

W. W. DEAN.

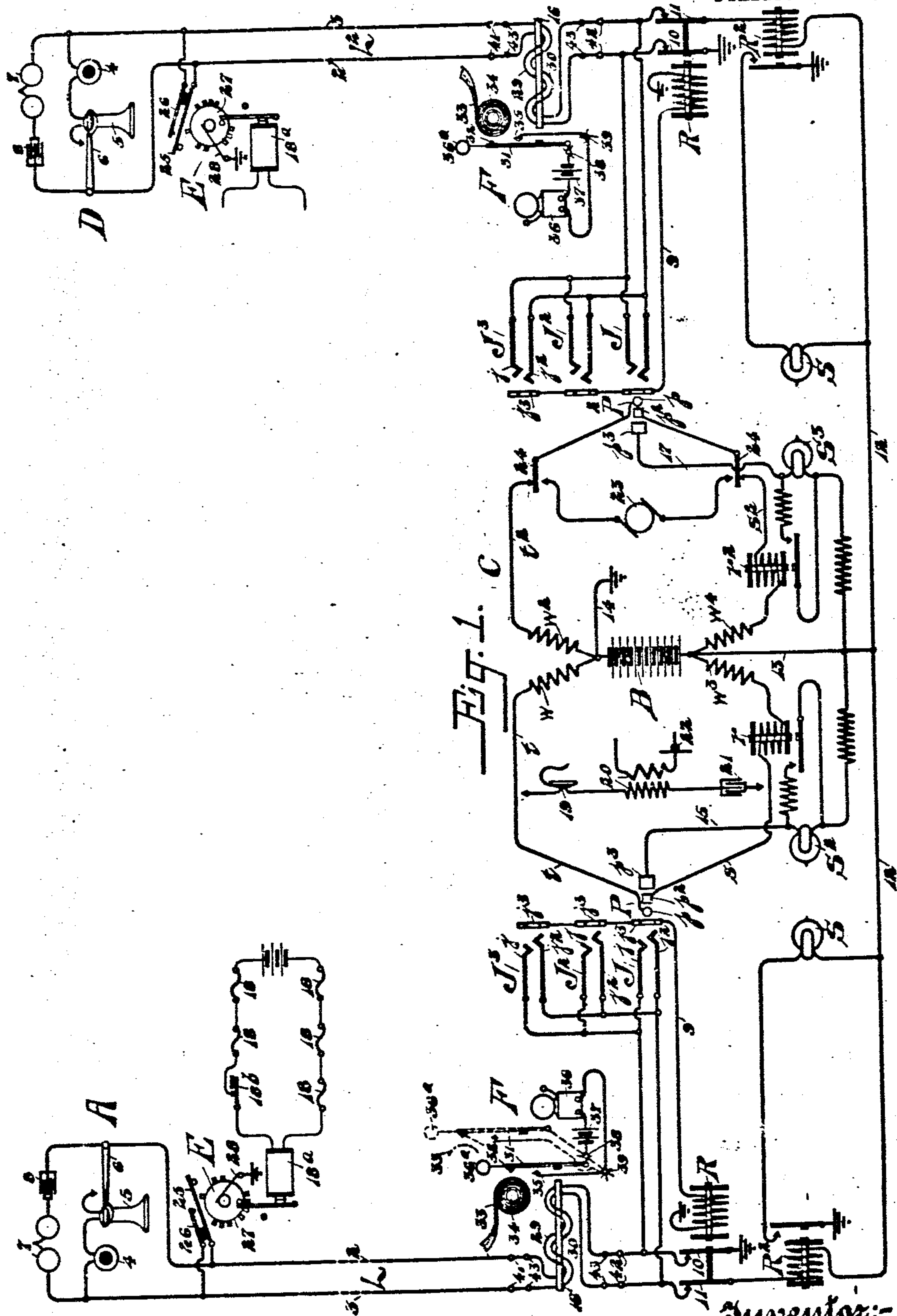
COMBINED TELEPHONE AND ALARM OR KINDRED SERVICE SYSTEM.

APPLICATION FILED APR. 30, 1903.

Patented Aug. 9, 1910.

967,113.

2 SHEETS-SHEET 1.



Witnesses.

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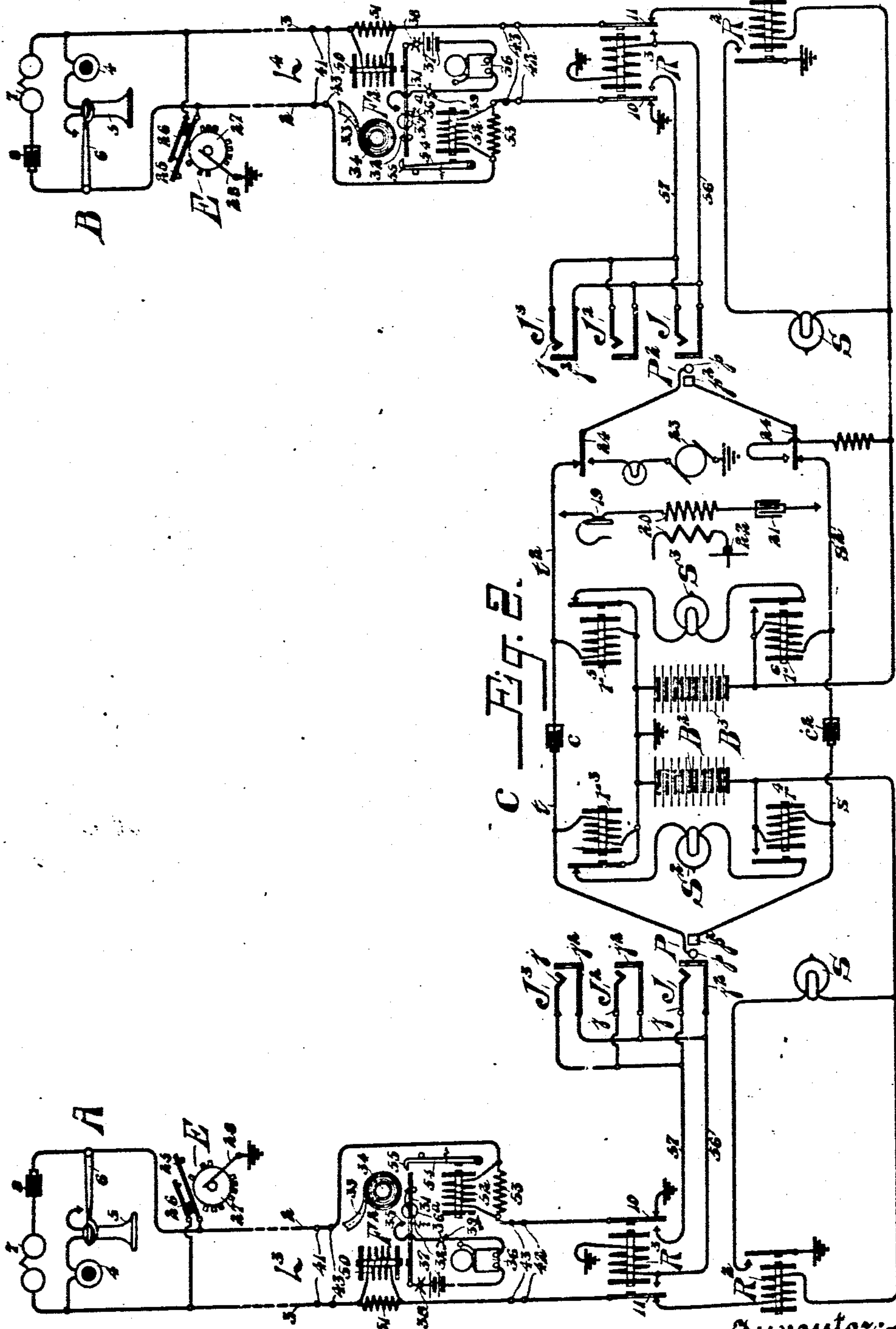


Fig. 2.

Witnesses.

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UNITED STATES PATENT OFFICE.

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COMBINED TELEPHONE AND ALARM OR KINDRED SERVICE SYSTEM.

967,113.

Specification of Letters Patent.

Patented Aug. 9, 1910.

Application filed April 30, 1903. Serial No. 154,957.

To all whom it may concern:

Be it known that I, WILLIAM W. DEAN, a citizen of the United States of America, and resident of Chicago, county of Cook, and State of Illinois, have invented a certain new and useful Improvement in Combined Telephone and Alarm or Kindred Service Systems, of which the following is a specification.

My invention relates to the application of alarm signal and kindred service to telephone exchange systems whereby the telephone circuits radiating from the central office of the exchange and a portion of the telephone apparatus at the exchange may be utilized for an additional purpose and an additional source of revenue.

As is well known the ordinary telephone line of an exchange is idle and useless a great part of the day and practically all of the night. A large proportion of the capital invested in a telephone plant is, therefore, idle and incapable of earning any revenue, but by combining an alarm or other auxiliary service with the telephone service by which the existing telephone apparatus is utilized without interruption or inconvenience to the telephone service, an additional earning capacity is imparted to the capital thus invested in the plant, and this with only a slight extra investment for the comparatively inexpensive extra apparatus required at each end of the telephone lines. From the alarm service point of view, such a system is ideal for the reason that independent metallic circuits are used between the alarm transmitters and the alarm receivers, whereas on account of the expense in the ordinary alarm system, each circuit includes many different stations all in series. The independent circuit system permits the employment of simplified apparatus at each end while the series circuit system requires more or less complicated instruments to prevent interference of signals, and for various other reasons.

One of the main objects of my invention is to provide a combined telephone and alarm or kindred service system that is practically and commercially operative; that to a large extent employs the circuits and apparatus of the telephone exchange, and one that does not interfere with the exchange for telephonic purposes.

The invention includes the provision of

individual registers for the lines whereby trouble on any of the lines is segregated and does not affect the normal working of the remainder of the lines and registers. The apparatus is preferably operated from the central common source of current used in connection with the telephone exchange whereby an extra expense for operating the alarm system is avoided. The alarm transmitter is arranged to permit reversal of the line wires in installing or repairing the lines without affecting the operation of the alarm system.

Another feature of the invention resides in the provision of visual alarm signals in connection with the alarm service lines, whereby in the case of trouble on the lines the attention of the attendant is directed to the particular line or lines.

The invention consists, further, in the provision of a mechanical lock for the alarm receiving devices at the exchange whereby current over the metallic line or over a particular side of the line prevents the operation of the receiver.

Other features of the invention are pointed out in the detailed description and the claims, reference being had to the accompanying drawings in which the same reference letters are used throughout and in which:

Figure 1 is a diagram of a telephone exchange system to which my improvements are applied; and Fig. 2 is a diagrammatical view of a different arrangement of the invention.

Referring to Fig. 1, L and L² indicate telephone subscribers' lines extending in two limbs 2 and 3 from their respective substations A and D to the central office C of the exchange. At the substations any usual or desired telephone outfit may be employed, but preferably such as is adapted for use in connection with a common central source of current. The apparatus shown comprises a transmitter 4 and a receiver 5 in a bridge of the line conductors whose normal discontinuity is maintained by the switch hook 6, while an ordinary polarized call bell 7 and a condenser 8 are connected in a permanent bridge of the telephone line.

At the central office the line is represented as usual by an answering jack J and a plurality of multiple jacks J² and J³, each hav-

ing tip and sleeve contact springs j and j^2 connected with the corresponding line conductors 2 and 3, and with test rings j^3 which are all electrically connected and joined by conductor 9 with the winding of the cut-off relay R of the telephone line, the opposite terminal of which is grounded. The line conductors 2 and 3 are normally extended through contacts 10 and 11 of relay R, one of which is grounded and the other connected with line relay R^2 of the telephone line, which in turn is joined by conductors 12 and 13 with the live pole of the central and common battery B, the opposite pole of which is grounded by conductor 14. The relay R^2 controls the local circuit of the line signal S which is preferably a small incandescent lamp.

The operators are provided with any suitable number of cord circuits, only one being represented in the diagram, each of which is provided with an answering plug P and a calling plug P^2 provided with contact surfaces p , p^2 and p^3 adapted to register with the corresponding contact surfaces of the spring jacks when inserted therein. The tip contact p of the answering plug P is connected by flexible strand t with the winding w of a suitable repeating coil while the corresponding contact of plug P^2 is joined by a similar strand t^2 with the repeating coil winding w^2 which is placed in inductive relation with said winding w ; and both of which are connected at their inner ends with the grounded pole of the battery B. A similar strand s joins the sleeve contact p^2 of plug P with the winding w^3 of the repeating coil which includes the winding of the supervisory relay r , while the sleeve strand of plug P^2 is connected by strand s^2 with the winding w^4 of said repeating coil, placed in inductive relation with the winding w^3 , said latter strand likewise including the coil of supervisory relay r^2 . The inner ends of said windings w^3 and w^4 are united to the live pole of battery B. The ring contact p^3 of the plug P is connected by means of a third conductor 15 through a suitable supervisory signal S^2 , usually in the form of a small incandescent lamp, with the conductor 13 leading to the live pole of the battery B; while a similar third conductor 17 joins the contact p^3 of the plug P^2 through the supervisory signal S^3 with the said conductor 13. The relays r and r^2 control respectively the shunts of the supervisory signals S^2 and S^3 .

The operator's head receiver 19, the secondary winding of her induction coil 20, and a suitable condenser 21, are adapted to be connected across the answering end of the cord circuit by means of any suitable listening key switch, her transmitter 22 in circuit with the primary of her induction coil being charged from any suitable source of current, and which may be battery B. A ring-

ing generator 23 adapted to produce alternating or pulsating current is arranged to be connected with the calling end of the cord circuit by the depression of springs 24, 24 of any suitable ringing key, the strands t^2 and s^2 being at this time open to prevent the passage of ringing current back to the repeating coil windings w^2 and w^4 , and thus preventing disturbance in the calling subscriber's telephone.

The apparatus so far described comprises one common type of telephone exchange system and its operation is well understood. It is explained at some length since a striking feature of the invention consists in the fact that the telephone system upon which the alarm or kindred service system is engrafted continues to be operated in the same manner in which it has heretofore been operated in the absence of the alarm system. In order to adapt such lines for alarm signaling, the subscribers' stations or other outlying stations are provided with suitable alarm signal transmitting devices connected with the telephone lines and by means of which a signal, preferably distinctive, may be sent to the central office. At the central office auxiliary alarm signal responsive devices are provided to receive and record the said alarm-signal so that the same may be attended to in the proper manner. This additional apparatus should be arranged so as to not normally interfere with the use of the systems for telephonic purposes.

E represents the alarm signal transmitter at the substation and comprises suitable springs 25 and 26 connected respectively with the line conductors 2 and 3, and arranged to be normally isolated, but when the pin wheel 27 is rotated to be thereby intermittently connected together and thence to ground through the brush 28.

The alarm signal receiving device F preferably at the central office, comprises a magnet 16 having differential windings 29 and 30 interposed respectively in line conductors 2 and 3, so that current flowing in the metallic line does not operate the magnet. These coils are wound side by side, as shown, or superimposed in such close relationship that the magnetic effects of the rapidly varying voice currents are neutralized and the voice currents are unimpeded. When, however, current traverses one winding only, or both windings in parallel, the core is magnetized and the armature is attracted. The armature of the magnet is mounted upon the normally retracted spring or lever 31, provided with a printing point 32 adapted to impress the tape or ribbon 33, wound upon a spool 34, and which may be automatically set in operation by the operation of the magnet 16. This device registers the signal received from the substation, and in order that an audible alarm may be

given to attract the attention of the attendant, the said movable part 31 is arranged to close contact 35 in the circuit of the bell or other alarm 36 and battery 37.

- 5 This battery may be the same as battery B, and both battery and the alarm are preferably common to the exchange or to a large number of lines as indicated by the dotted lines branching from the points 38 and 39.
10 Each alarm signal receiver may have a visual signal associated therewith as indicated by the target 36^a.

- It is apparent that the use of the telephone line for telephonic purposes does not
15 set in operation the alarm signal receiving devices. For example, subscriber A in calling for a connection takes up his receiver and completes a path for current over the metallic line from the battery B over conductors 13 and 12, through line relay R²,
20 contact 11 of relay R, the sleeve conductor 3 of the telephone line including winding 30 of relay 16 to the substation and thence back to the central office over line conductor
25 2 through winding 29 of relay 16 and to ground through spring 10 of cut-off relay R. This current flowing through the differential windings of the magnet 16 in series does not operate it and the alarm signal receiver
30 remains irresponsive. But relay R² operates and causes lamp S to light. In response to the call the operator inserts the plug P of her cord circuit in the jack J and connects her instrument with the cord circuit by means of the listening key. The insertion of the plug P closes a path for current from battery B, over the third conductors 13 and 15 through contacts p³ and j³ and
35 thence by way of conductor 9 to the cut-off relay R, which operates to sever the line conductors 2 and 3 at springs 10 and 11 thereof. Owing to the fact that the receiver at the substation A is now removed from its hook, current from battery B will
40 circulate over the two strands of the cord circuit and in the metallic telephone line in the same manner as before, thus again not affecting the magnet 16 of the receiver. The supervisory relay r is also actuated to
50 close the shunt of the supervisory lamp S² which is thus rendered inert. Upon learning the number of the party wanted the line is tested in the usual way to determine its idle or busy condition. If idle the test rings
55 j³ of the jacks are connected through the winding of the associated cut-off relay to ground, and since the tip of the calling plug P² is likewise grounded by branch 14 no flow of current results over said branch, and
60 no click is received in the operator's receiver. If the line is busy on the other hand the test rings of the jacks are connected through a third conductor 15 or 17 of the cord circuit at the other section of the multiple
65 board with the live pole of the battery B so

that when the tip contact of the testing plug is brought into contact with the test ring, a flow of current takes place through the winding w³ of the repeating coil which inductively causes a click in the operator's receiver. 70

Assuming that the line wanted is found idle the calling plug P² is inserted in one of the multiple jacks of the line and the ringing generator 23 operated. This generator
75 sends current over the metallic line in a manner similar to the battery B though of different character to operate call bell 7 at the substation. Here again owing to the differential coils of magnet 16 in the called
80 line the alarm register of the line is not actuated. After the subscriber has been called and before his response the supervisory lamp S³ is lighted over the said third conductors and is extinguished only when
85 the subscriber responds by the operation of supervisory relay r³. During conversation the battery B is furnishing current over both metallic lines L and L² for the operation of the microphones at the two substations to which current the magnets are, as
90 stated, unresponsive, and the rapidly varying voice currents are transmitted over said metallic lines through said magnets 16 without retardation, as explained. 95

When the alarm signal transmitter E is operated the rotating wheel 27 intermittently closes the springs 25 and 26 together and to ground. The grounding of conductor 3 permits current from battery B to
100 flow over conductors 13 and 12, through the line relay R², thence over the sleeve conductor 3 of the line, winding 30 of magnet 16, thence to spring 25, wheel 27 and brush 28 to ground. This current in winding 30
105 energizes the magnet 16 which attracts its armature and accordingly registers the alarm signal by means of the pencil or point 32 upon the tape 33 which is now being unreeled from spool 34 by the register mechanism. At the same time the contact 35 is
110 closed and alarm 36 is operated thus calling the attention of the attendant. Likewise the visual indicator 36^a is exposed and serves to direct the attention of the attendant to the
115 particular register operating. It is, of course, unnecessary for the above mentioned operation to ground the line conductor 2, but it is convenient in view of the fact that it does no harm and the linemen in installing
120 the system and connecting the subscriber's line to the central office as well as in making repairs are liable to reverse connections of the two line conductors. When, however, provision is made for grounding both con-
125 ductors by the alarm signal transmitter, such reversal of the line connections in no way affects the operation of the alarm apparatus. The line relay R² may respond to this current and the line signal S may be 130

flashed but the operators at the exchange would be instructed to disregard such intermittent lighting or flashing of the lamps, so that the usual working of the exchange would not be interfered with. Should the alarm signal transmitter be set in operation during the time that the cord circuit is connected with the line, current will flow in the same manner over the sleeve conductor of the telephone line but through the sleeve strand of the connected cord circuit but will not flow over the tip side of the line since it is grounded at the transmitter E. This might interfere with any conversation going on at the time over the line, but would be less objectionable considering the few times that it is likely to occur than that the alarm should be delayed or not given at all.

It is apparent that means might readily be provided to cut out the alarm signal transmitter should such type of service be desired, as by carrying the connection of spring 26 to line conductor 3 through normal contacts of the hook switch, or in any other desired manner.

I have indicated the alarm signal transmitter as adapted for automatic operation by the opening of the local alarm circuit through the melting of a fuse 18 or by the key switch 18^b which deenergizes magnet 18^a and releases the wheel 27 and its driving mechanism. It will be understood that the transmitter may be varied to meet the demands of any type of alarm and kindred service desired without departing from the spirit of my invention. The construction and operation of such transmitters is well understood in the art and further description thereof is deemed unnecessary.

As above pointed out, the registers F are individual to each line, which is of particular advantage in case of trouble on any of the lines as for example the common trouble of an accidental ground on the line outside the central office. This would be made manifest in the present arrangement by the continued display of visual signal 36^a and the sounding of pilot signal 36 and only the one register would be put out of service; but in the case of the common register arrangement the whole service would be thrown out by the accident on one line. Still other advantages exist; the record for each line may be conveniently preserved as is desired in some types of watch service where hourly or more frequent reports from the watchmen are turned in.

The association of the visual indicator with the individual register is of convenience in locating the register thus held in locked position as by an accidental ground upon the line and serves further by dropping back to automatically indicate when the trouble has been remedied.

The receiver magnets are preferably in-

terposed at the main distributing board indicated by the terminals 41 and 42 which is provided with extra terminals 43 to which the said magnets may be permanently connected.

In Fig. 2 the lines L³ and L⁴ are provided with alarm signal transmitting device at the substations as before, and with alarm signal receiving and registering devices F² at the central office. The latter includes a magnet 50 placed in the line conductor 3 of the telephone line and shunted by a non-inductive resistance 51 and serving to actuate the pencil or point 32 as before described, and also to close the circuit of common alarm 36 and source 37. In order to prevent the marker from operating in this instance when current flows in the metallic telephone line a mechanical device is provided, which consists of a magnet 52 included in the line conductor 2 and shunted by non-inductive resistance 53. This magnet has an armature 54 carrying a catch 55 adapted when the armature is actuated to hook over the end of armature 31 and prevent its operation. When current traverses line conductor 3 in response to the operation of the alarm transmitter E, the magnet 50 is operated and the signal is received and registered in the usual manner. But when current flows over both line conductors in series the magnet 52 is also energized and since its armature is adjusted to respond before armature 31 of magnet 50 is drawn up, the catch 55 hooks over and locks the part 31 from operating. Thus while current is flowing over the metallic line as during the sending of a call from the subscriber's station to the central office for a connection, or during conversation, the said register is locked and prevented from operating. The alarm transmitter is the same as that shown in Fig. 1. The line circuits in this figure differ somewhat from those shown in Fig. 1, and principally in that the switchboard sections of the lines and the cord circuits require only two conductors. The line conductor is normally grounded at one spring of the cut-off relay R³, while the conductor 3 is normally connected through a spring of said relay with the line relay R², which is thence connected with the common battery B². The winding of said cut-off relay R³ is grounded from the sleeve conductor of the normally disconnected switch board section of the line. When the subscriber calls the central office for a connection, current flows over the metallic line, locking the alarm signal receiving apparatus at the central office and actuating the line relay R². In response to the signal the plug P of the cord circuit is inserted in one of the jacks, thereby permitting current to flow from the battery B² through supervisory relay R⁴, the

sleeve conductor 8 of the cord, and thence over sleeve conductor 56 of the switchboard section of the line, and through the cut-off relay R^3 to ground. This connects conductors 2 and 3 with the said switchboard section and renders the line signal inoperative. Owing to the fact that the subscriber's receiver is in use current from the battery B^2 also circulates over the metallic line and thereby actuates supervisory relay r^2 to open the circuit of supervisory signal S^2 to render the same inert. The register mechanism remains inoperative. After connecting her receiver with the cord circuit by means of any suitable listening key and receiving the order she tests the condition of the wanted line by touching the tip of the calling plug P^2 to one of the test rings in the usual way and determines its idle or busy condition. The insertion of the plug P^2 in the jack of the idle line serves to operate sleeve supervisory relay r^2 and relay R^3 of the line. The supervisory signal S^3 is now actuated owing to the fact that relay r^2 is not yet operated. Depressing the springs 24 of the ringing key connects the generator 23 with the tip strand of the cord circuit and operates the subscriber's bell, a return path for the ringing current being provided in the usual manner through the alternate contact of the sleeve spring 24 of said ringing key. The cut-off relay R^3 is maintained actuated during ringing by current from the common source B^3 . The response of the called subscriber energizes magnet r^2 to cut out lamp S^3 .

During conversation the voice currents are not affected by the magnets 50 and 52 since they are shunted by the non-inductive resistances 51 and 53. The batteries B^2 and B^3 furnish current out over the respective lines to charge the transmitters, the registers R being thereby locked. Grounding both line conductors as in former instance guards against errors in connecting the external line circuits with the central office. The magnets 50 and 52 of the registers may be interposed in the lines by means of extra terminals 43 on the distributing frame indicated by terminals 41 and 42. The registers are preferably individual as in Fig. 1, but the mechanical locking of the armature of the magnet 50 is, of course independent of this feature since the marker 32 and tape 33 could be dispensed with and an ordinary register substituted for the bell 36.

Other modifications may obviously be made in the details of my invention without departing from its scope or principle.

Having described my invention what I claim is:

1. In a common battery telephone exchange, the combination with a plurality of telephone lines leading from subscribers' stations to the central station, of telephonic

apparatus including a common source of current at the said central station to cooperate with said lines for conversational purposes, telephone sets at the substations adapted for use with said central source of current, alarm transmitting apparatus at outlying points adapted to cause the flow of distinctive signaling currents over the lines from said central source of current, and alarm receiving and registering apparatus at the central station individual to each line, said individual receiving and registering apparatus having an electro-magnet in each side of the line, means for operating said receiving and registering apparatus when one of said magnets is energized and to prevent the operation of the same when the other magnet is energized whereby said receiving apparatus is responsive to the said distinctive signaling currents and irresponsive to the telephone signaling and talking currents, substantially as described.

2. In a telephone exchange, the combination with a plurality of telephone lines leading from subscribers' stations to the central office, of telephone sets at the substations and telephonic apparatus at the said central station to cooperate with said lines for conversational purposes, alarm transmitting apparatus at outlying points adapted to transmit distinctive signaling currents over the lines, an alarm receiving apparatus in the line at the central station responsive to said distinctive signaling currents, and a mechanical lock for said receiving apparatus adapted when the telephone signaling or talking currents are present on the line to lock said receiving apparatus and prevent its operation, substantially as described.

3. In a telephone exchange, the combination with a plurality of telephone lines leading from the subscribers' stations to the central station, of telephone sets at the substations and telephonic apparatus at the said central station to cooperate with said lines for conversational purposes, alarm transmitting apparatus at outlying points adapted to transmit distinctive signaling currents over the lines, alarm receiving and registering apparatus at the central station individual to each line and responsive to said distinctive signaling currents, said receiving and registering apparatus having an electro-mechanism in the telephone line, and a mechanical lock for said receiving apparatus controlled by said electro-mechanism and adapted when the telephone signaling or talking currents are present on the line to lock said receiving and registering apparatus and prevent its operation, substantially as described.

4. In a common battery telephone exchange, the combination with a plurality of telephone lines leading from the subscribers' stations to the central station, of

telephonic apparatus at the central station including a common source of current to co-operate with said lines for conversational purposes, telephone sets at the substation adapted for operation with said common source of current, alarm transmitting apparatus at outlying points adapted to transmit distinctive signaling currents over the telephone lines from said central source, alarm receiving apparatus at the central station responsive to said distinctive signaling currents, said receiving apparatus having an electro-magnet winding in each side of the telephone line, and a mechanical lock controlled by said magnet windings and adapted when the telephone signaling or talking currents are present on the line to lock said receiving apparatus and prevent it from operation, substantially as described.

5. In a common battery telephone exchange, the combination with a plurality of telephone lines leading from the subscribers' stations to the central station, of telephonic apparatus at the central station including a common source of current to coöperate with said lines for conversational purposes, telephone sets at the substations adapted to co-operate with said common source of current, alarm transmitting apparatus at outlying points adapted to transmit distinctive signaling currents over the telephone lines from said central source, alarm receiving and registering apparatus at the central station individual to each line and responsive to said distinctive signaling currents, said receiving and registering apparatus having a magnet winding in each side of the line, and a mechanical lock controlled by said magnet windings and actuated when telephone signaling or talking currents are present on the line to prevent said receiving and registering apparatus from operation, substantially as described.

6. In a telephone exchange, the combination with a plurality of telephone lines leading from the subscribers' stations to the central station, of telephone sets at the substations and telephonic apparatus at the central station to coöperate with said lines for conversational purposes, an alarm transmitting apparatus at an outlying point adapted to send distinctive signaling currents over one side of a line only, alarm receiving apparatus at the central station having a magnet in each side of the line, a mechanical lock for said receiving apparatus, one of said magnets serving to operate the receiving mechanism of said apparatus and the other to operate said lock, whereby when the said alarm transmitter is operated, said receiving mechanism is actuated, and when current is present on the other side of the line said lock is operated to prevent the actuation of said receiving apparatus, substantially as described.

7. In a common battery telephone exchange system the combination with a telephone line leading from the subscriber's station to the central station, of telephonic apparatus at the central station including a common source of current to coöperate with said line for conversational purposes, of a telephone set at the substation adapted for use in connection with said common source, an alarm transmitting apparatus at an outlying point adapted to transmit distinctive signaling currents over one side of the telephone circuit from said source, alarm receiving and registering apparatus at the central station, said apparatus having a magnet in each side of the line and the register being individual to the line, one of said magnets serving to actuate the receiving and registering mechanism and the other to prevent its operation, whereby said receiving and registering apparatus is responsive to said distinctive signaling currents and is locked and prevented from operation when telephone signaling and talking currents are present on the line, substantially as described.

8. In a common battery telephone exchange, the combination with a telephone line leading from the subscriber's station to the central station, of telephonic apparatus at the said central station including a common source of current to coöperate with said line for conversational purposes, a telephone set at the substation adapted for use in connection with said common source, an alarm transmitting apparatus at an outlying point adapted to transmit distinctive signaling currents over one side only of the telephone circuit from said common source, alarm receiving and registering apparatus at the central station, said apparatus having a magnet in each side of the line, a mechanical lock for said receiving apparatus, one of said magnets serving to actuate the receiving and registering mechanism and the other to operate said lock, whereby said receiving and registering apparatus is responsive to said distinctive signaling current, over one side of the line and is locked and prevented from operation when telephone signaling and talking currents are present on the line, substantially as described.

9. In a common battery telephone system, the combination with a plurality of telephone lines leading from subscribers' stations to a central station, of telephonic apparatus including a common source of current at the central station to coöperate with said lines for conversational purposes, telephone sets at the substations adapted for use with said central source of current, alarm transmitting apparatus at outlying points adapted to cause the flow of distinctive signaling currents over the line from

said common source of current, and alarm receiving and registering apparatus individual to each line and having mechanism in each side of the line co-acting in response to the said distinctive signaling currents but in obstructive opposition for telephone signaling or talking currents, said common source of current having one terminal normally grounded and having its other terminal normally connected with one side of each line, said line being grounded at the signal transmitting mechanism when the signal is being transmitted, substantially as described.

10. In a common battery telephone exchange, the combination with a plurality of telephone lines leading from subscribers' stations to the central station, of telephonic apparatus including a common source of current at the said central station to cooperate with said lines for conversational purposes, telephone sets at the substation adapted for use with said central source of current, alarm transmitting apparatus at outlying points adapted to cause the flow of distinctive signaling currents over the lines from said central source of current, and alarm receiving and registering apparatus at the central station individual to each line, said individual receiving and registering apparatus having electromagnetic mechanism in each side of the line co-acting in response to the said distinctive signaling currents but in obstructive opposition for the telephone signaling or talking currents, said common source of current having one terminal normally grounded and having its other terminal normally connected with one wire of each line, said wire being grounded at the signal transmitting mechanism when the signal is being transmitted, substantially as described.

11. In a common battery telephone system, the combination with a plurality of telephone lines leading from subscribers' stations to a central station, of telephonic apparatus including a common source of current at the central station to cooperate with said lines for conversational purposes, telephone sets at the substations adapted for use with said central source of current, alarm transmitting apparatus adapted to cause the flow of distinctive signaling currents over the line from said common source of current, and alarm receiving and registering apparatus individual to each line and having electromagnetic mechanism in each side of the line co-acting in response to said distinctive signaling currents, said common source of current having one terminal normally grounded and having its other terminal normally connected to one side of each line, said lines being grounded at the signal transmitting mechanism when signals are being transmitted, substantially as described.

12. In a common battery telephone exchange, the combination with a plurality of telephone lines leading from subscribers' stations to the central station, of telephonic apparatus including a common source of current at the central station to cooperate with said lines for conversational purposes, telephone sets at the substations adapted for use with said telephonic apparatus and common source of current, alarm transmitting apparatus at outlying points adapted to cause the flow of distinctive signaling currents over the lines from said central source, and visual signaling and registering apparatus at the exchange individual to each line, said individual signaling and registering apparatus having electromagnetic mechanism in each side of the line co-acting in response to said distinctive signaling currents but in obstructive opposition for the telephone signaling and talking currents, said common source of current having one terminal normally grounded and having its other terminal normally connected with one side of each line, the line being grounded on that side at the signal transmitting mechanism when the signal is being transmitted, substantially as described.

13. In a common battery telephone exchange, the combination with a plurality of telephone lines leading from subscriber's station to the central station, of telephone apparatus including a common source of current at the said central station to cooperate with said lines for conversational purposes, telephone sets at the substations adapted for use with said telephone apparatus and central source, alarm transmitting apparatus at outlying points adapted to send distinctive signaling currents over one side of the lines, visual signaling and registering apparatus at the exchange individual to each line, said individual signaling and registering apparatus having electromagnetic mechanism in one side of the line responsive to said distinctive signaling currents over that side, and locking means for rendering the said signaling and registering apparatus inoperative when current flows over the other side of the line whereby it does not respond to the telephone signaling and talking currents, said common source of current having one terminal normally grounded and having its other terminal normally connected with one side of each line, the line being grounded on that side at the signal transmitting mechanism when the signal is being transmitted, substantially as described.

14. In a common battery telephone exchange, the combination with a plurality of telephone lines leading from subscribers' stations to a central station, of telephonic apparatus including a common source of current at said central station to cooperate

with said lines for conversational purposes, telephone sets at the substations adapted for use with said line apparatus and said common source of current, alarm transmitting apparatus adapted to send distinctive signaling currents over one side of a line, visual signaling and registering apparatus individual to each line, and having mechanism in one side of the line responsive to said distinctive signaling currents, and locking means for rendering said signaling and registering apparatus inoperative by obstructive opposition when current flows over the

other side of the line, whereby it does not respond to the telephone signaling and talking currents, said common source of current having one terminal normally grounded and its other terminal normally connected to the signal transmitting side of each line. 15

Signed by me at Chicago, county of Cook, State of Illinois, this 27th day of April, 1903. 20

WILLIAM W. DEAN.

Witnesses:

ROBERT LEWIS AMES,
E. A. GARLOCK.