

R. C. M. HASTINGS.

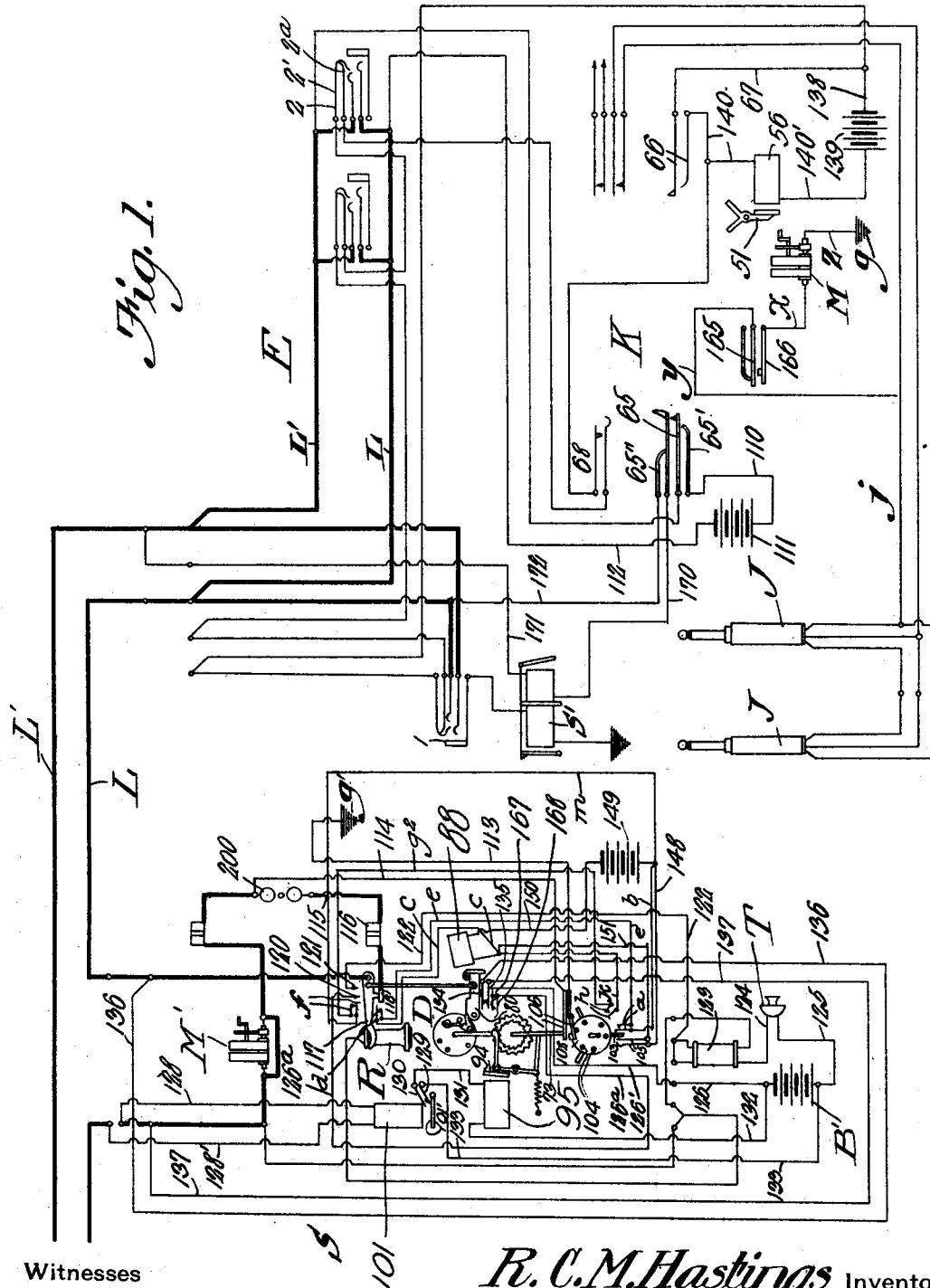
TELEPHONE SYSTEM.

APPLICATION FILED APR. 22, 1912.

Patented May 13, 1913.

4 SHEETS—SHEET 1.

1,061,287.



Witnesses

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4 SHEETS—SHEET 2.

Fig. 2.

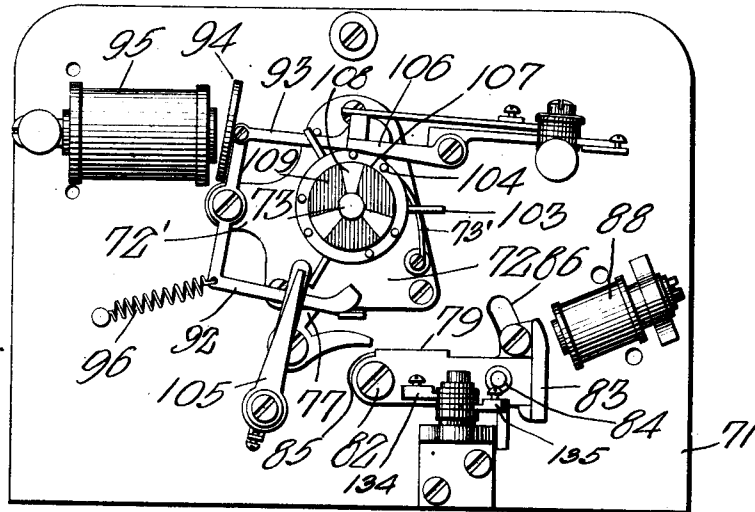
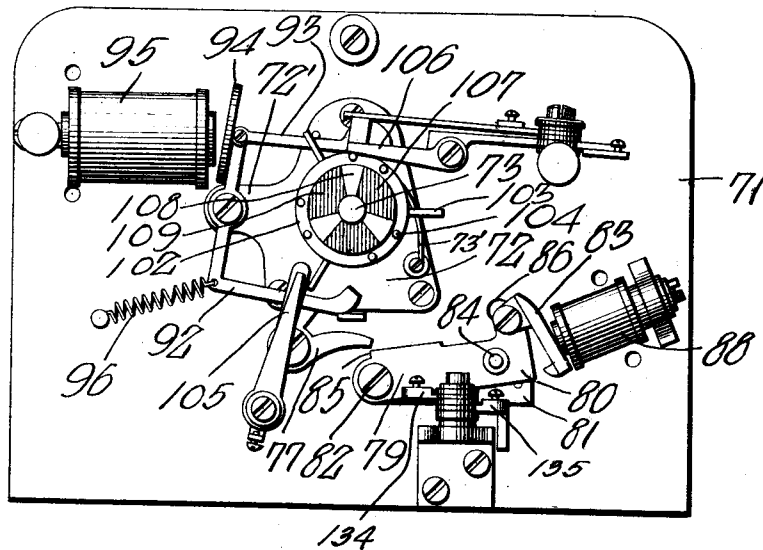


Fig. 3.



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4 SHEETS—SHEET 3.

Fig. 4.

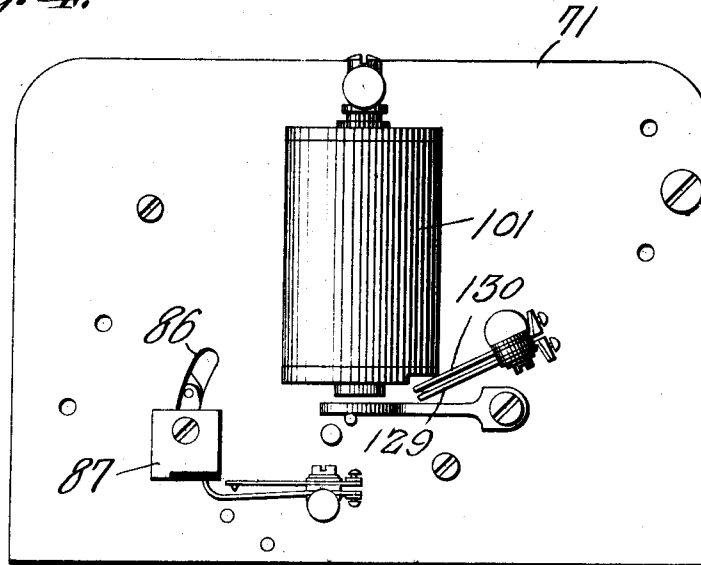
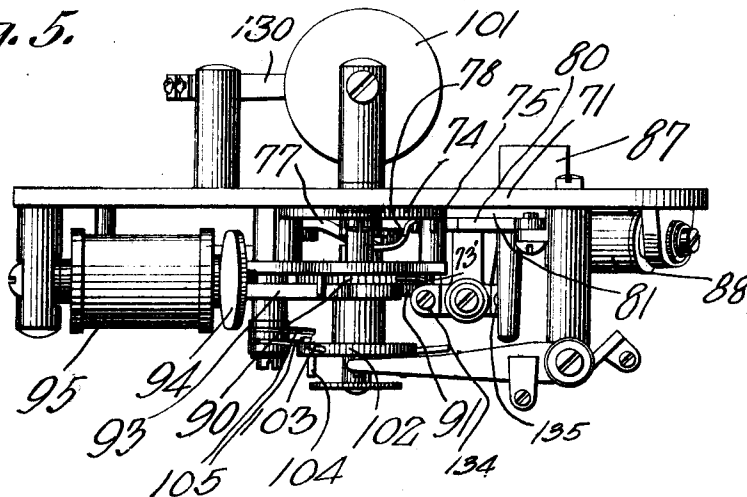


Fig. 5.



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4 SHEETS—SHEET 4.

Fig. 6.

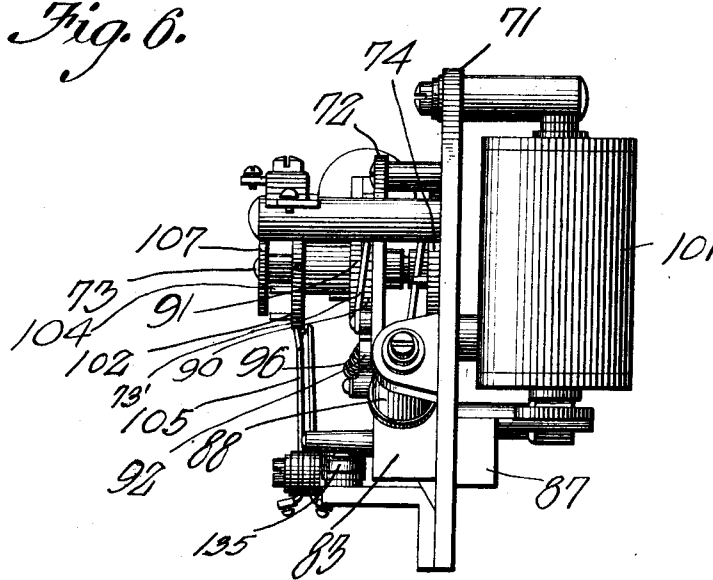


Fig. 7.

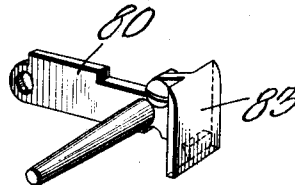
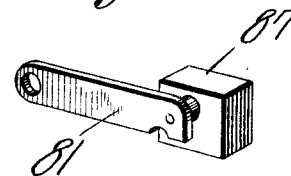


Fig. 8.



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UNITED STATES PATENT OFFICE.

RUBEN C. M. HASTINGS, OF COLUMBUS, OHIO, ASSIGNOR TO THE INTERNATIONAL TELEPHONE CO., OF COLUMBUS, OHIO.

TELEPHONE SYSTEM.

1,061,287.

Specification of Letters Patent.

Patented May 13, 1913.

Application filed April 22, 1912. Serial No. 692,466.

To all whom it may concern:

Be it known that I, RUBEN C. M. HASTINGS, a citizen of the United States, residing at Columbus, in the county of Franklin and State of Ohio, have invented a new and useful Telephone System, of which the following is a specification.

The present invention relates to improvements in telephone systems, and more particularly to a shunt and lock out device located at each sub-station and controlled from the exchange through the medium of a selecting apparatus, the primary object of the invention being the provision of a means whereby the transmitter and a receiver at the uncalled sub-stations are shunted from the line as well as the local battery circuits are opened.

A further object of the invention is the provision of a signaling device disposed in each sub-station to indicate the condition of the sub-stations relatively to the line or talking circuit. This particular device is shown as applied to a loop circuit, wherein a single central or exchange station and a series of subscribers' sets are connected in series, the particular form of selecting apparatus used at the exchange station being set forth in a co-pending application filed on even date herewith, Serial No. 692,465, while the complete selective telephonic system is set forth in another co-pending application filed August 29, 1911, Serial No. 646,699, this detailed construction being shown fully in operative relation to the system in the latter application. It is also to be understood that the present form of device may be used in connection with any form of telephone system, and is not limited to use in a system such as shown in the above set forth application.

With the foregoing and other objects in view which will appear as the description proceeds, the invention resides in the combination and arrangement of parts and in the details of construction hereinafter described and claimed, it being understood that changes in the precise embodiment of the invention herein disclosed can be made within the scope of what is claimed without departing from the spirit of the invention.

In the drawings—Figure 1 is a diagrammatic view illustrating a loop circuit with a single subscriber's set and the exchange station thereof. Fig. 2 is a front elevation of

the complete shunting device. Fig. 3 is a similar view with the parts in the position they assume should a receiver be off the hook when the same is shunted. Fig. 4 is a rear elevation of the device. Fig. 5 is a top plan view thereof. Fig. 6 is an end view. Figs. 7 and 8 are detail views.

Referring to the drawings, E designates the exchange or central station, L—L' the line conductors of a loop circuit system, and S the subscriber's set, connected in series with the conductor L. In the exchange are the selecting key K, shown in diagram, the connecting plug J, and its jacket I, and the call-up magneto M, the said magneto being employed as the call-up device in lieu of the usual automatic battery devices. In the subscriber's station, are the usual transmitter T and receiver R, the transmitter being in the local battery circuit including the battery B'. The receiver hook 117, is so disposed as to operably connect the ringer magneto M', with or disconnect it from the line. The transmitter and receiver shunting, lock-out and connecting device D, is located as shown in diagram (Fig. 1), in operable relation to the local battery circuit and the receiver and the transmitter, and comprises various details of construction, as clearly shown in the other Figs. 2-8. This diagram Fig. 1 will be set forth in detail, relatively to the operation of the device.

Subscriber's lock-out and shunting device.—This device, which is shown mounted in diagram in Fig. 1, and in detail in Fig. 2 through 8, consists primarily of the main supporting plate 71, having journaled therein and in the auxiliary plate 72, a shaft 73, which carries thereon the shunt or receiver hook lock disk 74, provided with the series of pins 75, which correspond in number to the number of sub-stations in the system and controlled by the selecting key K, said pins forming the operating means for controlling the receiver hook 117, and the shunt connections, as will presently appear. It is to be understood that although pins 75 are here shown, that grooves, or other projections may be used, and that there must be as many pins as there are sets of instruments. The pins 75 control the pawl 77, which is secured to the plate 71, by any well-known means, and is provided at one end with a spring 78, which is adapted to contact the pins 75, to raise the pawl 77

from engagement with the notch of the receiver hook lock or shunt controller 79, which is formed with two arms 80 and 81, and is secured to the plate 71 by the post 82. Secured to the controller 79, is an armature 83, said armature being provided to release the arm 81 to locking position. Carried by the arm 80 of the controller, is a pin 84, and a notch 85, which is adapted to receive the pawl 77, so that the controller may be locked and thus hold the receiver hook in shunted position. By the rotation of the plate or disk 74, the pawl is actuated to be raised or lowered from engagement with the notch 85, thus when the line is free, the pawl is out of engagement or when the sub-station is called, but when two subscribers are in communication, the pawls 77 of the remaining sub-stations are in the notches 85 of their respective controllers and the line is dead to them, as their transmitters and receivers are shunted from the line. The spring 73' prevents a retrograde movement of the shaft 73. Mounted through a slot 86 in the plate 71 and upon the opposite side to the controller, is a weight 87, which is connected to the free end of the arm 81, which as the controller is lifted, the pawl 77 being disengaged therefrom, and the electromagnet 88 being energized, the armature 83 being attracted, and pulled outwardly so that its lower end is disengaged from the weighted end of the arm 81, will fall by gravity and engage the pair of terminals 134—135, shunting the transmitter and receiver of this sub-station from the loop circuit and at the same time opening the battery circuit in said local sub-station. For example, in Fig. 3, the arm 81 has fallen, and placed the spring contacts 134—135 together, which shunts this sub-station. The main shaft 73 also carries two ratchet wheels 90 and 91, respectively, one of which is an actuating ratchet and the other of which is a retrograde movement preventing ratchet, and disposed to operate upon these ratchets to impart to the shaft 73 and the disk 74, the proper rotation, is the bell crank lever pawl 92, which is pivoted to the arm 72' of the auxiliary plate 72, and has pivoted to its upper free end the pawl 93, the pawl 93 operating to rotate the shaft and disk, while the pawl 92 operates to prevent its moving too far or retrograding. In order to operate these two pawls simultaneously, to operate the shaft, an armature 94 is connected to the end of the pawl 92 at its connection with the pawl 93, so that the energizing of the electromagnet 95 will pull upon the pawl 93 and cause the pawl 92 to be pushed and lifted, the pawl 93 engaging the ratchet 91 to rotate the shaft, and the pawl 92 engaging the ratchet 90 to prevent the shaft moving too far or retrograding, a spring 96 being employed to return the

pawls upon the deenergization of the electromagnet 95. By the making and breaking of the pairs of contacts by the selecting key, the electromagnet 95 is energized, and the shaft 73 and the disk 74 are operated in synchronism or in step with the selecting key, and thus the selected subscriber is permitted a line connection, and the remaining receivers and transmitters are shunted from the line, and are dead. The electromagnet 95 may be energized by a storage battery B' or by the main transmission battery 111 but as herein shown is controlled through the contacts 129 and 130, controlled by the main electromagnet or relay 101, disposed upon the rear of the plate 71, and connected in the talking circuit, the energizing of the electromagnet 101, closing the contacts 129, and 130, and closing the local circuit of the battery B', to energize the electromagnet 95 and operate the shunting and lock-out mechanism. The shaft 73 further carries a disk 102, having a set of peripheral pins 103, here shown three in number, and a set of outwardly projecting facial pins 104, which are three in number and are disposed intermediate of the respective peripheral pins 103. The pins 104 are employed to operate the bell controller spring terminal contacts 106, while the pins 103 are adapted to engage and operate the spring terminal contacts 105 which are in circuit with the electromagnet 88, to provide means for energizing the electromagnet 88, to release the arm 81, to produce a shunt and open the line circuit to the battery, should the subscriber neglect to hang up his receiver after his conversation is ended.

In order to provide a visual signal or indicator to advise the subscriber that the line is free or busy, there is mounted upon the extreme end of the shaft 73 and in view of the subscriber a portion of a disk 107, which is provided with two series of two colored portions 108 and 109, as shown in Figs. 2 and 3, a red color indicating "busy" and a white "free." By this means, the subscribers may be notified when they may expect to get the exchange for communication, or even in the event that they should have taken the receiver off the hook, during the selecting of a called subscriber by the exchange, or the receiver was off the hook, the visual signal will indicate at a glance that the line is busy and that their receiver and transmitter is shunted from the main line and is in reality "dead."

A pair of contacts 167—168 are disposed in the path to be held normally open when the arm 81 is down, even though the receiver hook 117 might be raised, due to the receiver being off or having been left off the hook. These contacts 167—168 provide the means to open the local battery circuit under such conditions so that should

the receiver be left off the hook 117, the batteries B', will not be permitted to become weakened or exhausted. The particular circuit affected will be set forth in the description of the operation.

With the various instruments in the position as illustrated in Fig. 1, the contacts 65—65'' are closed so that the signal S' is connected to the line conductors L—L' through the respective conductors 171, 170 and 172, so that all subscribers' sets are in line calling connection with the exchange E. Thus the line will be connected so that the exchange can be called by any one of the subscribers' sets. Pre-supposing that a subscriber desired to call the exchange, the receiver R is removed from the hook 117, and the magneto M' at the calling subscriber's set is actuated to actuate the exchange signal S' to indicate to the exchange operator that the calling subscriber desires to be connected with a selected subscriber. Should the magneto M' be dispensed with, the local battery B' of the calling sub-station will be connected to the line through the receiver hook 117 and contacts 120 and 121, thus bringing into the line the transmitter T and the receiver R with the local batteries B', which will energize, in short lines, the signal S' and give such indication to the exchange. The circuit closed when the receiver hook 117 is raised, is as follows: the contact point 121, the conductor 122, the coil 123, conductor 124, transmitter T, conductor 125, batteries B', conductors 126'—126, the contacts 167—168, the conductor 126'', the contact 120, and the receiver hook 117. Assuming that the calling sub-station desires to converse with a sub-station, as for instance No. 5, the exchange operator now inserts the jack plug J in the calling sub-station socket 2, this action opening contacts 2'—2''. The selecting key K is now operated to select the sub-station No. 5, and during such action the contacts 66, are closed and a circuit is closed at 66 and includes one contact 66, the conductors 67 and 138, the battery 139, the conductor 140', the electromagnet 56, the conductor 140 and the other contact 66. Thus the electromagnet 56 is energized to retain the key in selected position, and as particularly set forth in the two co-pending applications heretofore mentioned. The key operates the contact 65 and thus closes the talking circuit and intermittently opens and closes another circuit, as will presently appear. The closure is made between the contact 65 and terminal 65'', while the contact is open at 65'' and closed at 65', thus intermittently and alternately forming a talking connection and connecting the batteries 111 to the line. The removal of the plug J from the calling socket at the exchange causes the release of the key K to zero or initial position. As the key K was

moved toward initial position and before being stopped, as set forth in application Serial No. 646,699, the contact 65 is moved to intermittently open and close the contacts at 65 and 65'' and alternately and intermittently open and close the contacts 65—65'. This action throws into the line the battery 111, so that the various shafts 73 in all of the sub-stations are operated synchronously, to lock out all uncalled sub-stations and place into line connection the single called sub-station. The circuit closed to lock out the uncalled sub-stations and connect the line in the called sub-station is as follows: the contacts 65—65', the conductor 110, the battery 111, the conductor 112, the line conductors L—L', the conductor 128, in each sub-station, the electromagnet 101, in each sub-station, and the conductor 128', in each sub-station, thus intermittently energizing the electromagnet 101 in all sub-stations. The energization of each electromagnet 101 operates the armature 101', in each set and thus causes the contacts 129—130 to intermittently close a circuit including the electromagnet 95 in each sub-station. This circuit includes the contacts 129—130, the conductor 131, the electromagnet 95, the conductor 132, the batteries B', and the conductor 133. Thus the intermittent energization of the electromagnet 95 in each set will operate the armature 94 to step the shaft 73 and the disk 102. The disk 102 in the uncalled sub-station will be moved to indicate "red," if the line is busy. At this stage in each uncalled sub-station, the receiver hook is locked by reason of the lever 80 being locked in down position by the lock 77, engaging the notch 85. At the same time, the contacts 134—135 are closed by the lever 80 in such position as to shunt the uncalled sub-stations from the lines L—L' through the conductor 136, contacts 134—135, and conductor 137. As the uncalled sub-stations receiver hooks are thus locked, it is impossible for the same to be released by lifting the receiver, and the conductor 136, the contacts 134—135 and the conductor 137 completes a shunt around the transmitter and local battery circuit. The local battery circuit is thus shunted from the line. Also as the pin 104 in the uncalled set, is out of contact with the contacts 106, the bell 200 in each uncalled set is held inoperative and will not be affected when the bell 200 is actuated in the called set. When the selecting key K was stopped at selecting position, the electromagnet 56 was deenergized and the contacts 165—166 were held open. The automatic pressing of the contact 165 to engage the contact 166 by the key K, throws into the line the call-up machine M of the system. By this means the call-up machine, which may be operated at all times, or when desired, is thrown into the line

through the wires $z-y$ and energizes the call-up alarm 200 in the called sub-station. The key K also permits the contact 165 to automatically rise and be separated from the contact 166, so that the call-up machine M is cut from the line. The call-up alarm circuit energized by the call-up machine M when contacts 165—166 are closed, is as follows: the ground g , the conductor z , the machine M, the conductor x , the contacts 166—165, the conductor y , the conductor j , of jack plug J, the socket 2, the line L, the receiver hook 117 in the called set, the contact 118, the conductor 115, the call-up alarm 200, the conductor 114, the contacts 106, which are closed by the pin 104 in the called sub-station, the conductor 113 and the ground g' . As the locking lever 77 in the called sub-station is raised so as not to be in the path to engage the notch 85 of the arm 80, the receiver hook of the called sub-station, when the receiver has been removed therefrom, will automatically rise and thus open the contacts at 117—118 and bridge the contacts 120 and 121 and thus throw into the line the local battery circuit of the called sub-station so that the called sub-station and the calling subscriber's sets will be placed into connection with the line wires L and L'. At the end of the conversation, the operator at the exchange removes the jack plug J, and permits the contacts 2'—2* to close and as the contacts 68 are closed, due to the selecting key, the circuit including the electromagnet 56 is closed, and thus the key is automatically released and returned to zero or initial position. During this return movement of the key K, the contact 65 will intermittently open and close the contacts 65' and 65'' and thus throw into line the battery 111, which as before described will actuate all of the electromagnets 101 in every sub-station to automatically operate the shafts 73, the electromagnets 95, and armatures 94, so that the disks 102 will be placed in normal or zero position to indicate that the line is free and that the exchange can be called by all sub-stations. At this time all of the hooks 117 can be raised, as the locking lever 77 is in raised position and out of the path to engage the notch 85 of the various arms 80. In the event that a receiver in any sub-station is left off of the hook 117, such hook is consequently raised, to permit contacts 134—135 to be opened, with contacts 167—168 closed, and the arm 80 due to the armature catch 83 will have carried with it the arm 81. Now as the shafts 73 are rotated, as before described, during the selection of a called sub-station and the locking out of the uncalled sub-stations, the pin 103 carried by the disk 102 will engage the contacts 105 in each sub-station, thus closing a circuit in each sub-station to energize the electromagnet 88.

Thus in the set where the hook 117 is raised, the armature catch 83 will be moved to the position as shown in Fig. 3, and should this be an uncalled sub-station, it will be shunted from the line by the closure of the contacts 134—135 and opening of the contacts 167—168, due to the falling thereupon of the arm 81. This circuit is as follows: the contacts 105, conductor 151, electromagnet 88, conductor 150, battery 149, and conductor 148, thus energizing the electromagnet 88 to attract the armature catch 83, as above described, to release the arm 81, which due to gravity will fall and close the contacts 134 and 135, thus shunting the set from the lines L—L'. As before stated, the contacts 167—168 are held opened by the arm 81 when down, and by this arrangement it is evident that the local battery B' is saved, should the receiver R, be purposely or accidentally lifted off the hook 117.

To provide for any and all conditions, the various pairs of contacts a , d , f and h are employed, the contacts $a-h$ being controlled by pins 103, while contacts d and f are controlled by the receiver hook 117. The contacts d are normally opened and are only closed by the hook 117 upon its downward movement and then only for an instant. To clearly set forth the use of these contacts and their circuits, a detail of the operations and conditions under which they are brought into play will be given.

Suppose sub-station No. 11 desires and does call the exchange, thus removing the receiver and raising the hook 117, and also arm 80, and with it the armature catch 83, so that the arm 81 is also raised. This action opens contacts 134—135 and opens the shunt as heretofore described. The arm 80 during the conversation retains arm 81 up, but after the conversation is completed, and the receiver has been placed on the hook 117, the arm 81 is lowered and returned to its initial position. This is due to the pin 103, bridging contacts a , while the contacts d are momentarily closed by the hook 117 in its passage downwardly, a circuit being closed to energize the electromagnet 88 and attract the armature catch 83 away from the arm 81. When the hook 117 is in full down position, the contacts d normally open and these contacts are not closed when the hook rises. The circuit momentarily closed is as follows: the contacts a , the conductor b , the battery 149, the conductor 150, the electromagnet 88, the conductors 151, and c , the contacts d , and the conductor c . The magnet 88, therefore, under these conditions is only energized for an instant, during the passage of the hook 117 downwardly, and is deenergized when the hook is down or is moving upwardly. Should, however, the calling sub-station not return the receiver, in order that he might listen to another con-

version, the contacts 120—121 are bridged, as usual, placing the instruments in the line, and as contacts *f* above the hook 117 are held closed, and as disk 102 has been moved, the pin 103 is out of contact with contacts *a* and they are opened. The arms 80 and 81 are both up, but as the exchange desires to connect other sub-stations, and does manipulate the key *K* to such end, the disk 102 in the sub-station with the receiver off and the hook 117 and arms 80 and 81 up, is moved to cause the pin 103 to engage and close contacts *h*, which through the medium of the now closed contacts *f* close a circuit to energize the electromagnet 88 and thus attract the armature catch 83, to release the arm 81, which due to gravity falls and closes contacts 134—135 and thus shunts the undesired sub-station from the line, even though the hook 117 is up. The circuit closed is as follows: the contacts *f*, the conductor *g*², the contacts *h*, the conductors *k*, and 151, the electromagnet 88, the conductor 150, the battery 149 and the conductor *m*.

What is claimed is:

1. In a telephone system, the combination with an exchange station having a selecting apparatus, of a series of sub-stations connected in said system and with the exchange for the transmission of speech, each sub-station having a transmitter, a receiver, and a receiver hook, a shunting device controlled by said selecting apparatus, each shunting device having a rotatable shaft, an electromagnet controlled from the selecting apparatus to actuate said shaft, a receiver hook lock controlled by the shaft, shunt contacts connected to the line at each sub-station, and a lever disposed in operable relation to the shunt contacts and receiver hook lock to shunt the sub-station from the system or place the same into the system for speech transmission.

2. The combination with an exchange station having a selecting apparatus, of a series of sub-stations connected to the exchange station for the transmission of intelligence, a transmitter, a receiver, and a receiver hook in each sub-station, and a shunting device for each sub-station controlled by said selecting apparatus, each shunting device having a rotatable shaft, means controlled through the line to actuate said shaft, a receiver hook lock controlled by said means, a shunting connection with the line operably disposed to be closed by the lock, and a visual signal connected to the shaft to indicate the condition of the shunt connection.

3. In a shunting device for the local battery circuit of a sub-station set of instruments, a rotatable shaft, electromagnetically operated means for rotating said shaft, a receiver hook lock controlled by said shaft, a

lever in operable relation to said lock, and a pair of spring terminal contacts controlled by said lever and in a shunt circuit with the transmission line to cause the local battery circuit to be shunted from or connected in the line.

4. In a shunting device for the local battery circuit of a sub-station set of instruments, a rotatable shaft, electromagnetically operated means for rotating the shaft, a receiver hook lock controlled by said shaft, a lever in operable relation to said lock, a pair of spring terminal contacts controlled by said lever and in a shunt circuit with the transmission line to cause the local battery circuit to be shunted from or connected in the line, and a visual signal operated by the shaft to indicate the condition of the local battery circuit relatively to the line.

5. In a telephone system, a sub-station having a switch controlled shunt connection when closed adapted to isolate the sub-station from the line, a transmitter, a receiver, a local battery circuit having two switches therein, and means controlled by the transmission current of the system for opening and closing the switch of the shunt connection and opening one of the switches of the local battery circuit, the switch of the shunt connection being closed when one switch of the local battery circuit is open, or vice versa.

6. In a telephone system, a sub-station having a switch controlled shunt connection for isolating the sub-station from the line, a transmitter, a receiver, a receiver hook lock for controlling the switch of the shunt connection, a local battery circuit having two switches therein, one of said switches being closed by the receiver hook, and the other being controlled by the receiver hook lock, and mechanism controlled at a distant point for locking and releasing the receiver hook lock.

7. In a telephone system, an exchange and a substation connected for the electrical transmission of intelligence, the substation having a switch controlled shunt connection for isolating the substation from the line, a receiver, a local battery circuit, a transmitter in said circuit, two switches in said circuit, a receiver hook, a receiver hook lock, the receiver hook lock being disposed to close the shunt switch when in locked position, one of the switches of the local battery circuit being open when the receiver is upon the hook and when the receiver hook is locked, means controlled from the exchange for causing the opening and closing of the second switch of the local battery circuit and for locking and releasing the receiver hook lock, and a visual indicator for indicating the position of the shunt connection.

8. In a telephone system, a sub-station having a switch controlled shunt connection

to isolate the sub-station from the line, a transmitter, a receiver hook lock, a local battery circuit controlled by the receiver hook, a switch in said local battery circuit, 5 a two-part receiver lock, one part being connected to the receiver hook, means carried by said part for locking the other part thereto, said receiver hook lock when in receiver holding position closing the switches of the shunt circuit and the local battery circuit, 10 another circuit at the sub-station including an electromagnet disposed to actuate the means carried by one part of the receiver hook lock to release the other part, a switch in said circuit, and means controlled at a distant point for locking and releasing the receiver hook lock and for opening and closing the switch of the last circuit.

9. In a telephone system, a sub-station 20 having a transmitter, a receiver; a receiver hook, a receiver hook locking lever operably connected to the receiver hook; another lever pivoted in parallel to the first lever; an armature catch carried by the first lever 25 for locking the second lever thereto for movement in unison when the receiver hook rises; a local battery circuit having bridging contacts to be closed by the receiver hook when in raised position; a switch in said 30 local battery circuit and disposed to be closed by the second lever of the receiver hook locking levers, another circuit including a battery, an electromagnet, and a switch for actuating the armature catch of 35 the receiver locking levers, and an electromagnetically controlled means operable from a distant point and connected to the line for locking the levers and for opening and closing the last mentioned switch.

40 10. In a telephone system, a sub-station having a transmitter; a receiver; a receiver hook; a receiver hook locking lever operably connected to the receiver hook; another lever pivoted in parallel to the first lever, 45 an armature catch carried by the first lever for locking the second lever thereto for movement in unison when the receiver hook rises; a local battery circuit having bridging contacts to be closed by the receiver hook 50 when in raised position; a switch in said local battery circuit and disposed to be closed by the second lever of the receiver hook locking levers; another circuit includ-

ing a battery, an electromagnet, and a switch for actuating the armature catch of 55 the receiver locking levers; electromagnetically controlled means operable from a distant point and connected to the line for opening and closing the last mentioned switch; and a shunt circuit including the 60 last battery and the electromagnet having a normally open switch in the path to be engaged by the receiver hook to close the last switch and release the armature catch and open the local battery circuit in an un- 65 called sub-station.

11. In a device for shunting the local battery circuit from the line, a rotatable shaft, adapted to rotate in one direction, co-acting pawls and ratchets for operating said shaft, 70 an electromagnet actuated from a distant point for operating said pawls and ratchets to rotate the shaft, a pair of co-acting terminals connected in the battery circuit, an arm controlled by the shaft for actuating said 75 terminals to connect and disconnect the local battery circuit from the line, and electromagnetically controlled means for releasing said arm to engage the terminals to shunt the local battery circuit from the line should 80 the receiver be off its hook.

12. In a telephone system, an exchange and a substation connected for the electrical transmission of intelligence, the substation having a switch controlled shunt connection 85 for isolating the substation from the line, a receiver, a local battery circuit, a transmitter in said circuit, two switches in said circuit, a receiver hook, a receiver hook lock, the receiver hook lock being disposed to 90 close the shunt switch when in locked position, one of the switches of the local battery circuit being open when the receiver is upon the hook and when the receiver hook is locked, and means controlled from the ex- 95 change for causing the opening and closing of the second switch of the local battery circuit and for locking and releasing the receiver hook lock.

In testimony that I claim the foregoing 100 as my own, I have hereto affixed my signature in the presence of two witnesses.

RUBEN C. M. HASTINGS.

Witnesses:

L. A. KOONS,
E. C. WOODWORTH.