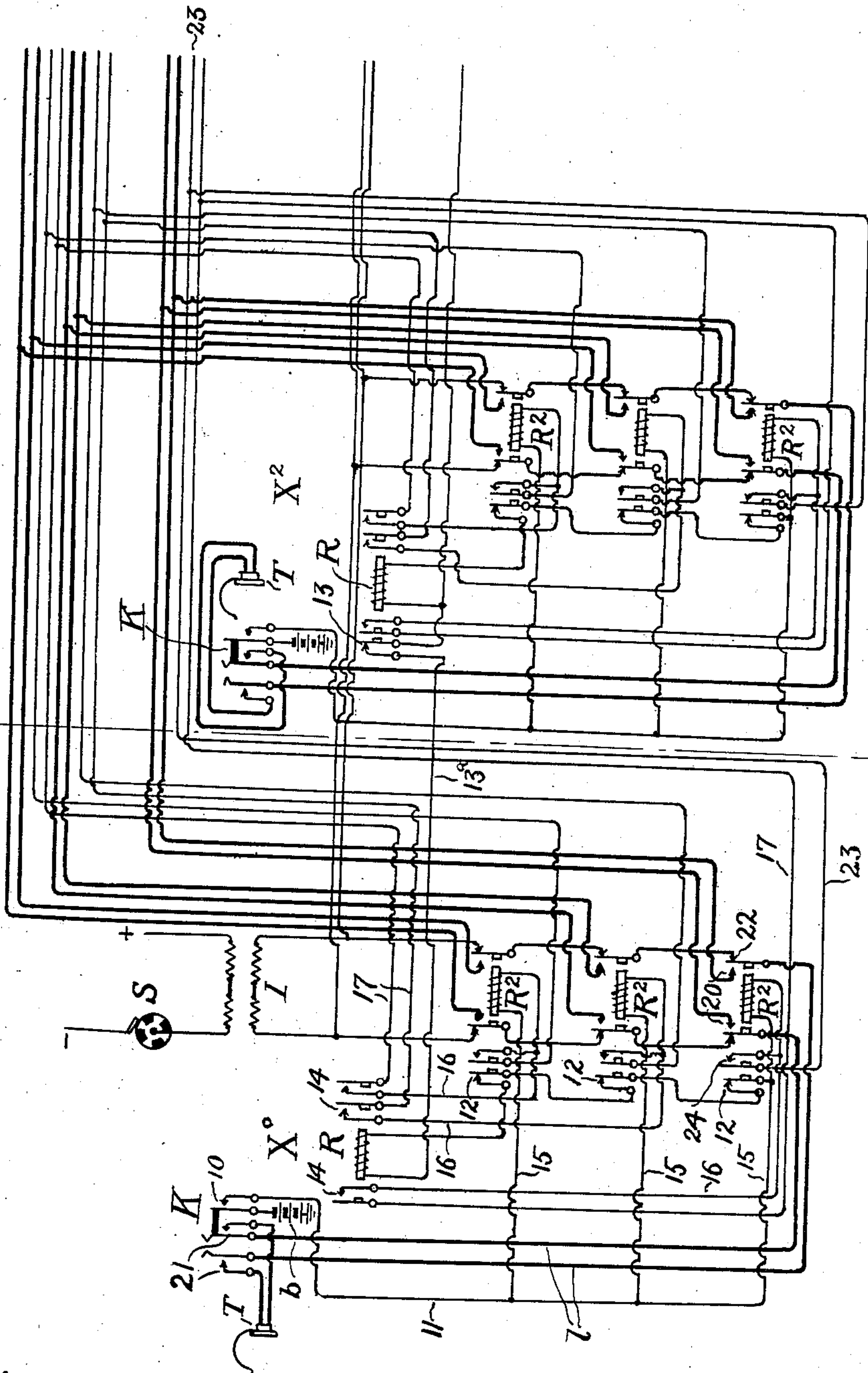


H. M. BASCOM.
SYSTEM OF CALL DISTRIBUTION.
APPLICATION FILED MAY 18, 1915.

1,172,760.

Patented Feb. 22, 1916.
2 SHEETS—SHEET 1.

Fig. 1.



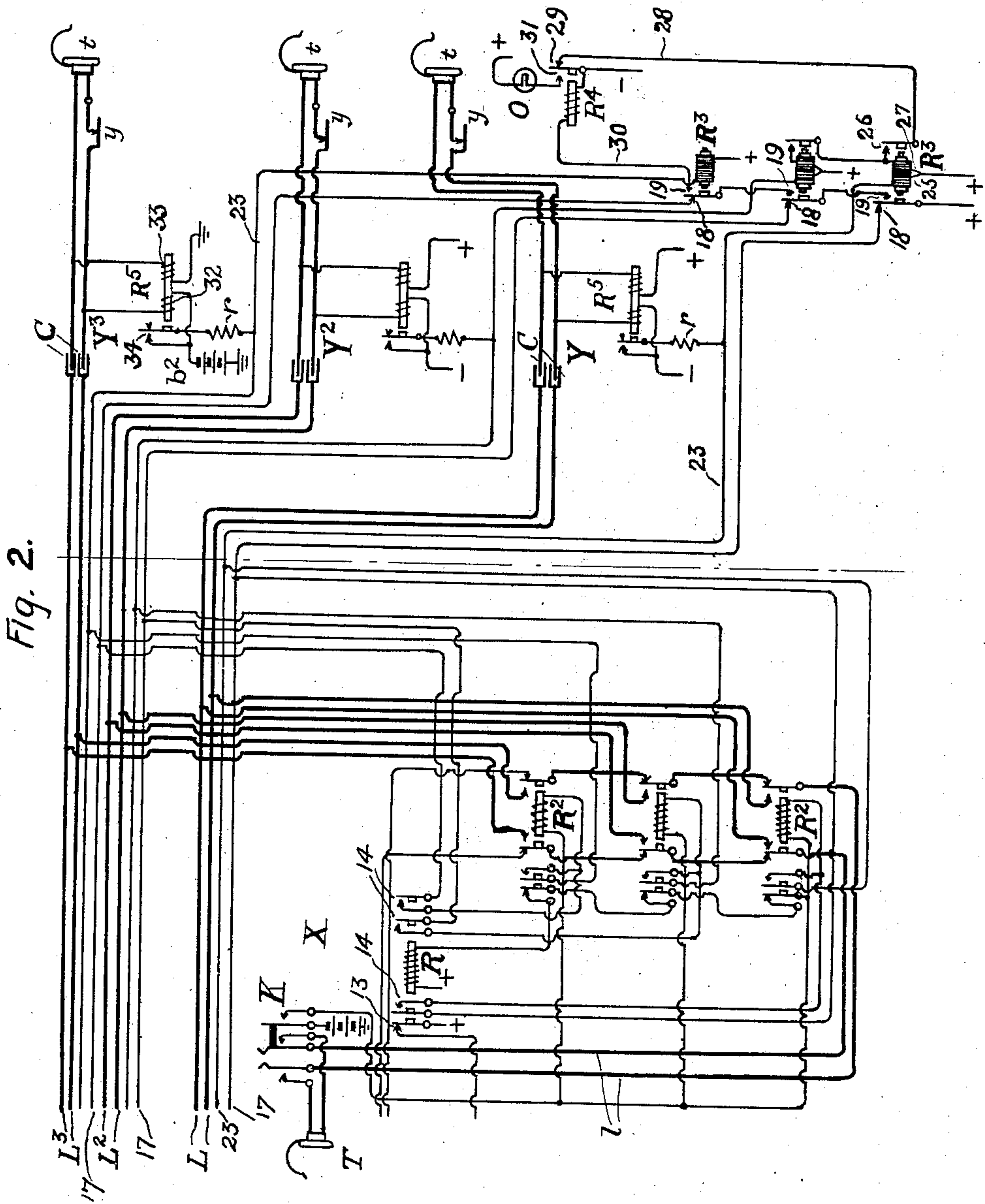
Witnesses:
Joseph A. Gately
James E. Lynch.

Inventor:
Henry M. Bascom.
by Thomas Lockwood Atty.

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UNITED STATES PATENT OFFICE.

HENRY M. BASCOM, OF BROOKLYN, NEW YORK, ASSIGNOR TO AMERICAN TELEPHONE AND TELEGRAPH COMPANY, A CORPORATION OF NEW YORK.

SYSTEM OF CALL DISTRIBUTION.

1,172,760.

Specification of Letters Patent.

Patented Feb. 22, 1916.

Application filed May 18, 1915. Serial No. 28,914.

To all whom it may concern:

Be it known that I, HENRY M. BASCOM, residing at Brooklyn, in the county of Kings and State of New York, have invented certain Improvements in Systems of Call Distribution, of which the following is a specification.

The present invention is directed to systems for giving individual access to an idle circuit of a group, as the call or order circuits connecting the positions of subscribers' operators and trunking operators, its chief objects being the provision of a simple and reliable system of this character in which interfering connections are avoided and in which the circuits are used in rotation to effect a uniform distribution of the calls.

One embodiment of the invention appears in the accompanying drawings, in which—
Figures 1 and 2 placed in alinement, with Fig. 2 at the right, represent diagrammatically the improved system applied to a plurality of call circuits connecting the positions of A and B-operators.

X, X² and X⁰ designate the first, second and last of a series of positions belonging to subscribers' or A-operators, at which the usual operator's equipment is conventionally indicated by a telephone set T. Through these positions extend call circuits L, L² and L³ terminating at the positions Y, Y² and Y³ of trunking or B-operators, there being a sufficient number of these B-operators and the corresponding call circuits to satisfy the requirements of the entire series of A-operators. The B-operators have the customary equipment *t*, and are also preferably provided with a contact device *y* at each position which maintains a closure of one side of the call circuit when the position is occupied but which is opened when the B-operator leaves her position.

Of the apparatus belonging more particularly to this improved system, there is at each A-operator's position a manual call circuit connection-initiating device or key K, which, in addition to contacts for joining the operator's set T to the call circuit leads *l*, has a contact for applying current from battery *b* to the winding of a connection-initiating relay or other suitable electromagnetic device R through back contacts of connecting relays R² in series and then back to battery for the relay R of the first position X, or, for such relays of any of the

other positions, on in series through the back contacts of the relays R between it and the first position to the battery connection at a back contact of relay R thereof. Relay R has also a front contact in the energizing circuit of each of the relays R². These latter relays are in a group equal in number to the call circuits apportioned to the A-positions. At their back contacts in series call circuit leads *l* are united through a repeating coil I to a source S of tone, when all the call circuits are in use. At the front contacts the leads *l* are connected, either directly, if the first call circuit L is idle, or through the back contacts of preceding connecting relays if some are busy, to the corresponding call circuit. The windings of each group of relays R² are joined in multiple to battery at the key K, so that upon the closure of this key and the consequent energization of relay R all the connecting relays are prepared for operation. Which of these will be actuated to unite its call circuit to the leads *l* is determined by a group of controlling relays R³ common to all the A-positions and including a relay for each call circuit. A back contact of each of the controlling relays is multiplied to the windings of the corresponding relays R² at all the A-positions through a front contact of the initiating relay R at each such position. The armature of relay R³ of the first call circuit L cooperating with this contact is connected to battery, while the armature of the succeeding relay R³ is joined to the front contact of the relay preceding it in the group. The front contact of the last relay R³ is carried to battery through the windings of a release relay R⁴.

As the connecting relay at any A-position is energized, it completes at a front contact the circuit of one winding of the relay R³ associated with the same call circuit. This, attracting its armatures, severs at its back contact the energizing circuits of all the other connecting relays for this call circuit and transfers at its front contact the battery connection to the connecting relays of the next call circuit. This continues in rotation until all the call circuits have been put into use. At a front contact each relay R³, except that of the last circuit L³, furnishes a locking circuit through a second winding of the relay to battery at the back contact of the release relay R⁴. The con-

nection of the controlling relay for the first call circuit L to this holding circuit is direct, while that of the others is through the front contacts of the relays preceding them in the group. By this arrangement each controlling relay, as it acts as a result of the operation of one of the corresponding connecting relays, locks its call circuit from use and sequentially renders the next circuit of the group effective, this continuing until the last call circuit L^3 has been utilized. Then release relay R^4 operates, opening the locking circuit through the right hand windings of the controlling relays. The calls of the A-operators are therefore uniformly distributed among the entire group of circuits. At its front contact R^4 supplies current to a lamp O or operates some other signal to show that all the circuits are busy.

To permit a call circuit to be temporarily disabled, so that, for example, an operator may leave her position, a relay R^5 is associated with each circuit with one end of each of its double windings joined to the call circuit conductors and the other extremities united to battery b^2 . At its back contact relay R^5 connects battery through a resistance r to the left hand winding of the controlling relay R^3 of the same call circuit. So long as the B-end of the circuit is closed through the contact device y , the relay R^5 remains energized, holding the path through the resistance r open, but when the call circuit is broken at y relay R^5 releases and relay R^3 operates, thus severing the circuit of the relay R^2 belonging to this call circuit at all positions. Calls are therefore diverted from the latter as long as this condition is maintained. Condensers C are included in each call circuit between connections of relay R^5 and the A-positions, to prevent current from battery b^2 flowing back over the call circuits to the A-positions and the repeating coil I thereat and causing false operation of the circuit.

To describe the operation of the system in detail, it may first be assumed that all the call circuits are idle and that the A-operator at the last position X^0 , desiring the assignment of a trunk by a B-operator, depresses her key K. Current flows from battery b through contact 10 of the key, conductor 11, successively through the back contacts 12 of all the connecting relays R^2 , winding of the initiating relay R, conductor 13^a and back contacts 13 of the initiating relays at all positions back to battery. There are now circuit branches from battery and conductor 11 through conductors 15, windings of relays R^2 , conductors 16, front contacts 14 of relay R conductors 17 to the back contacts 18 of controlling relays R^3 . All the call circuits being idle and the armatures of relays R^3 being retracted a battery connection exists only at the relay associated

with the first circuit L, the path from the other conductors 17 being open at the front contact 19 of the relay R^3 of the next circuit, L^2 , succeeding it. Consequently, only relay R^2 of circuit L is operated and breaking its back contact 12 opens the initiating circuit of relay R, which releases, preventing the energization of other connecting relays at the same position. At front contacts 20 the common leads l are united to the call circuit L, and since these leads are connected to the A-operator's set at contacts 21 of the key, said operator is in connection with a B-operator over circuit L and may give the number wanted and receive a trunk assignment. At back contacts 22 relay R^2 opens the circuit for the leads l through the back contacts of the succeeding relays R^2 to the source S of the busy tone. A branch 23 from conductor 16, including winding 25 of the first controlling relay R^3 , is completed at the front contact 24 of relay R^2 . Relay R^3 is thereby energized and transfers the battery connection from contact 18 to contact 19, thus preventing connecting relays for the call circuit L at other A-positions from operating and preparing for the operation of such relays of circuit L^2 . The originating circuit for the connecting relay is opened, but it is locked in series with the winding of relay R^3 . Front contact 26 of relay R^3 closes an independent locking circuit through winding 27 of this relay, conductor 28 and back contact 29 of the release relay R^4 . When use of the circuit L is completed by the operator at position X^0 she releases the key K. This at contact 10 deenergizes the connecting relay, restoring the call circuit equipment individual to the position to its normal condition and opening the originating circuit of the controlling relay through winding 25. The latter relay remains energized on account of the locking circuit through winding 27.

If another A-operator actuates her key K when the circuit L is still in use, or at any time before the selection of another call circuit, the second of the group of connecting relays R^2 at her position, or that belonging to the circuit L^2 , will be operated by a circuit as previously traced, but including the back contact 18 of controlling relay R^3 associated with circuit L^2 and front contact 19 of relay R^3 belonging to circuit L. Relay R^3 of circuit L^2 is thereupon locked through its contact 26 and like contact of the previously energized relay R^3 . This selection continues until every call circuit of the group has been put into use. When the last of these, L^3 , is reached, the energization of release relay R^4 is effected by a circuit comprising conductor 30 and the contacts 19 of all the controlling relays in series. This withdraws the armature from contact 29 and the locking circuit of the controlling relays through con-

ductor 28 is severed, causing the retraction of all said relays, the circuits through windings 25 of which do not remain closed. Release relay R^4 is deenergized by the opening of any one of the contacts 19. Upon the closure of front contact 31 of relay R^4 , the signal O is displayed, showing that all call circuits are busy, and this continues as long as all the controlling relays are energized. At this time the actuation by an A-operator of key K applies a tone to her receiver, because none of the connecting relays R^2 at the position respond and the tone generating device is joined to the leads 7 through the back contacts of all said relays in series.

If a plurality of A-operators chanced to depress their keys K at the same time while there were call circuits available for use, the one whose position was nearest the battery connection at the resting contact 13 of relay R at position X would first be connected to a call circuit, the opening of the corresponding contact at said operator's position barring those at positions farther removed by severing the initiating circuit. Upon the release of relay R of the successful operator and the closure of contact 13, the next in order would obtain a call circuit, and so on.

If it is desired to discontinue the use of one or more call circuits their contacts y are separated and the corresponding relays R^5 released, these having been energized by current from battery b^2 through winding 32, one side of the call circuit, the B-operator's equipment, contact y , the other side of the call circuit and winding 33. The windings 25 of relays R^3 of these circuits now receive current by way of conductor 23, resistance r and back contact 34 of relay R^5 . This produces the same effect as though these call circuits were in use, or as though after use the rotation through the group had not been completed. To restore the disabled circuits, the contacts y are again closed, respectively energizing and releasing the corresponding relays R^5 and R^3 , when the circuits may be selected as before.

I claim:

1. In a telephone system, the combination with a plurality of telephone sets, of a plurality of circuits, a group of devices individual to a telephone set for connecting the same to an idle circuit and containing one of said devices for each circuit, a connection-initiating device for preparing all the connecting devices for operation, and means for determining the operation of the connecting devices in said groups in rotation.

2. In a telephone system, the combination with a plurality of telephone sets, of a plurality of circuits, a group of devices individual to a telephone set for connecting the same to an idle circuit and containing one of said devices for each circuit, a connection-initiating device for preparing all the con-

necting devices for operation, and means individual to each circuit for determining the operation of the connecting devices in said groups in rotation.

3. In a telephone system, the combination with a plurality of telephone sets, of a plurality of circuits, a group of devices individual to a telephone set for connecting the same to an idle circuit and containing one of said devices for each circuit, a connection-initiating device for preparing all the connecting devices for operation, and means governed by the connecting devices for determining the operation of the connecting devices in said groups in rotation.

4. In a system of call distribution, the combination with a plurality of telephone sets, of a plurality of call circuits, a group of devices individual to a telephone set simultaneously available for connecting the same to an idle call circuit and containing one of said devices for each call circuit, and a group of devices common to the plural telephone sets and containing devices individual to each call circuit for controlling the operation of the connecting devices in rotation.

5. In a system of call distribution, the combination with a plurality of telephone sets, of a plurality of call circuits, a group of devices individual to a telephone set simultaneously available for connecting the same to an idle call circuit and containing one of said devices for each call circuit, and a group of devices common to the plural telephone sets and containing devices individual to each call circuit for controlling the operation of the connecting devices in rotation, these controlling devices being dependent for their operation upon the condition of the connecting devices.

6. A plurality of telephone sets, a group of call circuits, means for connecting a telephone set to an idle call circuit, and means individual to each call circuit for preventing repeated connection of a call circuit with the telephone sets until all the other call circuits of the group have been utilized.

7. In a system of call distribution, the combination with a plurality of telephone sets, of a plurality of call circuits, devices individual to the call circuits operable to control the connection of a telephone set to an idle call circuit, and means for preventing the repeated operation of a controlling device until all the associated devices have been operated.

8. A plurality of operators' positions and a plurality of call circuits associated therewith, a device at each position individual to each call circuit for rendering a call circuit available at said position, and means for preventing the simultaneous operation of said devices.

9. A plurality of operators' positions and a plurality of call circuits associated there-

with, a device at each position individual to each call circuit for rendering a call circuit available at said position, and means for causing the operation of one of said devices and for preventing the operation of other devices.

10. A plurality of operators' positions and a plurality of call circuits associated therewith, a device at each position individual to each call circuit for rendering a call circuit available at said position, and means for initiating the operation of certain of said devices, said initiating means including means for preventing the operation of other of the devices.

11. A plurality of operators' positions, a plurality of call circuits associated with said positions, a group of electromagnetic connecting devices at each position for rendering a call circuit effective thereat, and a group of electromagnetic controlling devices for preventing connection to a busy call circuit, each of said controlling devices being joined directly to the connecting devices of different positions, and adapted to remain energized till all the call circuits have been utilized.

12. A plurality of operators' positions, a plurality of call circuits associated with said positions, an initiating relay at each position, a group of electromagnetic connecting devices at each position provided with energizing windings and rendering a call circuit effective thereat, and a group of electromagnetic controlling devices for preventing connection to a busy call circuit, the energizing windings of the connecting devices of different positions being multiplied directly to the contacts of a controlling device and extending through contacts of said relays.

13. A plurality of operators' positions, a plurality of call circuits associated with said positions, a group of electromagnetic connecting devices at each position having contacts and being adapted to render a call circuit effective at such positions, a group of electromagnetic controlling devices for preventing connection to a busy call circuit, and energizing circuits for the controlling devices multiplied to contacts of the connecting devices of different positions and means for locking said devices in rotation.

14. A plurality of operators' positions, a plurality of call circuits associated with said positions, electromagnetic connecting devices therefor, electromagnetic controlling devices for the connecting devices, energizing circuits for the controlling devices governed by the connecting devices, and a circuit independent of the connecting devices for continuing the energization of the controlling devices.

15. A plurality of operators' positions, a plurality of call circuits associated with said

positions, a group of electromagnetic connecting devices at each position for rendering a call circuit effective thereat, a group of electromagnetic controlling devices for the connecting devices, means for locking each controlling device upon its energization, and means for unlocking the controlling devices after the entire group has been energized.

16. A plurality of operators' positions, a plurality of call circuits associated with said positions, a group of electromagnetic connecting devices at each position for rendering a call circuit effective thereat, a group of electromagnetic controlling devices for the connecting devices, means for locking each controlling device upon its energization, means for unlocking the controlling devices, and a signal governed by the unlocking means.

17. A plurality of operators' positions, a plurality of call circuits associated with said positions, an operator's connection-initiating relay, a plurality of electromagnetic call circuit connecting devices multiplied to the initiating relay, and means associated with the call circuits whereby the connecting device affected by the initiating relay is determined.

18. The combination with a plurality of operators' positions each having a telephone set and a call circuit key, of call circuits extending through the positions, a group of relays at each position having normally closed contacts connected to the key and contacts arranged to join the telephone set to a particular call circuit, and means for controlling the operation of the relays.

19. The combination with a plurality of operators' positions each having a telephone set and a call circuit key, of call circuits extending through the positions, a group of relays at each position having contacts connected in series to the key and contacts arranged to join the telephone set to a particular call circuit, and means for controlling the operation of the relays.

20. The combination with a plurality of operators' positions each having a telephone set, of call circuits extending through the positions, an initiating relay at each position, and a group of relays at each position having their windings connected to contacts of the initiating relay, said relays having contacts arranged to join the telephone set to a particular call circuit and other contacts in series with the winding of the initiating relay.

21. The combination with a plurality of operators' positions each having a telephone set and a call circuit key, of call circuits extending through the positions, an initiating relay at each position, a group of call circuit connecting relays at each position started in operation by the initiating re-

lay, and an energizing circuit for the initiating relay including a contact of the key and back contacts of the connecting relays in series.

22. The combination with a plurality of operators' positions each having a telephone set, of call circuits extending through the positions, an initiating relay at each position, a group of call circuit connecting relays at each position started in operation by the initiating relay, and an energizing circuit for the initiating relay at each position including the back contacts of the initiating relays at other positions.

23. The combination with a plurality of call circuits, of a plurality of operators' positions each provided with a telephone set, an initiating relay and electromagnetic means for connecting an idle call circuit thereto and controlled by said initiating relay, of controlling relays associated with the call circuits, and an energizing circuit for the connecting means comprising the contacts of a plurality of the controlling relays.

24. The combination with a plurality of call circuits, of a plurality of operators' positions each provided with a telephone set, an initiating relay and a group of electromagnetic means for connecting an idle circuit thereto and controlled by said initiating relay, of controlling relays associated with the call circuits, an energizing circuit for one of the group of connecting means comprising the contacts of a single controlling relay, and an energizing circuit for another of said connecting means comprising contacts of a plurality of the controlling relays.

25. The combination with a plurality of call circuits, of a plurality of operators' positions each provided with a telephone set and electromagnetic means for connecting an idle call circuit thereto, of controlling relays for the connecting means, an energizing circuit for each controlling relay governed by the connecting means, and a locking circuit for controlling the relays in rotation.

26. The combination with a plurality of

call circuits, of a plurality of operators' positions each provided with a telephone set and electromagnetic means for connecting an idle call circuit thereto, of controlling relays for the connecting means, an energizing circuit for each controlling relay governed by the connecting means, a locking circuit for the controlling relays, and a release relay governing the locking circuit.

27. The combination with a plurality of call circuits, of a plurality of operators' positions each provided with a telephone set and electromagnetic means for connecting an idle call circuit thereto, of controlling relays for the connecting means, an energizing circuit for each controlling relay governed by the connecting means, a locking circuit for the controlling relays, a release relay governing the locking circuit, and a signal controlled by the release relay.

28. The combination with a plurality of call circuits, of a plurality of operators' positions each provided with a telephone set and electromagnetic means for connecting an idle call circuit thereto, of controlling relays for the connecting means, an energizing circuit for each controlling relay governed by the connecting means, a locking circuit for the controlling relays, a release relay governing the locking circuit, and an energizing circuit for the release relay extending through the front contacts of the controlling relays.

29. The combination with a plurality of operators' positions each having a telephone set and a call circuit key, of call circuits extending through the positions, a group of relays at each position having contacts connected in series to the key and contacts arranged to join the telephone set to a particular call circuit, and means for controlling the operation of the relays in rotation.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses, this 13th day of May, 1915.

HENRY M. BASCOM.

Witnesses:

SAMUEL RASMISIN,
HARRY L. BROWN.