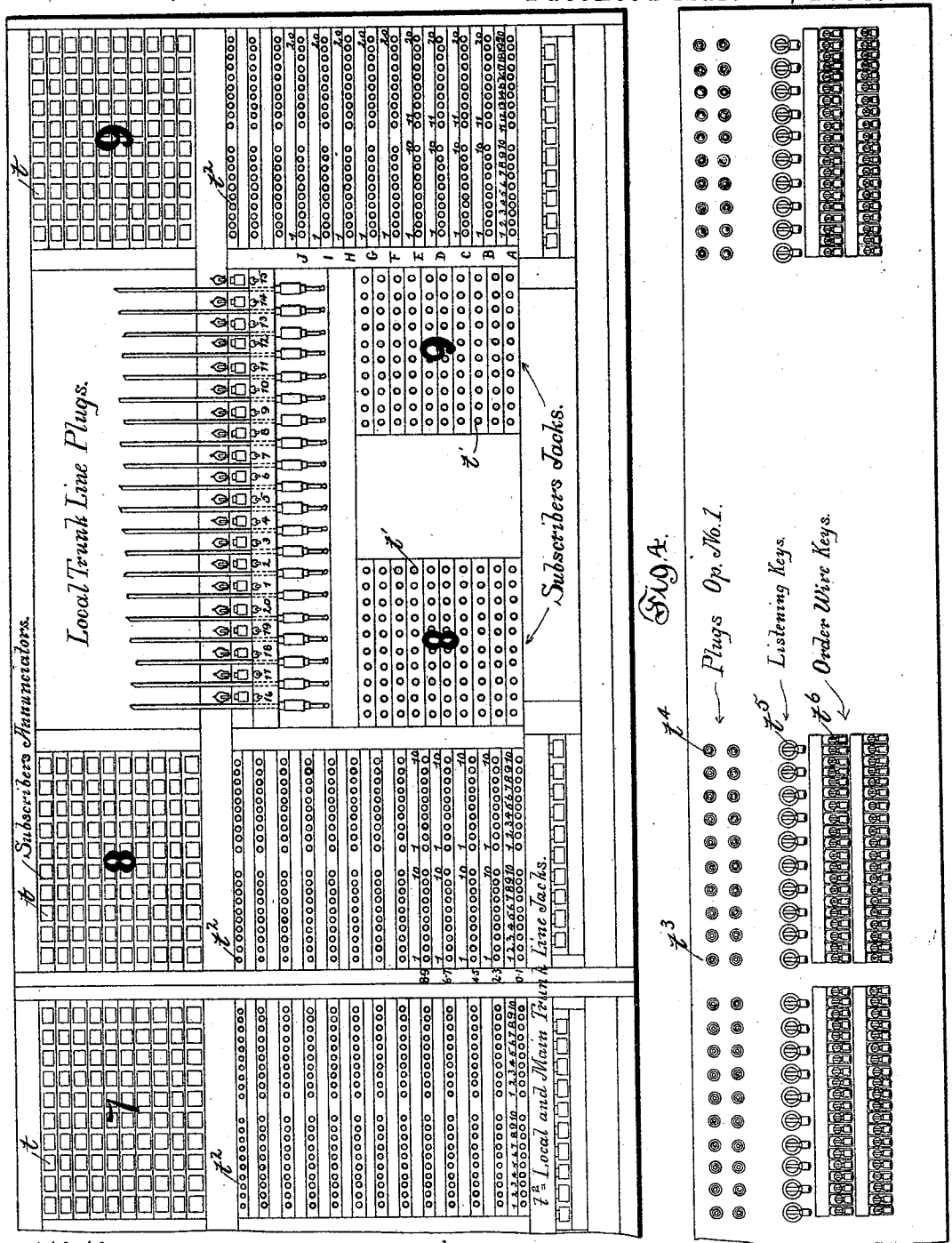


Fig. 3.

Fig. 4.

Witnesses:
George L. Cragg.
DeWitt C. Tanner.

Inventors:
John I. Sabin.
William Hampton.
By Barton & Brown.
Attorneys.

(No Model.) 4 Sheets—Sheet 4.

J. I. SABIN & W. HAMPTON.

TELEPHONE SYSTEM.

No. 536,233. Patented Mar. 26, 1895.

Fig. 5.

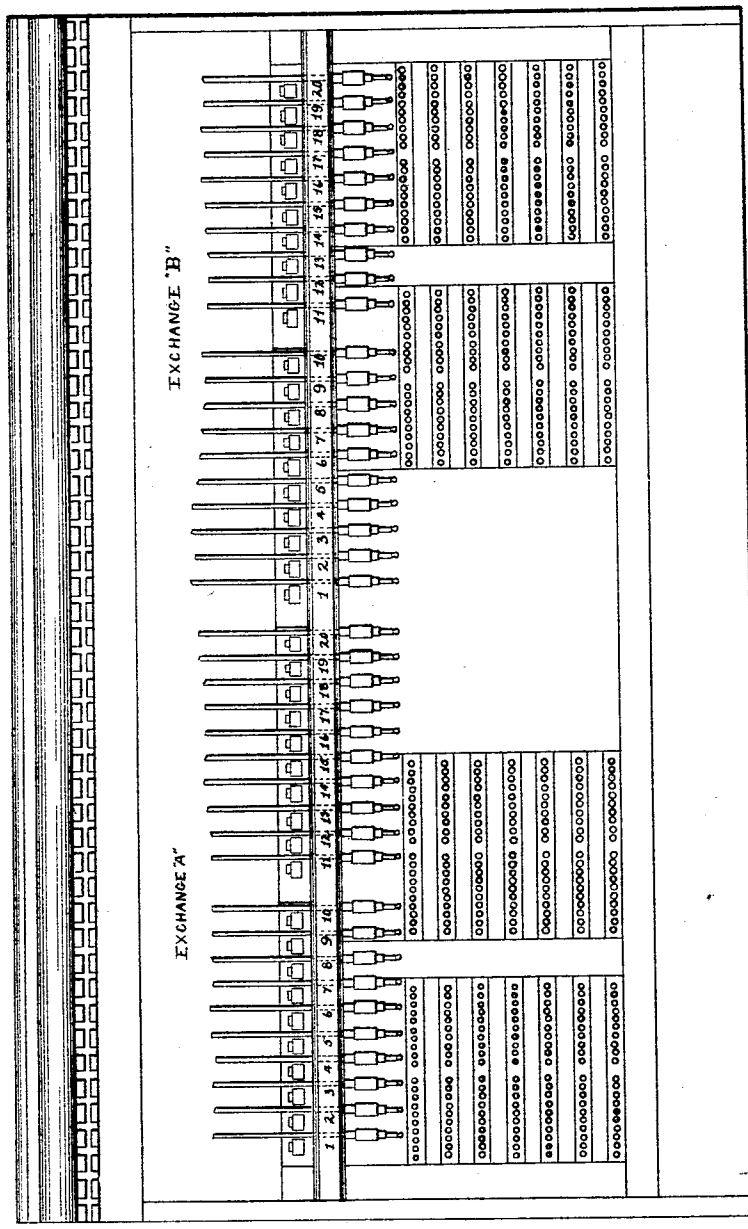
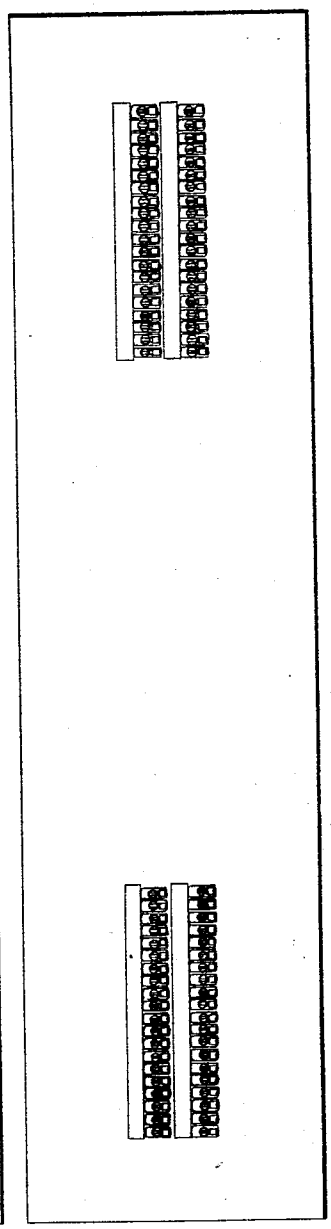


Fig. 6.



Witnesses:
George L. Cragg.
De Witt C. Tanner.

Inventors:
John I. Sabin.
William Hampton.
By Burton Brown,
Attorneys.

UNITED STATES PATENT OFFICE.

JOHN I. SABIN AND WILLIAM HAMPTON, OF SAN FRANCISCO, CALIFORNIA.

TELEPHONE SYSTEM.

SPECIFICATION forming part of Letters Patent No. 536,233, dated March 26, 1895.

Application filed November 9, 1894. Serial No. 528,325. (No model.)

To all whom it may concern:

Be it known that we, JOHN I. SABIN and WILLIAM HAMPTON, citizens of the United States, residing at San Francisco, in the county of San Francisco and State of California, have invented a certain new and useful Improvement in Telephone Systems, (Case No. 12,) of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

Our invention relates to a telephone system, and more particularly to a system to be used in connection with divided boards.

The object of our invention is to facilitate the making of connection between subscribers, and to decrease the time required for making such connection.

In the preferred embodiment of our invention the incoming spring jacks are divided up among a number of boards, according to the divided board plan. That is, the spring jacks belonging to, say, two hundred subscribers, will terminate at one of the boards, while the spring jacks belonging to another two hundred subscribers will terminate at a second board, and so on. At each board a series of spring jacks is provided, the spring jacks being connected through trunk lines. At each board is stationed an operator whose duty it is to receive the incoming calls of the subscribers of her board and make connection by means of a pair of plugs and cord between the subscriber's line and one of the trunk lines, which will be used in completing the connection with the called subscriber. If the called subscriber be at her own board, she will insert one of the plugs of her cord set in the spring jack of the calling subscriber, and the other plug in a trunk line spring jack which terminates at that same board in a trunk line plug. At each board is provided a second operator whose duty it is to attend to the trunk line plugs only. The second operator takes up the plug corresponding to the trunk line which has been connected with the calling subscriber, and inserts the same in the spring jack of the called subscriber, thus completing the circuit between the calling and the called subscribers. If the called subscriber be at another board of the exchange, the first operator—whom we will hereinafter designate as operator No. 1—after inserting a plug in the spring jack of the calling subscriber, inserts its mate in the spring jack of a trunk line extending to a plug at the board of the called subscriber, and the second operator thereat—whom we will hereinafter designate as operator No. 2—picks up this plug and inserts it into the spring jack of the called subscriber. If the called subscriber be at a different exchange, operator No. 1 will insert the second plug of her pair into a spring jack which terminates in a plug at the distant exchange on the board of an intermediate operator—who will be designated hereinafter as the assistant operator. The assistant operator inserts the plug in a spring jack of a trunk line which terminates in a plug at the board of the called subscriber, and operator No. 2 at his board inserts the plug in the spring jack of the called subscriber, thus completing the connection between the calling and the called subscribers.

In order that the operator No. 1 may know into which particular spring jack of a set her second plug should be inserted, talking circuits are provided, by means of which she may switch herself into communication with operator No. 2 at her own board, or with operator No. 2 at any other board of the exchange, or with the assistant operator. The trunk lines which extend between the boards of a single exchange, or between the boards of an exchange and the board of the assistant operator at that exchange, we designate as local trunks, and in the system we have illustrated herein ten local trunk line plugs are provided at each board which are connected in multiple at each of the other boards of that exchange with a series of ten spring jacks. A second set of ten local trunk line plugs are provided at each board and extend to a series of ten spring jacks provided at the assistant operator's station. At the assistant operator's station are provided, besides the series of local trunk spring jacks—one series for each of the boards at that exchange—a number of plugs connected with main trunk lines extending to the other exchanges.

In the system illustrated herein we provide at the assistant operator's board a series of twenty main trunk line plugs extending to each of the exchanges of the system, each of the trunk lines being connected with a spring

jack upon each of the boards at the distant exchange.

We will describe our invention more in detail in connection with the accompanying drawings, in which—

Figure 1 is a diagram of a telephone system embodying our invention. Fig. 2 is a diagram illustrating the subscribers' apparatus. Fig. 3 is a view of the vertical portion of the switch board provided at one of the sections of the divided board system, as employed in practice. Fig. 4 is a view of the horizontal portion of the board. Fig. 5 is a similar view of the vertical portion of the assistant operator's board. Fig. 6 is a view of the horizontal portion thereof.

Like letters and numerals refer to like parts in the several figures.

Referring more particularly to Fig. 1, the subscribers' lines terminate in spring jacks provided at several boards. For instance, the subscribers whose numbers run from six hundred to seven hundred and ninety-nine, terminate in spring jacks a provided at board 1, while the subscribers whose numbers run from eight hundred to nine hundred and ninety-nine terminate in spring jacks provided at another board, there being as many divided boards at the exchange as there are multiples of two hundred subscribers connected with the exchange. At each of the divided boards is provided a number of pairs of plugs and cords, a pair of plugs c c' connected by the strands c^2 c^3 being shown at the first board, while a pair of plugs d d' connected by strands d^2 d^3 are shown at the second board. At the first board is shown a series of plugs e, which are connected with a series of spring jacks e' provided at the first board, and also with a series of spring jacks e^2 provided at the second board. If there are more than two boards in the exchange a series of spring jacks is similarly provided at each of the other boards, and connected with the plugs e. Likewise upon the second board is provided a series of plugs e^4 connected with a series of spring jacks e^5 at the second board, and with a series of spring jacks e^6 at the first board; similar series of spring jacks being provided at each of the other boards of the exchange if there be more than two. A series of plugs f is provided at the first board and extends to spring jacks f' provided upon the board of the assistant operator of the exchange A. Likewise a series of plugs f^2 is provided at the second board and extends to a series of spring jacks f^3 at the board of the assistant operator A. Upon the first board a series of spring jacks g is provided, connected with main trunk lines extending to the plugs g' provided at the board of the assistant operator B. A corresponding series of spring jacks g^2 provided at the second board, and connected with the same set of trunk lines extending to the plugs g' at the board of the assistant operator B. Spring jacks g^3 are provided at the first board extending to a series of plugs at the board of assistant operator C, a similar series of spring jacks g^4 being provided at the second board and connected with the same set of trunk lines. For clearness the station of the assistant operator C is not shown in Fig. 1.

At the board of assistant operator A are provided plugs h which extend to spring jacks h' at the first board of station C and to spring jacks h^2 at the second board, the spring jacks being thus multipled upon each board at station C. Likewise plugs h^3 are provided at the board of assistant operator A and are connected through trunk lines with spring jacks h^4 at the first board of station B, and with spring jacks h^5 at the second board of station B, being thus multipled upon each of the boards at station B.

The plugs i are provided at the board of assistant operator B and are connected through trunk lines i' with spring jacks i^2 at the first board of station C, and with spring jacks i^3 at the second board of station C, being thus multipled upon each of the boards at station C. The subscribers' lines extending to board 1 at station C terminate in spring jacks i^4, while the subscribers' lines extending to the second board at station C terminate in spring jacks i^5. At the first board is provided the cord set i^6 of operator No. 1, and at the second board is provided the cord set i^7 of operator No. 1 at that board. At the first board of station C is provided a series of plugs i^8 which extends to a series of spring jacks i^9 at the first board and a series of spring jacks i^{10} at the second board. Likewise at the second board is provided a series of plugs i^{11} extending to a series of spring jacks i^{12} at the second board, and a series of spring jacks i^{13} at the first board. A series of plugs i^{14} extends from the first board to spring jacks provided at the station of assistant operator C, said station being omitted from the drawings for clearness. Likewise a series of plugs i^{15} at the second board is connected with a series of spring jacks upon the board of the assistant operator C.

The subscribers' lines extending to the first board at station B terminate in a series of spring jacks k, while the subscribers' lines extending to the second board terminate in a series of spring jacks k'. At board 1 is provided the operator's set k^2, and at board 3 is provided a similar set k^3. At the first board is provided a series of plugs k^4 extending to a series of spring jacks k^5 at the board of assistant operator B. Likewise, a series of plugs k^6 extend from the second board to a series of spring jacks k^7 at the board of assistant operator B. The other series of plugs and spring jacks at station B are omitted for clearness.

We will now describe the manner of making connection between a calling and a called subscriber.

Suppose the subscriber No. 705, whose line terminates in a spring jack at the first board of station A, desires connection with the sub-

scriber No. 701 whose line terminates at the same board. The calling subscriber removes his telephone from its hook and thus conveys to the central station the call for connection. We have not illustrated the calling feature in the present instance, but prefer to employ the arrangement of circuits for the calling apparatus as described in Letters Patent No. 518,331, dated April 17, 1894. Operator No. 1 at the first board noting the signal conveyed by the individual indicator of the calling subscriber, inserts one of the plugs *c* of her cord set in the spring jack *l* of the calling subscriber No. 705. She then bridges her telephone into circuit and receives the number of the called subscriber—701. Noting by the number that the called subscriber is connected at her own board she depresses a key to throw herself into speaking communication with operator No. 2 at her own board, and repeats the number, "701." Operator No. 2 informs operator No. 1 as to what local trunk line will be employed for making the connection, and supposing the trunk line to be No. 1 she will reply merely "one." Operator No. 1 will then insert the remaining plug *c'* of her cord set in the spring jack *l'* of local trunk No. 1. Operator No. 2 then takes up the plug l^2 belonging to local trunk line No. 1 and inserts it in spring jack l^3 of the subscriber No. 701, thus completing the connection between the calling and called subscribers. Suppose, however, the calling subscriber, 705, instead of desiring connection with a subscriber at his own board, desires connection with a subscriber at the second board, say subscriber No. 903. After operator No. 1 bridges her telephone into circuit with the calling subscriber and receives the number "903," she throws herself into communication with operator No. 2 at the second board, and repeats the number "903." Operator No. 2 then informs her of the number of the trunk line to be used for making the connection; and supposing trunk line No. 2 is to be employed she merely says "two." Operator No. 1 at the first board then inserts plug *c'* in spring jack l^4 of the trunk line No. 2, and operator No. 2 at the second board takes up the plug l^5 of trunk line No. 2 and inserts it in spring jack l^6 of subscriber No. 903, thus completing the connection.

Suppose the calling subscriber desires connection with a subscriber at another station, say subscriber No. 701 whose line terminates at the first board of station B; operator No. 1 at the first board of station A after having received the number, "B 701," of the called subscriber, and knowing that the subscriber's line thus terminates at station B, throws herself into communication with the assistant operator at station B and repeats the number, "701." Assistant operator B informs her as to what trunk line may be used in making the connection, and supposing trunk line No. 2 is to be employed, she merely says "two." The operator No. 1 at the first board of station A then inserts her plug *c'* in spring jack l^7 belonging to main trunk line No. 2. The assistant operator B then throws herself into communication with operator No. 2 at the first board of station B and repeats the number "701." Operator No. 2 then informs her what local trunk line will be used in making the connection, and supposing trunk line No. 11 is to be employed, says merely "eleven." The assistant operator B then inserts the plug l^8 belonging to the main trunk line No. 2 into spring jack l^9 of the local trunk line No. 11, and operator No. 2 inserts the plug l^{10} into spring jack l^{11} of the called subscriber No. 701, thus completing the connection.

Should a subscriber at station B desire connection with a subscriber at station A, the connection would have to be made through the board of assistant operator A. Thus suppose subscriber No. 701 at the first board of station B desires connection with subscriber No. 705 at the first board of station A; the subscriber 701 having called, operator No. 1 at the first board of station B inserts one of her plugs k^8 in spring jack l^{11} of subscriber 701, and then throws herself into communication with assistant operator A, who informs her as to the number of the trunk line to be employed in making the connection. Supposing the trunk line to be No. 3, the other plug k^9 of her set is inserted in spring jack l^{12} of main trunk line No. 3. Assistant operator A throws herself into communication with operator No. 2 at the first board, and, being informed that local trunk line No. 12 will be employed for making the connection, inserts plug l^{13} of main trunk line No. 3 into the spring jack l^{14} of local trunk No. 12. Operator No. 2 at the first board then takes up the plug l^{15} and inserts it in spring jack *l* of the called subscriber,—705, thus completing the connection. The operator No. 1 at each board thus attends only to the calls sent by the calling subscribers and makes connection between the line of the calling subscriber and the trunk line which is to be employed in completing the connection, the connection being completed by an operator No. 2. If the calling and the called subscribers are both connected with the same exchange, but two operators are required to make the connection—that is an operator No. 1 and an operator No. 2. If, however, the calling and called subscribers be connected with different stations, three operators are required for making the connection,—that is, an operator No. 1, an assistant operator at the station of the called subscriber, and an operator No. 2.

We will now describe in detail, by reference to Fig. 2, the central station apparatus employed in making connection between the subscribers.

The subscriber's line terminates in a spring jack *m* upon the board, a battery and individual indicator being included in a bridge between the two limbs of the line, the indicator being operated when the subscriber removes

his telephone from its hook, as described in the Letters Patent hereinbefore referred to. The operator's plugs m' m^2 are connected by a sleeve strand m^3 and a tip strand m^4, a condenser m^5 being included in the tip strand m^4. The operator's telephone set m^6 is adapted to be bridged between the two strands m^3 m^4 when the lever m^7 is thrown to the left, as shown in dotted lines, the contacts m^8 m^9 connected to the opposite sides of the telephone set being thereby brought into connection with the springs m^{10} m^{11} which are connected, respectively, to the opposite strands m^3 m^4. A contact m^{12} is provided, adapted to make contact with the spring m^{11} when the lever m^7 occupies its position to the right, as shown in dotted lines, to thereby short-circuit the condenser m^5. Between the tip strand m^4 and ground is provided a battery n and a self-restoring indicator n', while a ground connection n^2 is provided from sleeve strand m^3, a coil n^3 being preferably included in the ground connection to balance the line. The main trunk line No. 1 extends from a spring jack n^4 to a plug n^5 normally resting in a socket n^6 at the station of the assistant operator. In a ground connection from the tip strand n^7 of the trunk line is provided a self-restoring indicator n^8 and a battery n^9. The plate or socket n^6 upon which the plug n^5 normally rests is connected with tip strand n^7 of the trunk line, and makes connection with the sleeve of the plug n^5, to thus close the tip strand n^7 and the sleeve strand n^9 together when the plug n^5 rests in its socket. When the plug m^2 is inserted in the spring jack n^4 of the main trunk line, the circuit of battery n^9 is closed through the indicator n^8, tip strand n^7 of the trunk line, tip strand m^4 of the cord set, through the calling subscriber's telephone line to the sleeve strand m^3 to ground by the ground connection n^2. The local trunk line No. 18 terminates in a spring jack o at the board of the assistant operator, and in a plug o' at one of the divided boards of the exchange, a condenser o^2 being included in circuit in the tip strand o^3 of the line. In a ground connection from the tip strand o^3 is provided a self-restoring indicator o^4 and a battery o^5. A key o^6 is provided, adapted, when depressed, to bridge the calling generator o^7 between the tip strand o^3 and the sleeve strand o^8. The spring jack o^9 is connected with the subscriber's sub-station apparatus, preferably in accordance with the Letters Patent hereinbefore referred to.

When the calling subscriber removes his telephone from its hook, the individual indicator is operated, and operator No. 1, observing the indication, inserts one of the plugs m' of her cord set in spring jack m of the calling subscriber. She then throws the lever m^7 to the left, as shown in the drawings, to bridge her telephone set m^6 into circuit and receive the number of the called subscriber; and supposing the number of the called subscriber to be 901 at station B, she hears "B 901." She then throws the lever m^7 to a vertical position to cut out her telephone set and throws herself into communication with the assistant operator at station B, and repeats the number "901." The assistant operator B then informs her as to the number of the main trunk line to be employed, and in the present instance merely says "one." Operator No. 1 then inserts plug m^2 in spring jack n^4. Until the assistant operator lifts plug n^5 from its socket n^6, the circuit of battery n is closed through the indicator n', tip strand m^4 of the pair of plugs, tip strand n^7 of the trunk line to the socket or plate n^6, thence to the sleeve of plug n^5, through the sleeve strand n^{10} of the trunk line to the sleeve strand m^3 of the pair of plugs, and to ground by the connection n^2. The indicator n' is thus actuated. As soon as the assistant operator removes the plug n^5 from the socket n^6, the circuit of battery n is opened and the indication of the indicator n' is changed to inform operator No. 1 that the assistant operator has completed the connection. The operator No. 1 then throws the lever m^7 to the right, thus bringing the spring m^{11} into engagement with the contact m^{12}, and thus short-circuits the condenser m^5. The indicator n' is now in a bridge between the strands m^3 m^4 of the cord set and may serve as the clearing out indicator of the calling subscriber, circuit being traced from the battery n, through the indicator n', spring m^{11}, contact m^{12}, tip strand m^4, over one limb of the subscriber's telephone line, back by the other limb to the sleeve strand m', and thence by the ground connection n^2 to ground, and back to the battery n. When the assistant operator receives the number 901 of the called subscriber, she throws herself into communication with the operator No. 2 at the board at which the line of subscriber 901 terminates, and repeats the number "901." Operator No. 2 choosing local trunk line No. 18 for completing the connection, says merely "eighteen." The assistant operator then inserts the plug n^5 in the spring jack o of trunk line No. 18, and operator No. 2 inserts the plug o' in spring jack o^9 of subscriber 901. She then depresses the key o^6, thus sending calling currents from the generator o^7 through the bell of the called subscriber.

When the lines of two hundred subscribers terminate at each of the divided boards, the lines from eight hundred to nine hundred and ninety-nine thus terminating at one board it will only be necessary in calling for a number between eight hundred and nine hundred to give the tens and units, omitting the hundreds. Thus, if the called subscriber be 831, the number 31 alone need be repeated, while if the number of the called subscriber be 931, the whole number—931—should be repeated. If but one hundred subscribers are provided at each of the boards it would be necessary in all cases only to repeat the tens and units of each number.

During the conversation the circuit of battery o^5 is closed through the indicator o^4, tip

strand o^8 of the local trunk line, one limb of the subscriber's line, through his sub-station apparatus, and back through the other limb of his line to the sleeve strand o^9, thence to the sleeve strand n^{10} of the main trunk line to the sleeve strand m^3 of the cord set, through the ground connection n^2 to ground. The conversation having been completed the subscribers hang up their telephones, thus opening the circuit through the sub-stations. The circuit of battery o^5 is thus opened and indicator o^4 conveys to operator No. 2 the information that disconnection is desired, and she removes plug o' from the spring jack o^9. Likewise the circuit of battery n is opened and the indicator n' conveys to the operator No. 1 the signal for disconnection, whereupon she removes plugs m' m^2 from the spring jacks in which they have been inserted. The replacing of the subscriber's telephone on its hook opens the circuit of battery n^9 and the indicator n^8 is thereby caused to convey the signal for disconnection to the assistant operator, who removes the plug n^5 from the spring jack o of the local trunk line and replaces the plug in its socket n^6.

During conversation the battery n^9 and indicator n^8 are in a circuit which may be traced through tip strands n^7 and m^4 to the subscriber's line and back through sleeve strand m^3 to ground by ground connection n^2.

We will now describe in detail the manner in which the talking circuits or order wires are connected between the telephone sets of the several operators.

Receiver p and transmitter p' of the operator No. 1, who manipulates the plugs m' m^2, are connected in circuit with a pair of limbs or mains p^2 p^3. The contact points p^4 p^5 of a series of switches are connected, respectively, with the mains p^2 p^3. Springs p^6 p^7 are adapted to make contact with the contacts p^4 p^5 when a plunger p^8 is depressed. The springs p^6 p^7 of one of the switches are connected in circuit with the telephone set of operator No. 2 at the same board. The springs of other switches are connected in circuit, respectively, with the telephone sets of each of the other operators No. 2 at that station. Likewise the springs of a switch are connected in circuit with the telephone sets of each of the assistant operators of the system; that is, the springs of one switch will be connected in circuit with the assistant operator at exchange B; the springs of another switch with the assistant operator at exchange C, and so on. Thus there are as many keys as there are divided boards at that exchange plus the number of distant exchanges. When the operator No. 1 wishes to place herself in communication with any of the operators No. 2, or with the assistant operators, she depresses the plunger of the switch belonging to that operator and thus throws her telephone set into communication therewith. As illustrated, the springs p^6 p^7 of switch r are connected by limbs r' r^2, with the receiver r^3 and the secondary r^4 of the induction coil of the transmitter of assistant operator B. A second secondary coil r^5 is provided in connection with the primary of the transmitter induction coil and is connected in circuit with the receiver r^6, the secondary r^4 and the receiver r^3 being connected with the incoming order wires, while the secondary r^5 and the receiver r^6 are adapted to be connected in circuit with the outgoing order wires. One side of the circuit containing the induction coil r^5 and receiver r^6 is connected with the contacts r^7 of the switches, while the other side is connected with the contacts r^8. Springs r^9 r^{10}, connected with the opposite sides of the outgoing order wires, are adapted, when the plunger of a switch is depressed, to make connection with the contacts r^7 r^8, thus looping the induction coil r^5 and the telephone receiver r^6 into circuit with the outgoing order wire, the switch of which is actuated. The opposite ends of the induction coil r^4 are connected, respectively, with a contact r^{11} and a spring r^{12} upon each of the switches, so that when the plunger is depressed the secondary coil r^4 is shunted about a short-circuit, which may be traced through the contact r^{11} and spring r^{12}. The springs r^9 r^{10} of the switch to the right, are shown connected in circuit with the telephone set of the operator No. 2 at the board of the called subscriber.

When operator No. 1 at the board of the calling subscriber receives the number of the called subscriber, she depresses the plunger of switch r, thus looping her telephone set into circuit with the receiver r^3 of the assistant operator, and repeats the number of the called subscriber. The assistant operator having determined which of the trunk lines she will employ in effecting the connection, informs operator No. 1 as to the number of the chosen trunk line. The assistant operator then depresses the plunger of the switch to the right, thus short-circuiting the induction coil r^4 and looping the induction coil r^5 and receiver r^6 into circuit with the telephone set r^{13} of the operator at the board of the called subscriber, and informs her as to the number of the called subscriber. The operator No. 2 having determined what trunk line will be used, informs the assistant operator as to its number.

We have illustrated two receivers, p and m^6, for the operator No. 1 in order to prevent confusion in the drawings, but in practice, but a single receiver would be provided for the operator.

In Figs. 3 and 4 we have illustrated the operator's board as employed in practice, the individual indicators t of the subscribers whose lines terminate in the spring jacks t' being placed upon the upper part of the board, while said spring jacks t' are placed near the lower part, whereby they may be readily reached. To the side of the spring jacks t' are provided the spring jacks t^2 in which the local and main trunk lines terminate. Above the incoming spring jacks t' are provided the plugs of the local trunk lines; the plugs num-

bered 1 to 10 being connected with the spring jacks upon the divided boards, while the plugs 11 to 20 are connected with the spring jacks at the station of the assistant operator. The spring jacks of the local trunk lines are numbered from 1 to 10, as indicated, while in the margin are placed figures to indicate hundreds. Thus, opposite the first row are placed the figures 0—1, indicating that these are the trunk lines which extend to plugs at the divided board at which the lines of the subscribers numbering from one to one hundred and ninety-nine, terminate. Opposite the second row are provided the figures 2—3, which indicate that the spring jacks extend to a series of plugs at the divided board at which terminate the lines of the subscribers numbering from two hundred to three hundred and ninety-nine, and so on. The main trunk lines are numbered from one to twenty, and in the margin is placed the letter indicating the station to which the spring jacks are connected. Upon the horizontal portion of the board, as shown in Fig. 4, are provided the plugs t^3 t^4 which are manipulated by the operator No. 1. Upon this portion of the board are also provided the listening keys t^5, by means of which the operator No. 1 bridges her telephone set into circuit with the calling subscriber. Keys t^6 are provided by means of which the operator No. 1 may connect her telephone set in circuit with the order wire of the operator No. 2 at any of the boards; or with any of the assistant operators.

In Figs. 5 and 6 is illustrated the board of the assistant operator, the spring jacks of the local trunk lines being placed at the lower portion of the board, while above are arranged in a row the main trunk line plugs,—twenty for each of the distant exchanges. Upon the horizontal portion of the board, as shown in Fig. 6, are provided the order wire keys, by means of which the assistant operator may connect her telephone set in circuit with the telephone set of the other operators.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In a telephone system, the combination with telephone lines extending in groups to divided boards of an exchange, each group to a separate board, of a local trunk line plug provided at one of said boards and adapted to be inserted in the switch of a called subscriber, switches, one at each of said boards connected in circuit with said local trunk line plug, and means for connecting the line of a calling subscriber at any one of said boards with the switch thereat to complete circuit between a calling and a called subscriber.

2. In a telephone system, the combination with telephone lines extending in groups to divided boards of an exchange, each group to a separate board, of a trunk line terminal at one of said boards adapted to be connected in circuit with the line of a called subscriber, and connected through a local trunk line with trunk line terminals multipled upon each of the divided boards, said last mentioned terminals being adapted to be connected in circuit with the line of a calling subscriber at the particular board.

3. The combination with a telephone line terminating upon a divided board of the exchange, of a trunk line extending between said divided board and the board of an auxiliary or intermediate operator, and adapted to be connected with said telephone line to extend the circuit to the auxiliary board, a telephone line terminating upon a second divided board, a trunk line extending between said second divided board and the board of said auxiliary operator and adapted to be connected with said telephone line to extend the circuit to the auxiliary board, and means at the board of the auxiliary operator for uniting the two trunk lines, substantially as described.

4. In a telephone system, the combination with a telephone line extending to a board at the central station and terminating in a switch thereon, of a local trunk line plug at said board, a switch at an auxiliary or assistant operator's board connected with said local trunk line plug, a telephone line extending to a board at a distant exchange, and a main trunk line extending between a plug at said auxiliary board and a switch at the board of the distant exchange.

5. In a telephone system, the combination with telephone lines extending to divided boards at the central station, and terminating in switches thereat, of a local trunk line plug at each of said divided boards, switches at an auxiliary or assistant operator's board and connected one with each of said local trunk line plugs, a main trunk line plug at said auxiliary board, and switches, one at each of the divided boards of a distant exchange and connected in circuit with said main trunk line plug, substantially as described.

6. In a telephone system, the combination with telephone lines extending to divided boards at the central station and terminating in switches thereat, of a local trunk line plug at each of said boards and connected in circuit with a switch at each of said boards, a local trunk line plug at each of said boards connected in circuit with a switch at an auxiliary or assistant operator's board, a switch upon each of said boards connected with a main trunk line extending to a distant exchange, and a main trunk line extending from a plug at said auxiliary board to a distant exchange, substantially as described.

7. The combination with a cord set adapted to be looped into circuit with a subscriber's line, of a battery in a bridge between the strands of said cord set, an indicator in circuit with said battery, a condenser in one strand of said cord set, whereby said indicator may be controlled from one end of the cord set only, and means for shunting said condenser to throw said indicator under con-

trol from the opposite end of the cord set, substantially as described.

8. The combination with a trunk line terminating in a switch at one end, and in a plug at the other end, of a socket in which said plug normally rests to close together the tip and sleeve strands of the trunk line, a cord set adapted to be looped into circuit with said trunk line, a battery in a bridge between the opposite limbs of the circuit thus formed, and an indicator in circuit with the battery, the circuit of said battery being opened when said plug is removed from its socket to actuate said indicator, substantially as described.

9. The combination with the plunger of a switch having three positions of rest, of a condenser adapted to be included in circuit when said plunger occupies one of its positions, means for shunting said condenser when said plunger occupies a second position, and an operator's telephone set adapted to be cut into circuit when said plunger occupies a third position, substantially as described.

10. The combination with a transmitter provided with two secondary coils, of an incoming order wire connected in circuit with one of said coils, an outgoing order wire adapted to be connected in circuit with the other coil, but normally disconnected therefrom, a switch for connecting said outgoing order wire in circuit with its coil, and a short circuit adapted to be closed about the transmitter coil of the incoming order wire when said switch is actuated.

11. In a telephone system, the combination with telephone lines extending in groups to a series of divided boards, each group to a separate board, of trunk lines extending between each of said divided boards and the board of an intermediate operator, telephone lines extending in groups to a second series of divided boards, and trunk lines extending between the board of said intermediate operator and said second series of divided boards, whereby connection between a line terminating at a divided board of one series may be made with a line terminating at a board of the second series through the board of said intermediate operator, substantially as described.

In witness whereof we hereunto subscribe our names this 30th day of October, A. D. 1894.

JNO. I. SABIN.
WILLIAM HAMPTON.

Witnesses:
M. COUCHOT,
JNO. A. MALLON.