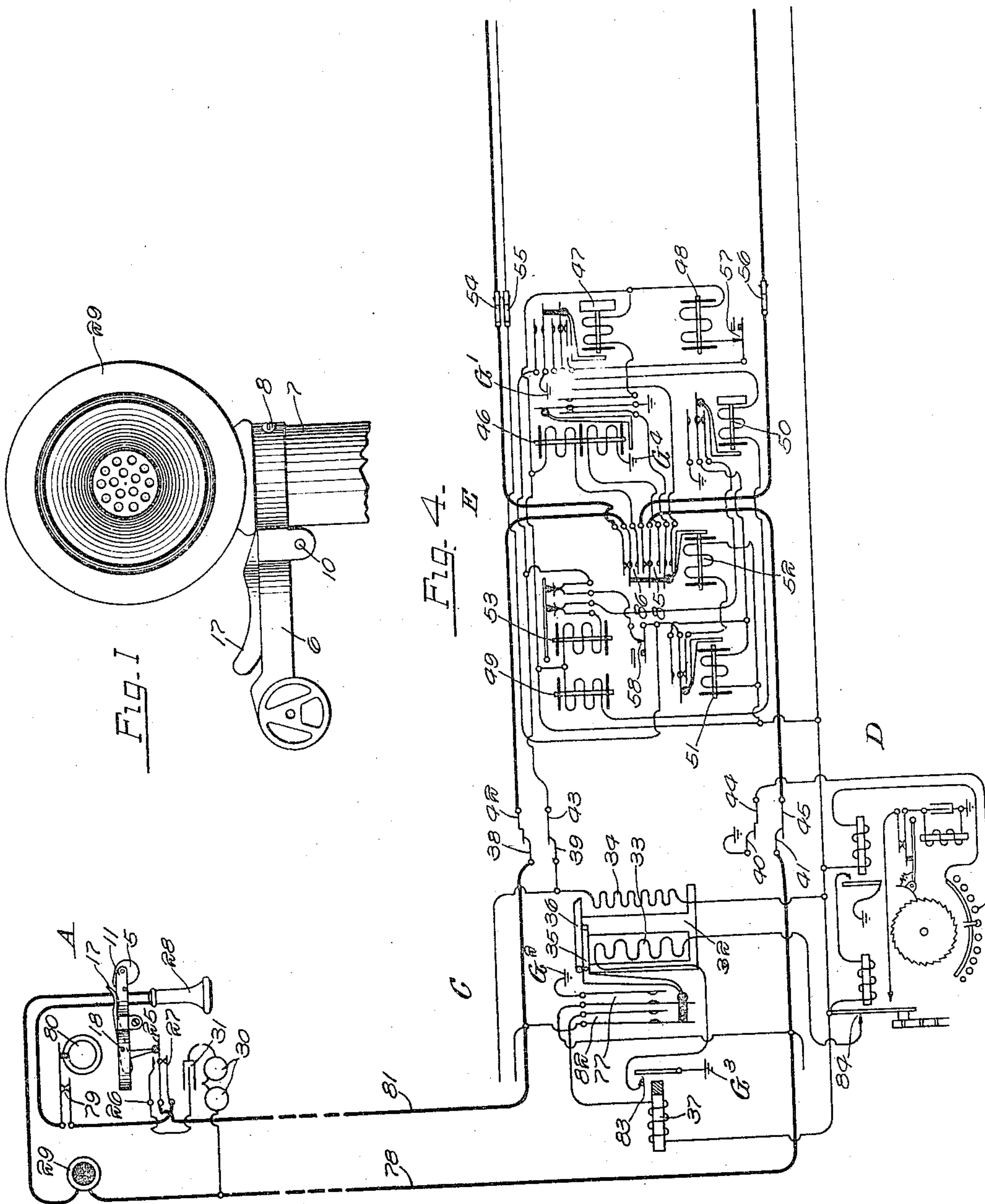


1,256,512.

J. G. BLESSING.
SUBSTATION SWITCH HOOK.
APPLICATION FILED MAR. 20, 1916.

Patented Feb. 19, 1918.
2 SHEETS—SHEET 1.

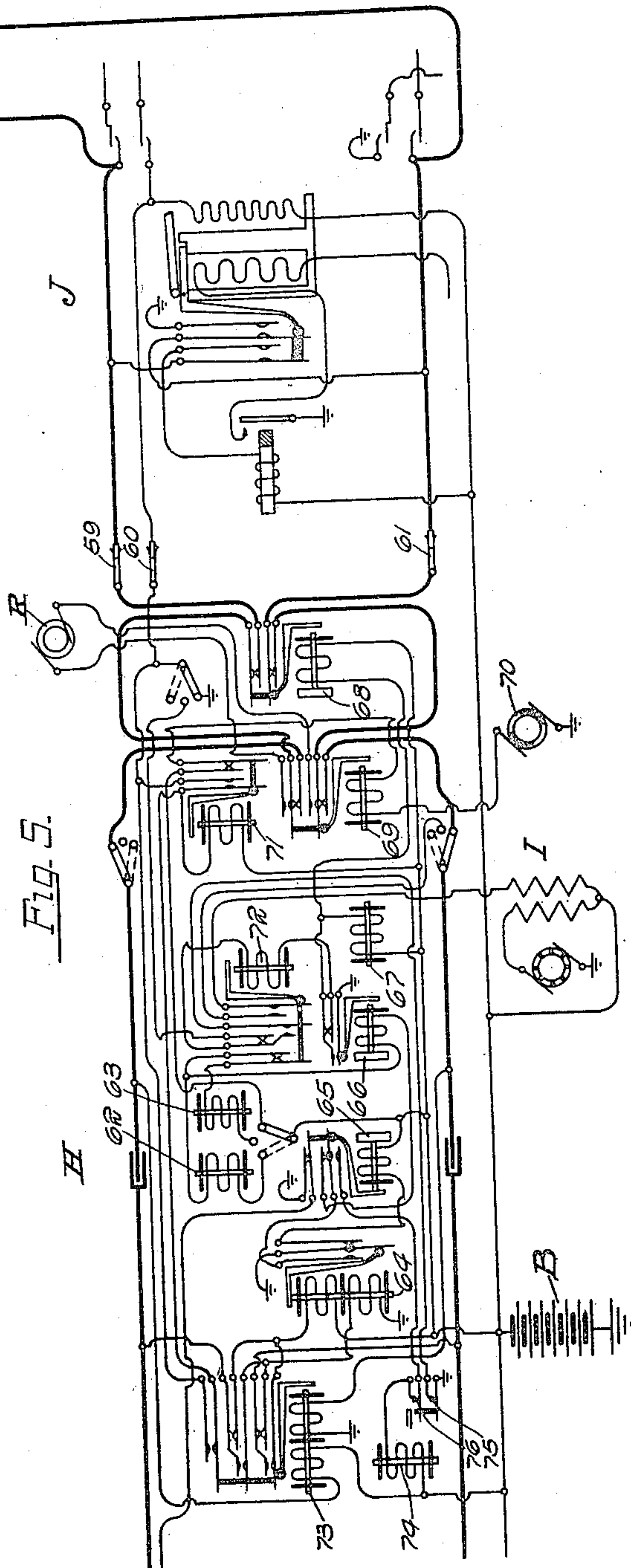
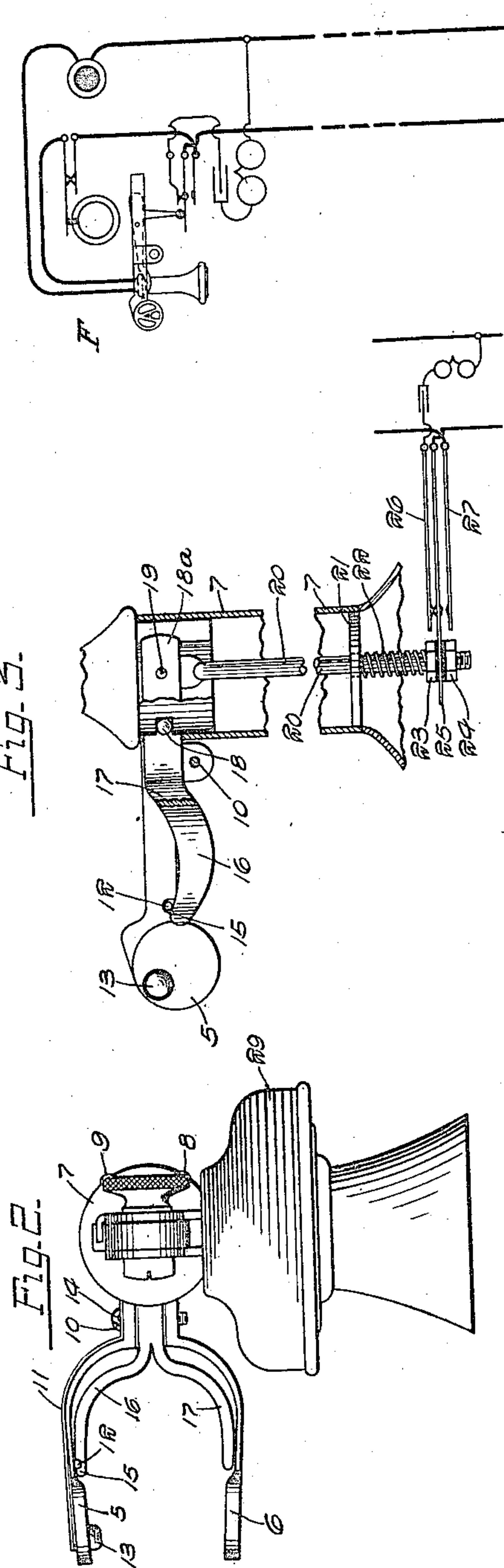


Inventor
John G. Blessing
By Charles C. Bulkley
Attorney

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2 SHEETS—SHEET 2.



Inventor
John G. Blessing.
By Charles C. Rutledge
Attorney

UNITED STATES PATENT OFFICE.

JOHN G. BLESSING, OF CHICAGO, ILLINOIS, ASSIGNOR TO AUTOMATIC ELECTRIC COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

SUBSTATION SWITCH-HOOK.

1,256,512.

Specification of Letters Patent.

Patented Feb. 19, 1918.

Application filed March 20, 1916. Serial No. 85,401.

To all whom it may concern:

Be it known that I, JOHN G. BLESSING, a citizen of the United States of America, and a resident of Chicago, Cook county, Illinois, have invented certain new and useful Improvements in Substation Switch-Hooks, of which the following is a specification.

My invention relates to switch-hooks for telephone systems in general, but more particularly to switch-hooks for automatic telephone systems.

In automatic telephone systems it frequently happens that an impulse is inadvertently transmitted to the central office switching equipment when the substation receiver is being removed from the switch-hook to initiate a call. This may be due to the switch-hook arms being bent too close together or it may be due to carelessness on the part of the person attempting to make the call. In any event if the switch-hook is moved sufficiently to break the line circuit after the said circuit has been closed, in the act of removing the receiver, a false impulse will be transmitted over the line and the calling subscriber will fail to be connected with the station number for which the calling device is subsequently operated.

Generally stated, therefore, the object of my invention is to provide positive and efficient means for closing the line circuit in such a manner as to prevent the transmission of a false impulse to the central office switching mechanism.

It is also an object of my invention to provide an improved switch-hook controlled by a receiver wherein the line circuit will remain positively closed when once closed in the act of removing the receiver.

It is also an object to provide certain details and features of improvement tending to increase the efficiency and general serviceability of a telephone system, by providing a device of this character.

To the foregoing and other useful ends my invention consists of matters hereinafter set forth and claimed.

My invention will be more readily understood by reference to the accompanying drawings in which Figure 1 represents a front view of a desk stand provided with my improved switch-hook. Fig. 2 illustrates a top view. Fig. 3 shows a front view partly in section with part of the desk stand cut away. Figs. 4 and 5 show one method of

applying my improved switch hook to a system of well known type, it being understood that any well known type of switches may be substituted for those illustrated. In the above views the hooked portions 5 and 6 are rigidly secured to the desk-stand tube 7 by the screws 8 and 9. The screw 10 holds the portions rigid with a space between them. The spring 11 provided with projecting pins 12 and 13, is secured to the portion 5 by means of the rivet 14. The pin 13 moves freely in a hole drilled near the end of portion 5 while the pin 12 moves freely in a cut out part of the said portion 5. The pin 12 is arranged to engage the end 15 of the arm 16. The arms 16 and 17 are rigidly secured together and are pivoted in the tube at 18. The arms 16-17 when released move freely inside of hook portions 5 and 6. In Fig. 3 a portion of arm 17 is cut away to show the relative arrangement of the parts. Pivoted to an extension 18^a of arms 16 and 17 at a point 19, inside of the tube 7, is a plunger 20 which passes through a hole in the disk 21, which disk is rigidly secured to the tube 7. A spiral spring 22, placed between the disk 21 and the nut 23, tends normally to force the plunger 20 downward but is prevented from doing so as long as the pin 12 is over the end portion 15 of arm 16, as shown in Figs. 2 and 3. Between nuts 23 and 24, which are secured near the end of plunger 20, and arranged to be engaged by insulating bushings, is a spring 25 normally engaging spring 26 and adapted when the plunger 20 is moved downward to disengage spring 26 and engage spring 27. When springs 25 and 26 are in contact the ringer or bell circuit is closed and when spring 25 is out of engagement with spring 26 but in engagement with spring 27 the bell circuit is open and the talking circuit is closed. The spring 11 is tensioned to maintain the pins 12 and 13 in the position shown in Fig. 2. It is to be understood that the screw 10 holds the portions 5 and 6 at such a distance from each other as to permit free up and down movement of the hook comprising the arms 16 and 17. The hook portions 5 and 6 are at such distance from each other that the receiver shell will easily pass between them, but the said shell will engage the projecting pin 13 and force it outward thereby disengaging projecting pin 12 from the end 15 of arm 16. The spiral spring 22 thereupon

exerts its tension to draw the plunger 20 downward, the hook 16—17 being carried upward as shown in Figs. 1 and 3. When the pin 13 is freed from the receiver shell the spring 11 carries both pins 12 and 13 back to normal, so that when hook 16—17 is carried down by the restoration of the receiver the pin 12 will be ready to engage and hold the hook through its end portion 15. Fig. 1 indicates the position of the parts after the receiver is removed. Fig. 2 shows the parts when the receiver is upon the hook. Fig. 3 illustrates views of the apparatus partly in section and partly cut away. The receiver shell has been omitted to make the illustration clearer.

In order that the operation of my improved switch hook may be more easily understood and the utility therefor more clearly seen, I have herein illustrated the same in connection with a telephone system comprising automatic switches of a well known character.

The substation A is provided with a receiver 28, transmitter 29, ringer 30, condenser 31, hook switch 17 pivoted at 18 and the component parts illustrated in Figs. 1, 2 and 3. Being an automatic substation, it is also provided with a calling device 80 controlling a pair of impulse springs 79 for transmitting impulses to the central office switching apparatus. This calling device or impulse sender may be similar to that shown and described in United States Letters Patent No. 1,119,394 granted December 1, 1914, to John G. Blessing.

The substation A is provided at the central office with an individual or line switch C, which is of the general type of subscriber's switch shown in British patent to T. G. Martin, No. 1419 of 1910, being however, of the particular type disclosed in United States Letters Patent to F. Newforth, Jr., No. 13,901, reissued April 13, 1915.

The master switch D is of the same general type disclosed in British patent to R. W. James, No. 26,301 of 1906, being however, of the particular type shown in British patent to T. G. Martin, No. 1419 of 1910. The function of the master switch, as is well known, is to maintain the plungers of all idle line switches in position to engage the terminals of an idle trunk line.

The selector switch E is of the same type of switch as that disclosed in British patent to Automatic Telephone Manufacturing Co., Ltd., No. 2543 of 1914.

The connector switch H (Fig. 5) is of the same type of connector switch as that shown in British Patent No. 2543 above referred to. The private magnet 67 is connected in a somewhat different circuit in the switch herein illustrated, but this is of no particular importance.

The line switch J and called station F are

in all respects similar to line switch C and station A. The line switch C comprises a magnet 32 having the pull-in winding 33 and holding or cut-off winding 34. The pull-in winding 33 is strong enough to operate both the cut-off arm 35 and the plunger arm 36 while the holding winding 34 is only strong enough to operate the cut-off arm 35 but will hold the plunger arm 36 in its operated position when the same has been operated by the pull-in winding 33. The line relay 37 is slow acting and closes the circuit of the pull-in winding when it is energized. The plunger arm 36 upon being operated thrusts its plunger (not shown) into a bank of contacts to extend a connection to a selector switch such as the switch E. The bank springs 38, 39, 40 and 41 are thereby pressed into contact with springs 42, 43, 44 and 45 respectively. Thereby extending the connection to the line relay 46 of the selector E. The line relay 46, upon energizing, closes the circuit for the release relay 47 which, upon energizing, opens the circuit of release magnet 48, prepares a circuit for vertical magnet 49 through slow acting relay 50 and supplies a holding ground from G' for the holding winding 34. The controlling relay 51 maintains open the circuit of switching relay 52, until the rotary magnet 53 has stepped the wipers 54, 55 and 56 onto the bank contacts of an idle trunk line leading to a connector H. The off-normal springs 57 and 58 are closed when the switch shaft takes one or more steps from its normal position.

The connector switch H carries upon its shaft (not shown) the wipers 59, 60 and 61 adapted to engage a series of bank contacts arranged in horizontal rows or levels. The vertical and rotary movements of these wipers are controlled by the vertical and rotary magnets 62 and 63 which in turn are controlled by the line relay 64. The line relay 64 when energized, closes the circuit of slow acting release relay 65. The slow acting private control relay 66 controls the circuit of private magnet 67 and slow acting cut-off relay 68. The relay 69 is controlled by the interrupter 70 to apply ringing current from the generator R to signal the called line. The ringer cut-off relay 71 when energized opens the circuit of ringing relay 69. The busy relay 72 energizes whenever the switch attempts to connect with a busy line. When energized the said relay 72, applies a busy tone from the busy machine I to the calling line. The back-bridge relay 73 is energized when the called subscriber answers. The release magnet 74 upon energizing restores the connector to its normal position. The switch shaft upon reaching normal, separates off-normal springs 75 and 76. The springs being closed when the shaft makes one or more steps from its normal position.

The battery B having one pole grounded is used for supplying current for operating the automatic switches and for talking purposes.

5 A general description of the automatic switches having been given and as they are of the type shown and described in the publications herein referred to, it is not deemed necessary to trace the details of a completed
10 connection between two substations. The operation of my improved device will be clearly seen when it is assumed that a subscriber at substation A (Fig. 1) removes his receiver from its hook support in order to
15 set up an automatic connection.

When the receiver 28 is raised from its supporting arms 16 and 17, the arms 16 and 17 remain in their position due to the engagement of pin 12 with end portion 15 of
20 arm 16. When, however, the receiver is taken out of the arms 5 and 6, the receiver shell engages and forces pin 13 upward (as viewed in Fig. 2) thereby carrying pin 12 upward far enough to disengage the end portion 15 of arm 16. The tension in spring 22
25 thereupon immediately draws the plunger 20 down (Fig. 3) and moves the arms 16 and 17 upward about the pivot 18. The spring 25 is thereby separated from spring 26 and engages spring 27. Upon referring to the
30 circuit diagram in Fig. 4, it will be seen that when this happens the circuit of ringer 30 and condenser 31 is broken and the line circuit is closed. This line circuit extends from ground G^2 through springs 77, line conductors 78, transmitter 29, receiver 28, impulse springs 79, hook switch springs 27 and
35 25, return line conductor 81, springs 82, and the line relay 37 to the battery B. The line relay, upon energizing, closes a circuit from ground G^3 through springs 83, pull-in winding 33 and contact 84 to the battery B. The plunger arm 36 thereupon thrusts its plunger into the bank of contacts 38 to 45 and extends the connection to the line relay 46.
40 The circuit for line relay 46 extends from ground G^4 through its lower winding, spring contacts 85, bank springs 45 and 41, line conductor 78 to and through station A, return conductor 81, bank springs 38 and 42, spring contacts 86 and the upper winding of said line relay 46 to the battery B. The relay 46 upon energizing, closes the circuit of release relay 47 which as before stated prepares the vertical magnet circuit and extends
55 a holding ground to the winding 34 before slow acting relay 37 falls back to open the circuit of pull-in winding 33. The circuit above traced to the line relay 46 is formed immediately after the hook switch springs 25 and 27 close contact, and as the receiver is entirely free from the switch hook arms 16 and 17 when they are released, the possibility of breaking the line circuit in the act
60 of removing the receiver to initiate a call is

removed. It should be noted that if the springs 25 and 27 are momentarily separated after the line relay 46 is energized in series with said springs, the relay 46 will be momentarily deenergized and will send an im- 70 pulse to the vertical magnet which will raise the shaft wipers to the first level where they begin to select an idle trunk line which may extend to a connector switch in an altogether different hundred group from that in which 75 the called line terminates. When, therefore, the calling subscriber operates his calling device the first digit of impulses will operate to step up the connector instead of operating the selector. The second digit of impulses will 80 rotate the connector while the last digit of impulses will be of no utility. The calling subscriber will therefore be connected with a wrong number. With my improved device wherein the receiver causes the release 85 of the switch hook arms 16—17 by forcing the spring 11 to disengage its pin 12 from 15, it is seen that the receiver will be entirely out of its seat before the springs 25 and 27 are permitted to close the line 90 circuit, thereby altogether removing the possibility of the switch E being falsely operated by the removal of the receiver.

The calling line is provided with a guarding ground potential upon its private bank 95 contacts as soon as the switch E is seized. The called line is also provided with a ground potential as soon as the connector H establishes connection therewith. If the called line is busy, the private wiper 60 of 100 the connector will engage the bank contact supplied with the guarding potential and will cause the relay 72 to energize and the private magnet 67 to hold the side switch in the second position to prevent the connection from being extended to the busy line. 105 The calling subscriber is given a busy signal from the busy machine I.

When the calling subscriber hangs up his receiver either after conversation is com- 110 pleted or after a busy line is found, the receiver upon being replaced to the arms 16 and 17 overcomes the tension of springs 22, thereby moving the plunger 20 (Fig. 3) upward to separate spring 25 from spring 27 115 and cause spring 25 to engage spring 26 thereby closing the ringer circuit. The hook comprising arms 16 and 17 is carried downward until the end 15 engages and forces the pin 12 outward. The end 15 is carried just 120 beneath pin 12 when the said pin is then forced by spring 11 to assume a position (Fig. 2) just above the end portion 15. The hook-arms 16—17 are thus held mechanically locked in this position until the re- 125 ceiver is removed for another call.

It is thus seen that I have devised a very efficient form of hook-switch for telephone systems and one which is very positive and reliable in its operation.

While I have illustrated and described my invention in connection with an automatic telephone system of a particular character it is to be understood that my invention is applicable to other automatic telephone systems as well as to operator-controlled or manual telephone systems. Also while my improved switch-hook is shown in its relation to a telephone system, I do not wish to be so limited as this device may be applied to other circuits or apparatus without departing from the spirit and scope of my invention.

What I claim as my invention is:

1. In a telephone system, a station, a line connecting said station with the exchange, a receiver, a receiver support for said station, said support comprising a plurality of U-shaped hooks arranged one within the other.
2. In a telephone system, a station, a line connecting said station with the exchange, a receiver, a support for said receiver at said station, said support comprising a plurality of hooks, one of said hooks being stationary, another of said hooks being movable in a downward direction.
3. In a telephone system, a station, a line connecting said station with the exchange, a receiver, a support for said receiver at said station, said support comprising a plurality of hooks, one of said hooks being stationary, another of said hooks being movable in a downward direction, and a spring for said stationary hook for controlling said movable hook.
4. In a telephone system, a station, a line connecting said station with the exchange, a receiver, a receiver support for said station, said support comprising a plurality of U-shaped hooks arranged one within the other, one of said hooks for supporting said receiver, another of said hooks having a spring for controlling said supporting hook.
5. In a telephone system, a station, a line connecting said station with the exchange, a receiver, a receiver support for said station, said support comprising a plurality of U-shaped hooks, arranged one within the other, one of said hooks movable by and supporting said receiver.
6. In a telephone system, a station, a line connecting said station with the exchange, a receiver, a receiver support for said station, said support comprising a plurality of U-shaped hooks arranged one within the other, one of said hooks movable by and supporting said receiver, another of said hooks having a flexible spring for controlling said supporting hook.
7. In a telephone system, a station, a line connecting said station with the exchange, a receiver, a support for said receiver at said station, said support comprising a plurality of hooks, one of said hooks being stationary, another of said hooks being movable, said

stationary hook having a flexible spring with a pair of projecting pins, one of said pins arranged to be engaged by said receiver, the other of said pins for holding said movable hook.

8. In a telephone system, a station, a line connecting said station with the exchange, a receiver, a support for said receiver at said station, said support comprising a plurality of hooks, one of said hooks being stationary, another of said hooks being movable, said stationary hook having a flexible spring with a pair of projecting pins, one of said pins arranged to be engaged by said receiver, the other of said pins for holding said movable hook, whereby when said receiver engages said first pin said movable hook is released.

9. In a telephone system, a station, a line connecting said station with the exchange, a receiver, a support for said receiver at said station, said support comprising a plurality of hooks, one of said hooks being stationary, another of said hooks being movable, said stationary hook having a flexible spring with a pair of projecting pins, one of said pins arranged to be engaged by said receiver, the other of said pins for holding said movable hook, whereby when said receiver engages said first pin said movable hook is released, and a spring for moving said movable hook.

10. In a telephone system, a station, a line connecting said station with the exchange, a receiver, a support for said receiver at said station, said support comprising a plurality of hooks, one of said hooks being stationary, another of said hooks being movable, and a spring for moving said movable hook in a vertical plane.

11. In a telephone system, a station, a line connecting said station with the exchange, a receiver, a support for said receiver at said station, said support comprising a plurality of hooks, one of said hooks being stationary, another of said hooks being movable, a spring for said stationary hook for controlling said movable hook, and a spring for moving said movable hook.

12. In a telephone system, a station, a line connecting said station with the exchange, a receiver, a support for said receiver at said station, said support comprising a plurality of hooks, one of said hooks being stationary, another of said hooks being movable in a vertical plane, a plurality of contact springs controlled by said movable hook, circuits controlled by said contact springs, and means for shifting said springs to alter the circuit conditions.

13. In a telephone system, a station, a line connecting said station with the exchange, a receiver, a support for said receiver at said station, said support comprising a plurality of hooks, one of said hooks being stationary, another of said hooks being movable in a

vertical plane, a spring for said stationary hook for controlling said movable hook, a plurality of contact springs controlled by said movable hook, circuits controlled by said contact springs, and means for shifting said springs to alter the circuit conditions.

14. In a telephone system, a station, a line connecting said station with the exchange, a receiver, a receiver support for said station, said support comprising a plurality of U-shaped hooks arranged one within the other, one of said hooks for supporting said receiver, another of said hooks having a spring for controlling said supporting hook, a plurality of contact springs controlled by said supporting hook, circuits controlled by said contact springs, and means for shifting said springs to alter the circuit conditions.

15. In a telephone system, a station, a line connecting said station with the exchange, a receiver, a receiver support for said station, said support comprising a plurality of U-shaped hooks arranged one within the other, one of said hooks movable by and supporting said receiver, a plurality of contact springs controlled by said supporting hook, circuits controlled by said contact springs, and means for shifting said springs to alter the circuit conditions.

16. In a telephone system, a station, a line connecting said station with the exchange, a receiver, a receiver support for said station, said support comprising a plurality of U-shaped hooks arranged one within the other, one of said hooks movable by and supporting said receiver, another of said hooks having a flexible spring for controlling said supporting hook, a plurality of contact springs controlled by said supporting hook, circuits controlled by said contact springs, and means for shifting said springs to alter the circuit conditions.

17. In a telephone system, a station, a line connecting said station with the exchange, a receiver, a support for said receiver at said station, said support comprising a plurality of hooks, one of said hooks being stationary, another of said hooks being movable, said stationary hook having a flexible spring with a pair of projecting pins, one of said pins arranged to be engaged by said receiver, the other of said pins for holding said movable hook, a plurality of contact springs controlled by said movable hook, circuits controlled by said contact springs, and means for shifting said springs to alter the circuit conditions.

18. In a telephone system, a station, a line connecting said station with the exchange, a receiver, a support for said receiver at said station, said support comprising a plurality of hooks, one of said hooks being stationary, another of said hooks being movable, a plunger pivotally secured to said movable hook, and means for moving said

movable hook through the medium of said plunger.

19. In a telephone system, a station, a line connecting said station with the exchange, a receiver, a support for said receiver at said station, said support comprising a plurality of hooks, one of said hooks being stationary, another of said hooks being movable, a spring for said stationary hook for controlling said movable hook, a plunger pivotally secured to said movable hook and means for moving said movable hook through the medium of said plunger.

20. In a telephone system, a station, a line connecting said station with the exchange, a receiver, a receiver support for said station, said support comprising a plurality of U-shaped hooks, one of said hooks for supporting said receiver, another of said hooks having a spring for controlling said supporting hook, a plunger pivotally secured to said supporting hook, and means for moving said supporting hook through the medium of said plunger.

21. In a telephone system, a station, a line connecting said station with the exchange, a receiver, a receiver support for said station, said support comprising a plurality of U-shaped hooks, one of said hooks movable by and supporting said receiver, another of said hooks having a flexible spring for controlling said supporting hook, a plunger pivotally secured to said supporting hook, and means for moving said supporting hook through the medium of said plunger.

22. In a telephone system, a station, a line connecting said station with the exchange, a receiver, a support for said receiver at said station, said support comprising a plurality of hooks, one of said hooks being stationary, another of said hooks being movable, said stationary hook having a flexible spring with a pair of projecting pins, one of said pins arranged to be engaged by said receiver, the other of said pins for holding said movable hook, a plunger pivotally secured to said movable hook, and means for moving said movable hook through the medium of said plunger.

23. In a telephone system, a station, a line connecting said station with the exchange, a receiver, a receiver support for said station, said support comprising a plurality of U-shaped hooks, one of said hooks movable by and supporting said receiver, another of said hooks having a flexible spring for controlling said supporting hook, a plunger pivotally secured to said movable hook, and means for moving said plunger when said movable hook is released.

24. In a telephone system, a station, a line connecting said station with the exchange, a receiver, a support for said receiver at said station, said support comprising a plurality of hooks, one of said hooks being stationary,

another of said hooks being movable, said stationary hook having a flexible spring with a pair of projecting pins, one of said pins arranged to be engaged by said receiver, the other of said pins for holding said movable hook, a plunger pivotally secured to said movable hook and means for moving said plunger when said movable hook is released.

25. In a telephone system, a subscriber's station having a transmitter and a receiver for conversational purposes, a line connecting said station with the exchange, a support for said receiver, said support operating springs to control the transmitter circuit, a latch for holding said support while said receiver is removed therefrom and means for thereafter removing said latch from the path of said support to allow said support to close said transmitter circuit.

26. In a telephone system, a subscriber's station having a transmitter and a receiver for conversational purposes, a line connecting said station with the exchange, a support for said receiver, said support operating springs to control the circuit of said transmitter and receiver, a latch for engaging and holding said support while said receiver is removed therefrom and means for thereafter removing said latch from the path of said support to allow said support to close the circuit of said transmitter and receiver.

27. In a telephone system, a subscriber's station, a line connecting said station with the exchange, a receiver, a support for said receiver, said support comprising a movable hook for holding said receiver and a stationary hook having a flexible member for holding said movable hook.

28. In a telephone system, a subscriber's station, a line connecting said station with the exchange, a receiver, a support for said receiver, said support comprising a movable hook for holding said receiver and a stationary hook having a flexible member for holding said movable hook, said flexible member controlled by said receiver for releasing said movable hook.

29. In a telephone system, a subscriber's

station, a line connecting said station with the exchange, a receiver, a support for said receiver, said support comprising a movable hook for holding said receiver and a stationary hook having a flexible member for holding said movable hook, and means controlled by the replacing of said receiver for controlling said flexible member to hold said movable hook.

30. In a telephone system, a subscriber's station, a line connecting said station with the exchange, a receiver, a support for said receiver, said support comprising a movable hook for holding said receiver and a stationary hook having a flexible member for holding said movable hook, whereby when said receiver moves said movable member into engagement with said flexible member, the said movable member is mechanically locked.

31. In a telephone system, a subscriber's station, a line connecting said station with the exchange, a receiver, a support for said receiver, a latch normally engaging with said support, means controlled by said receiver for removing said latch from engagement with said support to release said support.

32. In a telephone system, a subscriber's station, a line connecting said station with the exchange, a receiver, a hook for said receiver, a latch normally engaging said hook to prevent its operation when the receiver is lifted therefrom, and means controlled by said receiver for removing said latch from engagement with said hook to permit the operation of said hook.

33. In a telephone system, a subscriber's station, a line connecting said station with the exchange, a receiver, a hook for said receiver, circuits controlled by said hook, a latch normally engaging said hook to prevent its operation when the receiver is lifted therefrom, means controlled by said receiver for removing said latch from engagement with said hook and means for operating said hook to effect a circuit change.

Signed by me at Chicago, Cook county, Illinois, this 13th day of March, 1916.

JOHN G. BLESSING.