No. 859,884. PATENTED JULY 9, 1907.

U. S. JACKSON.

TELEPHONE SERVICE APPARATUS.

APPLICATION FILED AUG. 18, 1905.

4 SHEETS—SHEET 1.

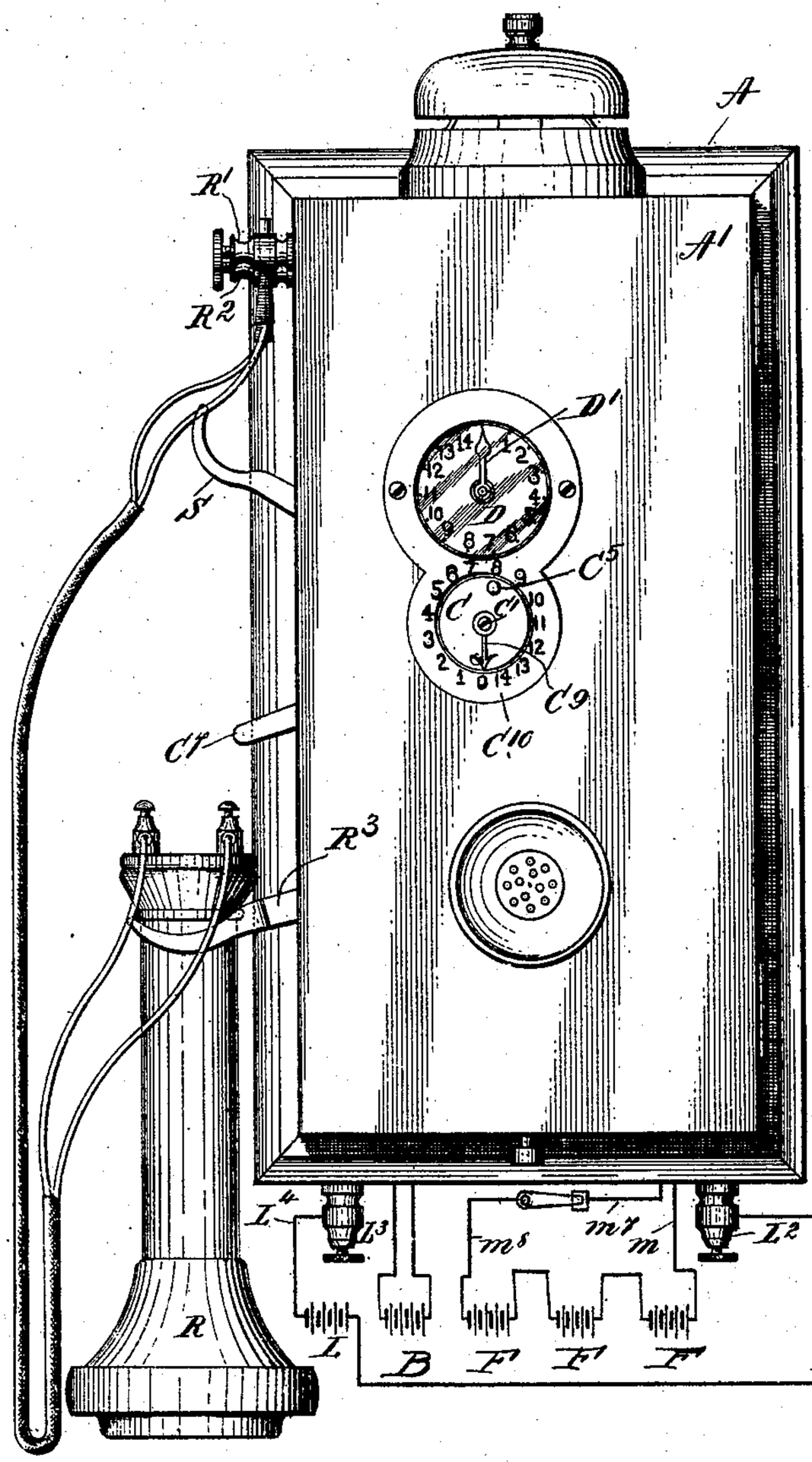

Fig. 1.

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A. C. Taisen

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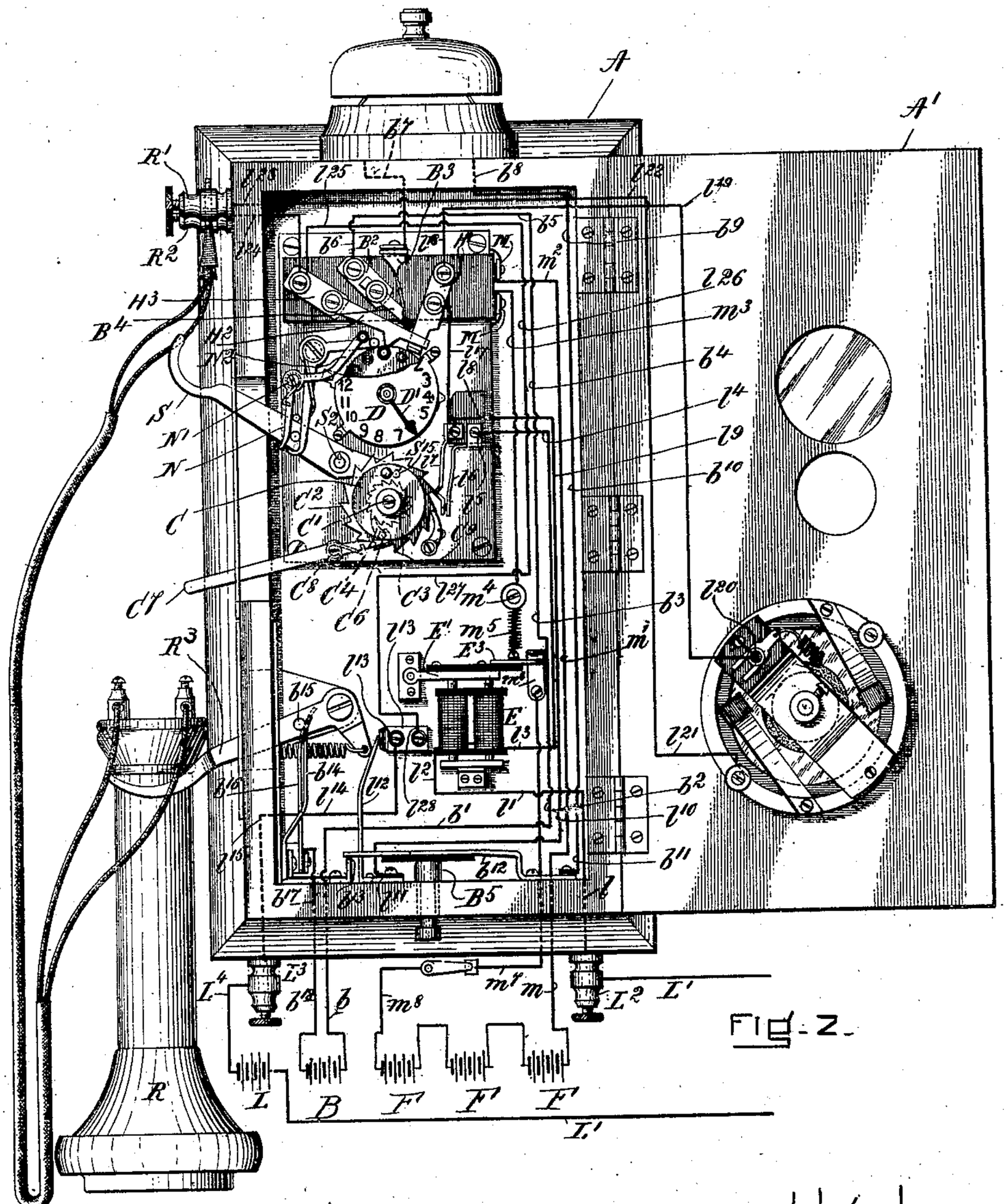

Fig. 2.

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4 SHEETS—SHEET 3.

Fig. 3.

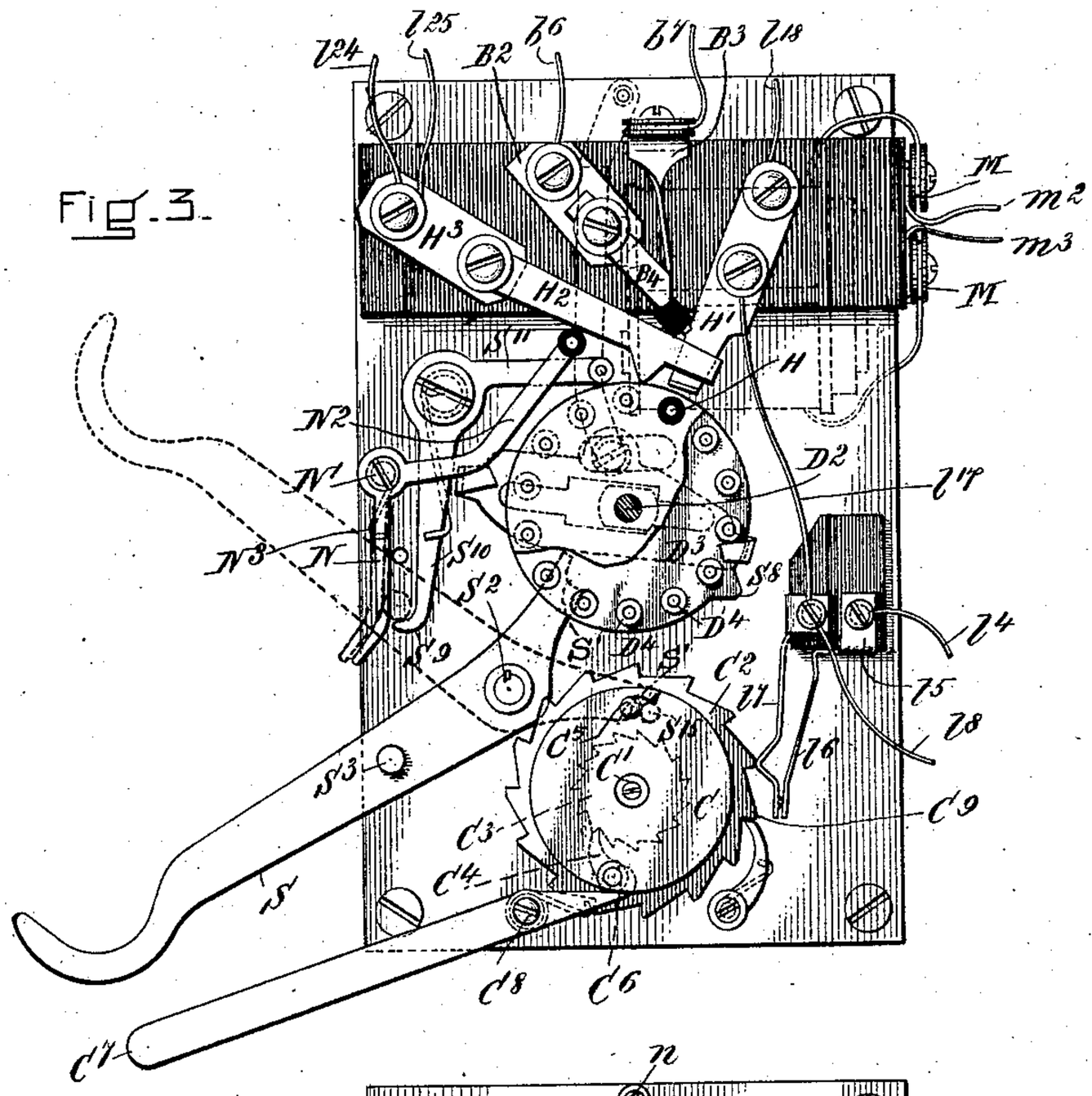
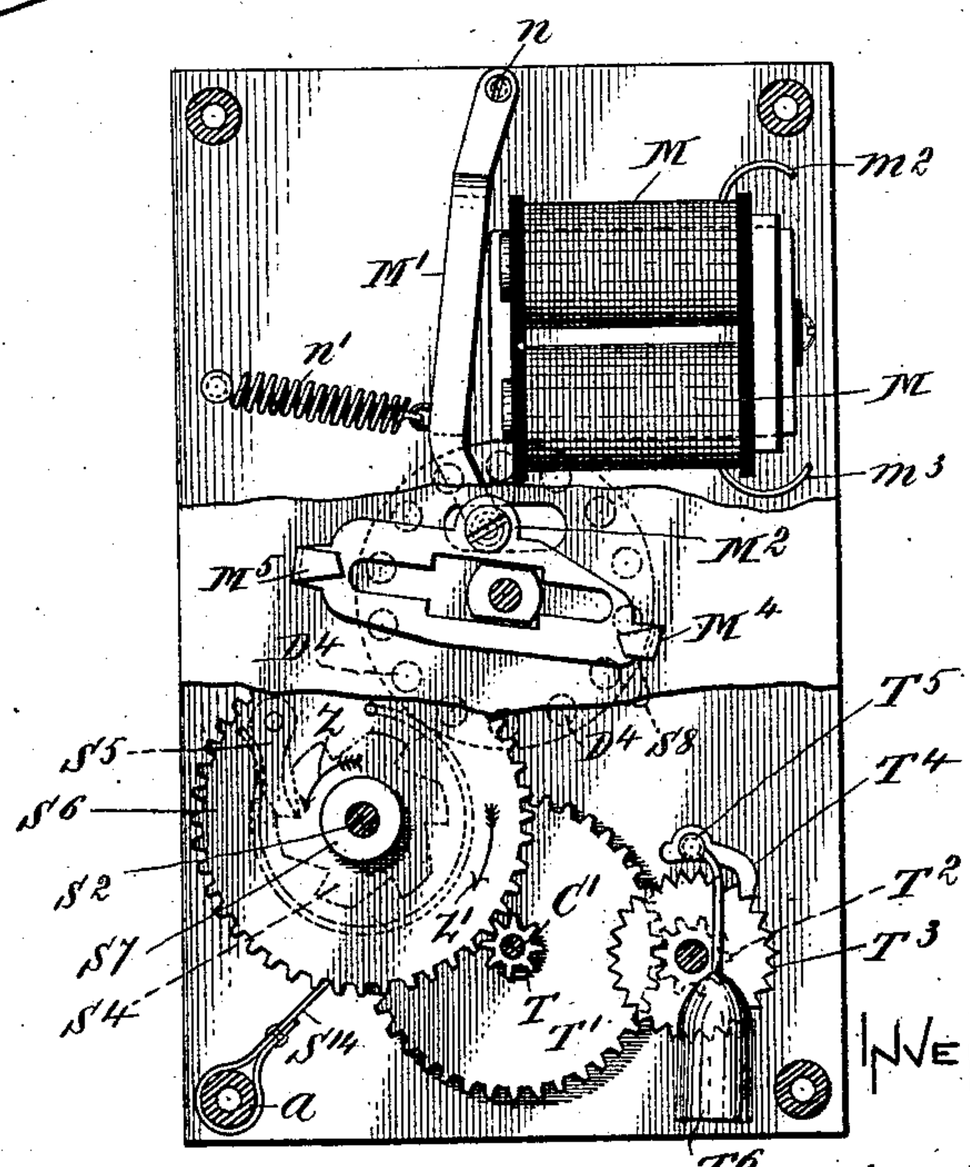


Fig. 4.



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4 SHEETS—SHEET 4.

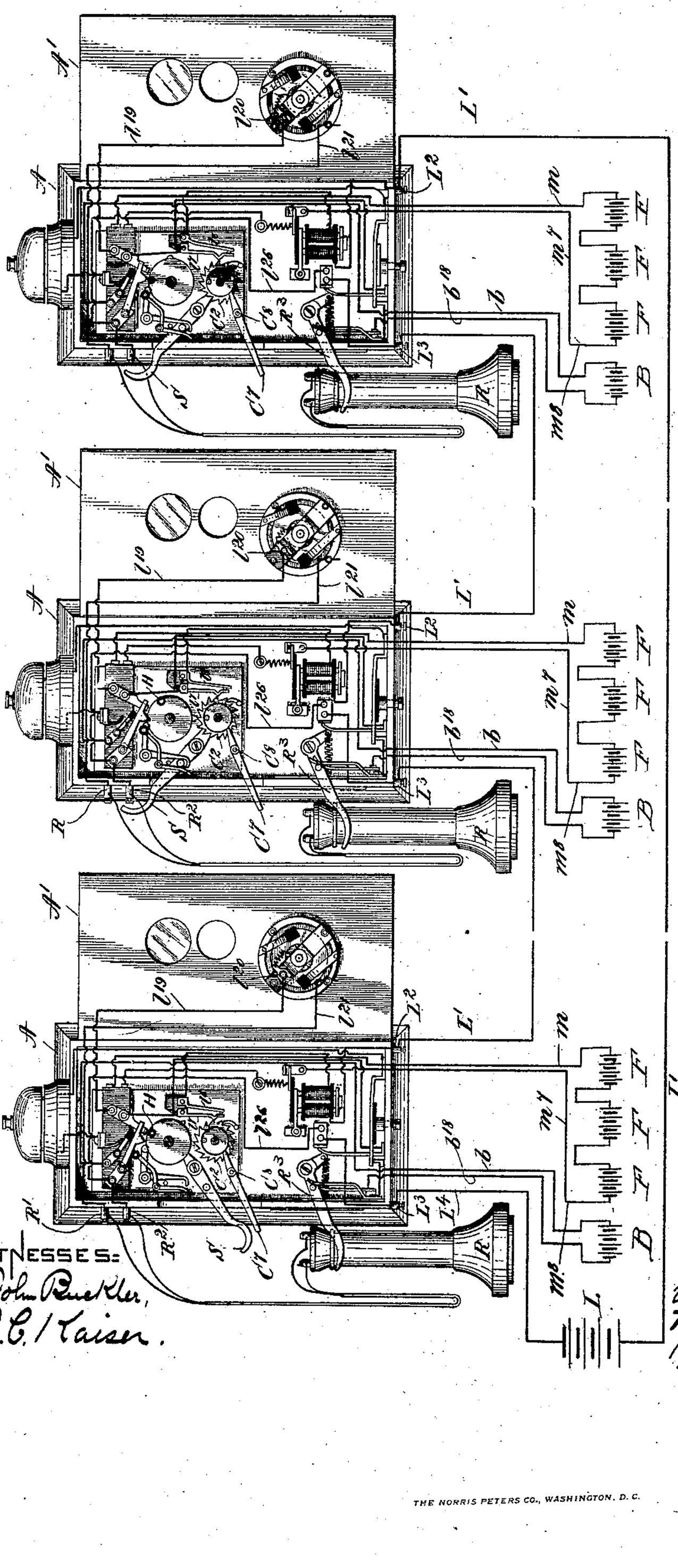

Fig. 5.

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UNITED STATES PATENT OFFICE.

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TELEPHONE-SERVICE APPARATUS.

No. 859,884. Specification of Letters Patent. Patented July 9, 1907.

Application filed August 18, 1905. Serial No. 274,781.

To all whom it may concern:

Be it known that I, URIAH S. JACKSON, a citizen of the United States, of Ossipee, in the county of Carroll and State of New Hampshire, have invented a new and useful Improvement in Telephone-Service Apparatus, of which the following, taken in connection with the accompanying drawings, is a specification.

My invention relates to what are known as two-wire (either two wires or one wire and ground) party-line telephone systems and apparatus, and is characterized by the fact that the several telephones of the line are included in closed loops tapped in a normally closed "calling" circuit, and consequently are normally short-circuited. In mode of operation the "calling" circuit is, together with the loops in which the calling and called telephones are included, utilized as the talking circuit, all telephones other than the calling and called remaining short-circuited. Each telephone-station is equipped with a manually operable device to open the normally closed talking circuit at the calling station, and also with make-and-break contact-mechanism the operation of which opens the talking circuit at the called station, whereby a talking circuit between the calling and called stations is established, all other telephones remaining short-circuited. To prevent the talking circuit, when in use, from being cut into, interfered with, or listened into, the equipment of each station includes a lock-out means to lock from operation all stations except the two in use.

The invention and the means for accomplishing the purposes stated are fully hereinafter set forth. That which is regarded as new will be set forth in the claims appended to the description.

In the accompanying drawings, illustrating an apparatus embodying the invention:—Figure 1 is an elevation of the inclosing box, the transmitting and receiving instruments and the batteries; Fig. 2 shows the same parts, the door of the box being open thus displaying the interior construction of the operating parts; Figs. 3 and 4 show in elevation details of construction; Fig. 5 illustrates the method of working.

For obvious reasons some of the details are omitted and the reference letters are not all used.

In the drawings, the box is indicated by A and its cover by A^1. The local telephone batteries are indicated by F—F and the bell-ringing battery by B. There are as many of these boxes and their batteries as there are users in the system and each user has a number for his box or station. One set of line batteries L will do for the entire system. These line batteries are preferably of the kind known as closed circuit batteries and the circuit in which they are included may be termed the "calling" circuit. In the present system, there are fourteen of these boxes, each of which is indicated by a numeral on the dial D, Figs. 1 and 2. A pointer D^1 moves on the dial D and is made to indicate to the user that the desired or called box is in connection and its user may be communicated with.

I will now describe the mechanism by which the calls are made: The lever S which may be called the winding lever is rigidly attached to the shaft S^2, and the said shaft S^2 has fixed upon it a drum S^7 and a notched wheel S^4, as shown in Fig. 4; a coiled spring, one end of which is shown as S^{14}, is attached to the post *a*, and the other end to the drum S^7. A pawl S^5 is attached to the spur gear S^6 and is constructed to engage with the said notched wheel S^4, this arrangement allows the notched wheel to be turned, by the depression of the winding lever S, in the direction of the arrow Z without turning the spur gear S^6. This action of turning the notched wheel S^4 and with it the drum S^7 winds up the spring S^{14}, as one end of it is attached to the drum S^7, and it is evident that the reaction of the said spring will give motion to the spur gear S^6 in the opposite direction, that is, in the direction indicated by the arrow Z^1. This action will take place whenever the lever S is depressed. The lever is returned to its normal position by the stress of the spring S^{14} which also rotates the spur gear S^6 in the direction of the arrow Z^1.

The spur gear S^6 communicates motion to the pinion T and the shaft C^1, thence to the contact make-and-break wheel C^2, see Figs. 2 and 3. The train T^1 T^2 and T^3 and the escapement device T^4 T^5 and T^6 have no function except to prevent the make-and-break wheel C^2 from rotating too rapidly.

The number of contact points on the wheel C^2, Fig. 3, is equal to the numerals or divisions on the dial D and to the number of the boxes in the system. A post S^{15} extends downward from the make-and-break wheel C^2 and serves as a stop for said wheel as it comes in contact with the end S^1 of the winding lever S when the said lever is in its normal position as indicated by dotted lines Fig. 3, and in full lines in Fig. 2; that is, the wheel C^2 is stopped when it has brought the pointer D^1 on the fixed dial D to "0" on said dial.

To cause the make-and-break wheel C^2 to stop when it has made a sufficient number of electrical contacts between the electrodes l^6 and l^7 to cause the required station to be called by the action of the trunnion pinion D^3 as will be explained, I have the following-described device. To the shaft C^1, a ratchet wheel C^3 is rigidly attached; this ratchet wheel has the same number of teeth that the contact wheel C^2 has contact points; see Fig. 3. A disk C, see Figs. 1 and 3, also mounted on the shaft C^1, but free to rotate upon it, has on its under side a pawl C^4 mounted upon a stop pin C^6; this stop pin extends below the pawl C^4 and serves,

when it comes in contact with the hook on the end of the controlling and releasing lever C^7, to hold the said disk C from further rotation. The said lever C^7 is pivoted at C^8. The rotatable disk C has a handle or knob C^5 for turning and also an arrow or pointer C^9 for indicating by the fixed dial C^{10} the number of the station to be called, that is, by turning the disk so that the arrow C^9 will indicate the number of the station to be called, the pawl C^4 will pass by a certain number of teeth on the ratchet C^3 according to the station to be called, the locking lever C^7 being lifted, to allow this operation:—and this action will take the stop pin C^6 so far away from the hook of the controlling lever C^7 that the make-and-break contact wheel C^2 may rotate, before being stopped by said hooks, sufficiently to make the required number of electrical contacts to operate the trunnion pinion D^3 to the extent required to open communication with the station desired. The above-described movements are dependent upon the action of the coiled spring S^{14} which operates the drum S^7 and the spur gear wheel S^6, and relate to the operation of the electric make-and-break electrodes l^6 and l^7 which I will now describe together with their function.

The battery L is the line or calling circuit battery and is of that class that is known as the closed-circuit battery. The circuit system consists of a normally closed circuit for operating the station-calling apparatus and closed local loop circuits for the telephone transmitters and receivers. This circuit, dominating and causing the batteries F—F to act through their own circuit, may be described as follows: Starting from the battery L, Fig. 2, the main line L^1 connects all of the station boxes in series as shown in Fig. 5. The relay circuits at and within the boxes are the same for all. One of these circuits will be described by reference to Fig. 2. The line wire enters the binding post L^2, thence by the wire l l^1 l^2 to the relay magnet E, thence by l^3 l^4 to binding block l^5, thence to the spring electrode l^6, to the spring electrode l^7 (when these electrodes are in contact), thence by wire l^8 l^9 l^{10} to binding plate l^{11}, thence by spring electrode l^{12} thence (when the electrode l^{12} is in contact) to contact block l^{13}, to the wire l^{14} l^{15} to binding post L^3, thence to line L^4 to battery L. The action of the last-described circuit on the local-calling circuit is as follows: The said local-calling circuit starts from the open circuit batteries F—F through the wires m m^1 m^2 to magnets at large M, Fig. 2 (see Fig. 4 and in dotted lines in Fig. 3), thence by m^3 to block m^4, coiled-spring electrode m^5 to electrode plate E^3 (attached to the armature E^1, but insulated from it), thence to fixed plate m^6 when armature E^1 is released, thence by wire m^7 m^8 to batteries F—F. Through this circuit the step-by-step movement of the pinion wheel D^3 is operated and movement is given to the pointer hand D^1 on the fixed dial D. The electro-magnet M is energized by the current through the circuit from the batteries F—F. An armature M^1 pivoted at n, Fig. 4, and retracted by the coiled spring n^1 has attached a double-acting sliding pawl M^2 having pawl points M^4 M^5. The action of the magnet when energized is to swing the pawl in one direction, and that of the spring n^1 (when the magnet is not energized) to swing the said pawl in the other direction; this back-and-forth motion of the pawl M^2 serves to give a step-by-step motion to the trunnion pinion D^3. The trunnions of this pinion are indicated by D^4 D^4. The pointer hand D^1 is attached to the shaft D^2 of the pinion D^3 so that a back-and-forth motion of the double pawl M^2 will cause the pointer hand D^1 to move one division on the fixed dial D, that is, one back-and-forth completed motion of the said pawl will cause the pointer hand to move from "0" to "1" and the next such motion from "1" to "2". One of these step-by-step motions takes place (caused by the batteries F—F) at each time a contact is made by the armature plate electrode E^3 with the fixed electrode plate m^6, that is, upon each release of the armature E^1 by the magnet E in the circuit of the line-closed circuit battery L.

The telephone circuit may be termed a closed supplemental or loop circuit from the circuit of the normally closed line or calling circuit battery, already described, and consists of the wire l^{17}, from the electrode l^7, the contact plate H^1 the wire l^{18} l^{19} to transmitter l^{20}, thence by wire l^{21} l^{22} l^{23} to binding post R^1, thence through receiver to binding post R^2, wire l^{24} to fixed plate H^3, thence by wire l^{25} l^{26} l^{27} l^{28} to fixed plate l^{13}, wire l^{14} l^{15} to binding post L^3, wire L^4 to battery L. Normally, and when a telephone instrument is not in use, contacts H' and H^2 are closed, and the talking circuit passing through the instrument not in use has two paths, one from binding post L^2 through relay E, contact springs l^6, l^7, spring l^{12}, block l^{13}, wire l^{14} to binding post L^3; the other from binding post L^2 over same route to contact spring l^7, thence by wire l^{17}, contact arms H', H^2, wires l^{25}, l^{26}, l^{27}, l^{28}, block l^{13}, to binding post L^3. Normally the current will divide through both paths, but should a party not called remove his receiver from the hook, the first circuit will be opened at l^{12}, block l^{13}, the inner end of the receiver hook being withdrawn from contact l^{12}, and the current will then pass entirely through the second circuit. It will thus be observed that the springs H', H^2 short circuit the receiver and transmitter of any instrument not called, and therefore prevent the talking circuit being listened into. There are two devices for breaking the circuit through the electrodes H^1 H^2 and establishing a telephone circuit through the plate electrode H^1, wire l^{18} l^{19} to transmitter l^{20}, etc. The first consists of the bent lever N N^2 (pivoted at N^1) controlled by the manually operable lever S. The upper end of this lever N, N^2 except when lever S is in raised or initial position rests against the electrode H^2 and will hold the same out of electrical contact with the other or plate electrode H^1 for the reason that the bent lever N N^2 has a strong spring N^3 which will force the end N^2 upward and thus keep the contact point of the electrode H^2 away from the corresponding point of the plate electrode H^1, thus keeping the telephone-loop circuit in use; but when the lever S is in its raised or normal resting position, then the pin S^3 engages the lower arm N of the lever N N^2, and thus causes the upper arm N^2 to be depressed, thus allowing the electrode H^2 to make contact with the electrode H^1 (see middle instrument, in Fig. 5) and short circuiting the local talking circuit. The other device for separating the electrodes H^2 H^1 consists of a pin H on the pinion D^3 (see Fig. 3). This pin is so located that when the pointer hand D^1 is on the number that indicates the number of the box in which it is placed then the short circuit at

contacts H′, H² is broken and the loop or telephone circuit is established and the telephone of this box can be used. The location of the pin H on the pinion is different for each box: for instance, in box No. 1 the pin H is so placed that when No. 1 is called, it, the pin, will place the telephone circuit in use when the hand is on No. 1. And in No. 6 the pin is so placed that it will place the loop or telephone circuit in use when the hand is on No. 6 of the dial, and so on.

A separate battery B is used for the bell of each station. The bell circuit and its connected parts may be described as follows: The wire b b^1 b^2 b^3 b^4 b^5 b^6 takes the current from the battery to the electrode B², Fig. 2, and through the drop latch B⁴ to the electrode B³ (when the said drop latch B⁴ is raised up by the latch H²), thence to the fixed electrode B³ and the wire b^7 to the bell. The circuit is completed by the wire b^8 b^9 b^{10} b^{11}, switch plate b^{12}, contact pin b^{13}, spring plate b^{14}, pin b^{15} (in the telephone hanging lever R³), spring plate b^{16}, wire b^{17} b^{18}, back to battery B. It will be noticed that the above bell circuit may be cut or opened in three places, viz: at the drop latch B⁴ when it is not held up by the action of the pin H acting through the electrode H²; and at the switch b^{12} when the push pin B⁵ is forced up by the user; and also by the telephone hanging lever R³, that is, when the lever is drawn up by its spring (as it will be when the telephone receiver R is taken off), the pin b^{15} will be out of contact with the spring plates b^{14} and b^{16}.

The operation may be explained as follows, all the telephones being initially or normally short-circuited. If user at station 1 wishes to call station 6 he turns disk C until stop-pin C⁶ is at 6 on dial C. Then he depresses lever S winding up spring S¹⁴ and permitting lever N, N² to open the short circuit and establish the telephone circuit at station 1. The spring S¹⁴ gives motion to the make-and-break wheel C². This wheel C² will rotate until the pointer D¹ has moved to No. 6 on the dial, that is, the double pawl M³ will have operated in all of the boxes and set all of the trunnion pinions ahead six numbers as has been explained. This action will cause the pin H of box No. 6 to break the contact between the electrodes H² and H¹ and thus cause the current to pass to the loop or talking circuit, that is, the current will pass through the electrode plate H¹, wire l^{18} and l^{19} to the transmitter l^{20} thence through wire l^{21} l^{22} and l^{23} to telephone receiver post R¹ and thence to the receiver R and the post R², thence by wire l^{24} to electrode plate H³, thence by wire l^{25} l^{26} l^{27} and l^{28} to plate l^{13}, thence by l^{14} l^{15} to post L³ and to the closed circuit battery L. Thus the user at station "1" may communicate with station No. "6" as desired.

If we assume that the person calling is at station No. 1, that is, the left-hand one on Fig. 5, his receiver R will be placed in the "loop circuit" by the action of the lever S, which he depresses at the outset. This depression of the lever S frees the lever N N² which in turn throws up the electrode H², separating it from the contact-ledge formed at the lower end of the electrode H¹, and breaks the short circuit and brings in the "loop circuit," while at the station called (that is, the station on the right of Fig. 5) the step-by-step motion of the trunnion-wheel D³ will bring the pin H to such a position that it will lift up the electrode H² and thus break the short circuit and bring the loop circuit into service of both the caller and the one called, and prevents short-circuiting of either telephone. The same movement of pin H will close the local ringing circuit at B³ B⁴, and the bell at the called station will continue to ring till the party called removes his receiver from the hook, or until the calling party replaces his receiver on the hook.

The mechanism at all the stations not in use is locked from operation by the hooked end S⁹ of lever S¹⁰ S¹¹, which engages a pin S³ on lever S, preventing the operation of said lever S, until released therefrom, by finger S⁸ of the trunnion wheel D³ lifting arm S¹¹ of the lever and withdrawing S⁹ from engagement with S³; and this occurs only when the index D′ is at "0."

To restore the apparatus to its normal condition, the user raises the outer end of the lever C⁷ by doing which he frees the pin C⁶ from the hook of the lever, and thus allows the rotation of the make-and-break wheel C² to continue until the pin S¹⁵ comes in contact with the end S¹ of the lever S and thus stops all of the rotating parts with the pointer hand at "0" as desired.

From the foregoing description it will be observed that according to my invention the several telephones are included in closed loops tapped in a normally closed calling circuit and are normally short circuited. The equipment of each telephone at each party station includes a manually operable device which opens the normally closed short circuit and establishes the talking circuit of that station, and also with a make and break contact mechanism, the operation of which breaks or opens the short circuit at a selected or called station, establishing the talking circuit of that station, and the telephone loop circuits of the called and calling stations are then in circuit with the line circuit. All other telephones on the line are unaffected and remain short-circuited. Combined with the foregoing mechanism, the equipment of each telephone is provided with a lockout means, whereby all the telephones except the calling and the called are locked out and cannot be operated, whereby the talking circuit between the calling and called stations cannot be interrupted and listening in is prevented.

Claims.

1. In a telephone service apparatus a call device consisting of a circuit make-and-break wheel; a winding lever the movement of which by the operator will incite a rotative movement in the said wheel; a step-by-step switch mechanism operated by said make-and-break wheel; an indicating disk having a pointer and stop pin attached; a fixed dial having numbers so arranged that by setting the said pointer at any determined number, a telephonic connection is made with the station corresponding with the said number; and a let-off lever constructed to allow the moving parts to restore the entire apparatus to its normal condition, that is, with all the pointers at "0"; substantially as and for the purpose set forth.

2. In a two wire party line telephone service apparatus, a normally closed calling circuit, a plurality of telephones included in closed normally short circuited loops tapped in the calling circuit, a manually operable device at each telephone station adapted to break the normal short circuit and establish the talking circuit of that station, each telephone also provided with a make and break contact mechanism the operation of which breaks the short circuit at a called station and establishes the talking circuit of that station, substantially as described.

3. In a two wire party line telephone service apparatus, a normally closed calling circuit, a plurality of telephones included in closed normally short circuited loops tapped in the calling circuit, a manually operable device at each telephone station adapted to break the normal short circuit and establish the talking circuit of that station, each telephone also provided with a make and break contact mechanism the operation of which breaks the short circuit at a called station and establishes the talking circuit of that station, and a lock out means at each telephone station arranged to prevent operation of said manually operable device of all the telephone stations.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses, on this 11th day of August A. D. 1905.

URIAH S. JACKSON.

Witnesses:
FRANK G. PARKER,
JOHN BUCKLER.