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R. HAMILTON.

TELEPHONE OR TELEGRAPH SYSTEM.

APPLICATION FILED FEB. 10, 1903.

NO MODEL.

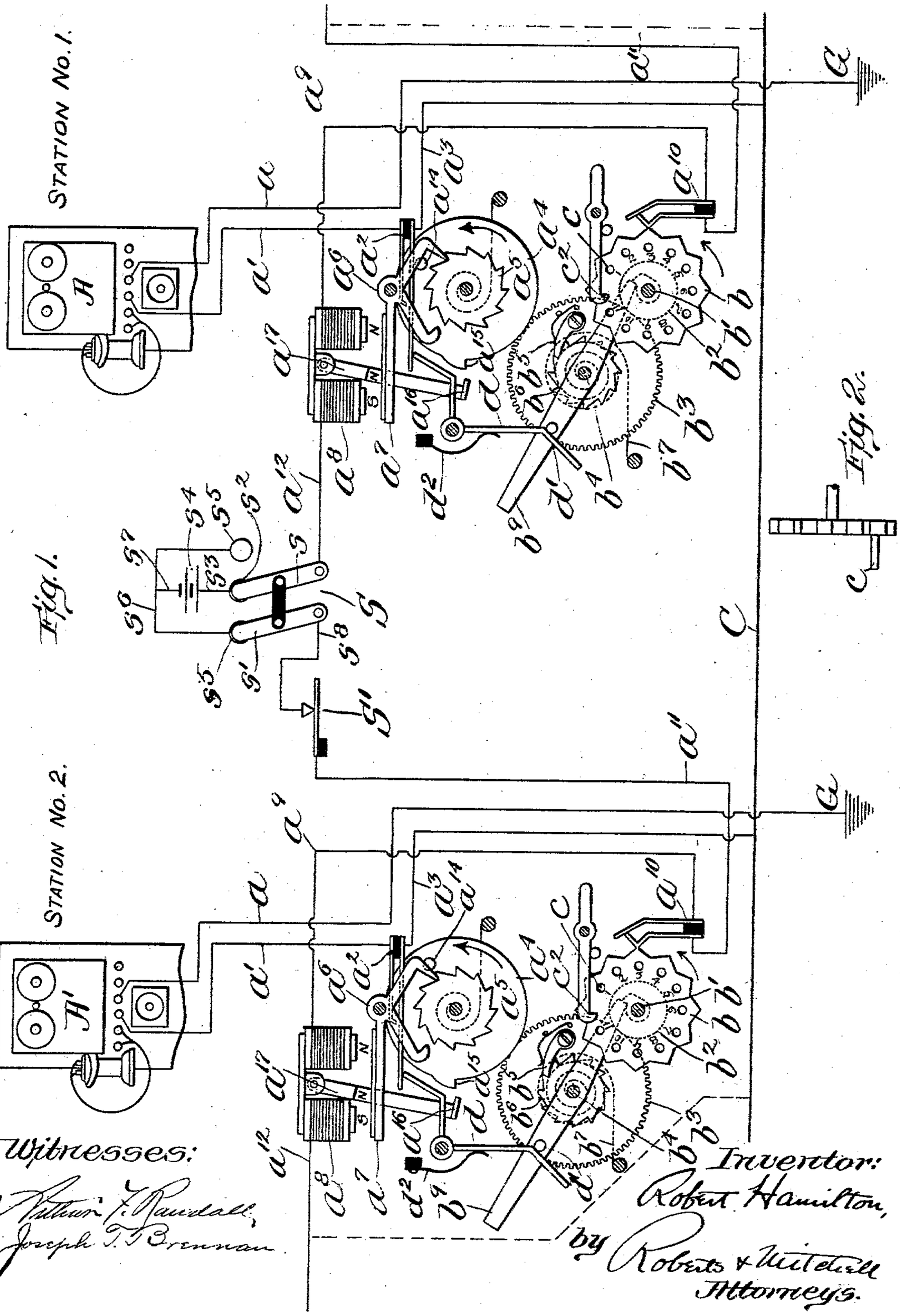

Fig. 1.

Fig. 2.

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UNITED STATES PATENT OFFICE.

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TELEPHONE OR TELEGRAPH SYSTEM.

SPECIFICATION forming part of Letters Patent No. 753,067, dated February 23, 1904.

Application filed February 10, 1903. Serial No. 142,758. (No model.)

To all whom it may concern:

Be it known that I, ROBERT HAMILTON, a citizen of the United States, and a resident of Milton, in the county of Norfolk and State of Massachusetts, have invented new and useful Improvements in Telephone or Telegraph Systems, of which the following is a specification.

My invention relates to telephone and telegraph systems, and particularly to telephone systems of that class wherein is included a number or group of instruments any one of which may be used to connect that instrument with any one of the others without the aid of a central station and central operator. Systems of this class, more especially telephone systems, have heretofore been so constructed that an operator after having connected his instrument with any one of the other instruments of the system must in order to disconnect the two instruments and return the system to normal condition perform an operation, such as depressing a push-button, withdrawing a pin, or the like. The systems described in Patent No. 664,757, granted to U. S. Jackson, December 25, 1900, and Patent No. 673,796, granted to U. S. Jackson, May 7, 1901, are illustrative of this class. Moreover, such systems are usually so arranged that so long as any two stations or instruments are connected all of the other instruments of the system are cut out and locked out, and so rendered inoperative, so that no other station can interrupt the two connected stations, the purpose being to insure privacy of conversation and non-interference. A serious objection, however, has heretofore been that if the operator at the calling-station of the two connected stations should neglect for any reason to perform the operation above referred to for the purpose of restoring the system to its normal condition every instrument on the line other than the calling and called stations would be locked out of the circuit and excluded from use of the system. In my application for patent, Serial No. 142,286, filed February 7, 1903, I have shown means whereby this difficulty may be overcome and the instruments automatically reset at their normal positions by the mere hanging up of the receiver at the calling-station. No means have, however, heretofore been devised for enabling the system to be reset at its normal position by means independent of the instruments, which would be essential if the operator at the calling-station should fail to return his receiver to its holder. Such independent means may be located at the central office or at any other convenient point. Neither have any means heretofore been devised for automatically synchronizing the operation of the step-by-step switch-controllers if by any accident they should become disarranged. The purpose of my invention is to accomplish these results.

Herein I have shown my invention embodied in a telephone system of that class wherein each instrument is connected with each of the other instruments by a normally open telephone-circuit. In the circuit for connecting any two instruments are arranged two normally open switches, one at each instrument and each operated by a magnet in a normally closed circuit, in which all of the other switch-operating magnets are also arranged. Located at each instrument in the circuit of the switch-operating magnets is a normally closed switch. When an operator at one of the instruments desires to connect his instrument with another of the instruments, he opens and closes the normally closed switch at his instrument the number of times corresponding to the number of the station with which he desires to connect. The normally open switches are so constructed that they all operate in unison when any one of the normally closed switches is operated; but only the switch of the instrument corresponding in number to the number of times the normally closed switch is operated is closed. Thus by operating the normally closed switch at his instrument the proper number of times the operator at each instrument may connect his instrument with any one of the others. Furthermore, I have also provided means whereby the operation of any normally closed switch not only acts to close the normally open switch at the called instrument, but also acts to automatically close the normally open switch at the calling instrument and in addition to lock all of the normally open switches of the other instruments open, so that the two connected

stations cannot be interrupted or disturbed by any of the other stations. In order to disconnect the two connected stations, it has heretofore been necessary for the operator at the calling instrument to again operate the normally closed switch of his instrument a number of times sufficient to return all of the normally open switches to normal position, and if he neglected to perform this operation then the system as heretofore constructed remained inoperative so far as use of it by the other stations or instruments of the system was concerned.

The principal objects of my invention are to prevent the system being rendered inoperative from the cause above pointed out and to enable the step-by-step mechanism for operating the normally open switches to be automatically synchronized if they for any reason get out of time with one another. To these ends I have provided, in connection with the switch-operating means of a telegraph or telephone system, means for controlling the switch-operating means independently of any station of the system to disconnect any two instruments and return all the instruments to their normal position at zero.

In the accompanying drawings, Figure 1 is a diagrammatical view of a telephone system embodying one form of my invention. Fig. 2 is a detail hereinafter described.

Having reference to the drawings, A represents a telephone instrument located at a station which for convenience is designated station No. 1, and A′ represents a telephone instrument located at another station, which may be designated station No. 2. Other instruments may be included in this system and numbered 3, 4, 5, &c. The telephone instruments A A′, &c., are each connected by a wire a with the ground, as indicated at G, and by a wire a' with one contact member of a normally open switch a^2, the other contact member of which is connected by a wire a^3 with a wire C, common to all of the instruments of the system.

Adjacent to each switch a^2 is arranged a disk a^4, fixed on an arbor, on which is also fixed an escapement-wheel a^5. The wheel a^5 is engaged by a pallet a^6, carried by the pivoted armature a^7 of an electromagnet a^8. Armature a^7 is moved in one direction by its magnet a^8 and in the opposite direction by gravity, (or a spring,) and when vibrated in this manner wheel a^5 is rotated (by the usual spring) step by step in the direction indicated by the arrow.

One end of the coil of each magnet a^8 is connected by a wire a^9 with one contact member of a normally closed switch a^{10}, and the other contact member of each switch a^{10} is connected by a wire a^{11} with wire C, either directly, as indicated by dotted line, or through the coils of the magnets a^8 and switches a^{10} of the other instruments in the series. The other end of the coil of magnets a^8 of one of the stations, as station A, is connected by a wire a^{12} with one member s of a reversing-switch S. Normally switch S occupies the position shown in the drawings, with contact member s in contact with a terminal s^2, connected by a wire s^3 with one pole of a battery s^4, and with the other contact member s' in contact with one of a pair of terminals s^5 s^5, joined by a wire s^6, connected with the other pole of battery s^4 by a wire s^7. The contact member s' of switch S is connected by a wire s^8 with the fixed contact member of a normally closed switch S′. The other movable spring contact member of switch S′ connects with the wire a^{11} of instrument A′ or station No. 2, while the wire a^{12} of magnet a^8 of instrument A′ connects directly with the switch a^{10} of the instrument (not shown) at station No. 3 to the left of instrument A′, or the wire a^{12} may be connected directly to wire C, as indicated by the dotted line.

Each disk a^4 carries a laterally-projecting pin a^{14}, adapted to engage with and close switch a^2 when moved into coöperative relation therewith. When the parts are in normal condition, each pin a^{14} is positioned on its disk with relation to its switch a^2 so that the pin a^{14} of station No. 1 is distant one step from its switch a^2, the pin a^{14} of station No. 2 is distant two steps from its switch, the pin a^{14} of station No. 3 three steps, and so on throughout the system. Thus it will be clear that if any switch a^{10} be operated once all of the disks a^4 will be moved one step by its spring and the switch at station No. 1 will be closed by its pin a^{14}, but none of the others, and that if the same switch a^{10} be operated once again all of the disks a^4 would be moved one step more in the same direction, thus opening switch a^2 of station No. 1 and closing the switch a^2 of station No. 2. So by operating any switch a^{10} the proper number of times the operator at any station may close the switch a^2 of any of the other instruments he may desire.

Each switch a^{10} is operated, as usual, by a toothed wheel b, fixed to an arbor b', which also carries a pinion b^2, driven by a gear b^3, loose on an arbor b^4. On gear b^3 is a pawl b^5, engaged by a ratchet-wheel b^6, fixed to arbor b^4. Arbor b^4 also has fixed to it a lever b^9, by means of which said arbor and ratchet may be turned in one direction to wind up a spring b^7. The wheel b is provided with a circular row of sockets, each numbered to correspond with the number of one of the stations of the system which it represents, and any one of these sockets is adapted to receive and hold a removable pin c. (See Fig. 2.) To close the switch a^2 of any of the other stations of the system, the operator at any particular station inserts the pin c in the socket of wheel b corresponding in number to the number of the station he desires to call and then depresses

lever b^9. Upon the release of lever b^9 spring b^7 rotates wheel b in the direction indicated by the arrow until pin c strikes a movable stop c^2, when further movement of wheel b in that direction is for the time being arrested. In order that the switch a^2 at the calling-station will also be closed when the wheel b is operated, as well as the switch a^2 of the station called, each instrument A A', &c., is provided, as usual, with a bell-crank lever d, one arm of which coöperates with switch a^2 and the other arm with a stud d' on lever b^9. When lever b^9 at the calling-station is depressed by the operator to start wheel b in motion, stud d' is carried away from the coöperating arm of lever d and the spring d^2 of lever d swings the latter in a direction to close switch a^2. Thus whenever wheel b of any calling-station is operated to close the switch a^2 of any other station the switch a^2 at the calling-station is closed, as well as the switch a^2 at the called station, and a complete telephone-circuit is established between the calling and called stations. To disconnect the two connected instruments, the operator at the calling-station either withdraws the pin c he inserted in the wheel b of his instrument or, as herein shown, he swings stop c^2 out of the path of pin c, thus freeing wheel b, which under the influence of its spring returns to normal position, as of course do all of the disks a^4.

Each disk a^4 is provided with a lug a^{15}, arranged to coöperate with a hook a^{16}, carried by a polarized armature a^{17}. The armature a^{17} is pivoted between the two pole-pieces of magnet a^8, and normally the direction of current through magnet a^8 is such that armature a^{17} is held by magnet a^8 in a position with hook a^{16} out of the path of lug a^{15}, so that normally all of the disks a^4 are free to be operated by their actuating-springs when any one of the wheels b is operated. This condition continues so long as the direction of current through magnets a^8 remains normal. If, however, the user of any instrument should fail to operate the wheel b to disconnect the two connected stations and return the system to its normal condition, any person (who may for convenience be the central operator) controlling the switch S may reverse the position of said switch, thereby reversing the direction of the current through the magnets a^8, and the polarity of magnets a^8 will thereby be changed and the polarized armatures a^{17} will each be swung toward disk a^4 to carry hook a^{16} in the path of lug a^{15}. After reversing switch S the operator then opens switch S' any number of times sufficient to cause all of the disks a^4 to be moved step by step until their lugs a^{15} all engage their respective hooks a^{16}. When the lugs a^{15} are all in engagement with the hooks a^{16}, all of the disks a^4 are in normal position and register zero. After the operator of switch S has returned that switch to normal position the system is in condition to be used by any station. The return of switch S to normal position of course again reverses the polarity of magnets a^8, which return armatures a^{17} to their normal positions with hooks a^{16} out of engagement with lugs a^{15}.

Preferably the switches S S' are located at one of the stations of the system and the operator of that station has it for his duty to control said switches and by them prevent the system being rendered inoperative through the neglect of the operator at any other station to return the system to normal condition after using it. The switches S S' may also be used to synchronize the disks a^4 when for any reason any one or more of them get to be out of time relatively to the others.

I have not shown the means for locking the levers b^9 of all the instruments, except the one at the calling-station, so that no other lever b^9 of the system can be operated while any two stations are connected. The usual means may be employed, as illustrated in the above-mentioned application and patents.

What I claim is—

1. In a telephone or telegraph system of the character described, in combination, two stations; two instruments one at each station; a normally open circuit for connecting those instruments; a normally open switch at each station arranged in said circuit; means controlled by the operator at either station for operating said switches to connect and disconnect the two instruments; and means for controlling said switch-operating means independently of either station to disconnect the two instruments.

2. In a telephone or telegraph system of the character described, a plurality of stations; a plurality of instruments, one at each station; a plurality of normally open circuits for connecting those instruments; a plurality of normally open switches arranged in said circuits, one for each station; means controlled by the operator at either station for operating said switches to connect the instrument of his own station with, or to disconnect it from, the instrument of any one of the other stations; and means for controlling said switch-operating means independently of any two connected stations to disconnect the instruments of said connected stations.

3. In a telephone or telegraph system of the character described, in combination, a plurality of stations; a plurality of instruments one at each station; a plurality of normally open circuits for connecting those instruments; a plurality of normally open switches arranged in said circuits one for each station; means controlled by the operator at either station for operating said switches to connect the instrument of his own station with, or disconnect it from, the instrument of any one of the other stations; means for controlling said switch-operating means independently of any two connected stations to disconnect the instruments of said connected stations; and

means for synchronizing the first-mentioned switch-operating means.

4. In a telephone or telegraph system of the character described, a plurality of stations; an instrument at each station; a circuit for connecting said instruments; a number of normally open switches in said circuit, one for each instrument; means controllable at each station for operating said switches to connect the instrument of such station with or disconnect it from the instrument of any one of the other stations, comprising a magnet for each switch; a normally closed circuit in which all of the magnets are located; a normally closed switch at each station in the normally closed circuit; a polarized armature at each station controlled by the magnet thereof adapted to regulate the action of the switch-operating means, and a reversing-switch in the normally closed circuit.

5. In a telephone or telegraph system of the character described, in combination, a plurality of stations; an instrument at each station; a plurality of normally open circuits for connecting any two of said instruments; a plurality of normally open switches in said circuits, one at each station; means controlled by the operator at each station for operating said switches to connect the instrument of his own station with or disconnect it from the instrument of any one of the other stations, comprising a plurality of magnets one for each switch, and a normally closed circuit in which those magnets are arranged; means for controlling the switch-operating devices independently of any connected station; means for synchronizing the switch-operating means, and an independent normally closed switch in the normally closed circuit.

6. In a telephone or telegraph system of the character described, a plurality of stations; a main-line wire and return common to all of the stations; a local telephone-circuit at each station connected at one end with the main-line wire and at its other end with the return; a telephone instrument in each local circuit; a normally open switch in each local circuit; means controllable at each station for operating said switches to connect the instrument thereof with and disconnect it from any one of the other instruments, comprising a magnet for each switch; a normally closed circuit in which all of the magnets are arranged, and a normally closed switch at each station in the normally closed circuit; and means for operating the normally open switches in the local circuits independently of the first-mentioned switch-operating means including the magnets to disconnect two connected stations.

Signed by me at Boston, Massachusetts, this 5th day of February, 1903.

ROBERT HAMILTON.

Witnesses:

ROBERT CUSHMAN,

JOSEPH T. BRENNAN.