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E. A. BUELL.

PARTY TELEPHONE LINE.

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Fig. 1.

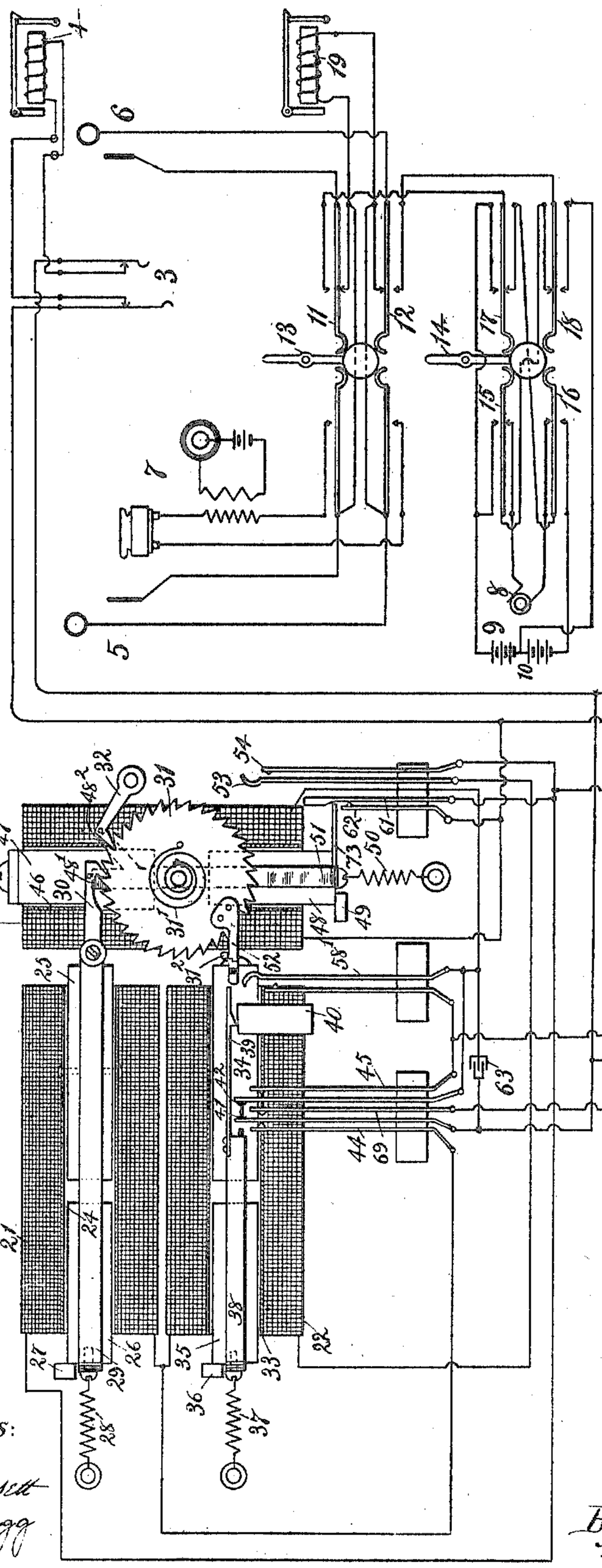
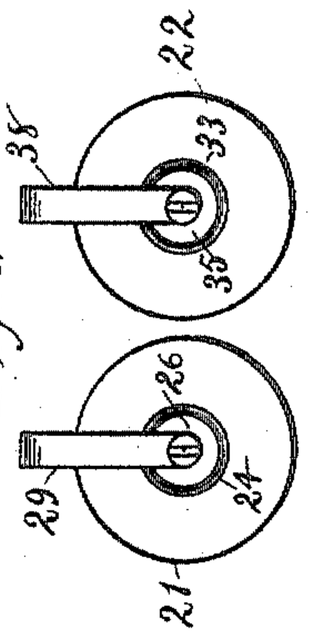


Fig. 2.



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PARTY TELEPHONE-LINE.

No. 811,691. Specification of Letters Patent. Patented Feb. 6, 1906.

Application filed March 17, 1905. Serial No. 250,621.

To all whom it may concern:

Be it known that I, EDWARD A. BUELL, a citizen of Canada, residing at Dekalb, in the county of Dekalb and State of Illinois, have invented a certain new and useful Improvement in Party Telephone-Lines, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to party telephone-lines, and has for its general object the provision of improved apparatus and circuits whereby the substations of a party-line are most effectively and accurately controlled from the exchange.

In practicing my invention I employ an electromagnet that serves to operate a step-by-step circuit-controlling switching mechanism at each substation and another electromagnet that governs the circuit relations of the aforesaid electromagnet and operated from the exchange, whereby the operation of the first aforesaid electromagnet at one station may be prevented while the operation of another selecting device at another station upon the line may be continued until both stations that are to be placed in telephonic connection are properly related to the party-line.

Another object of my invention is to clear certain of the electromagnetic mechanism from the line, whereby line loss may be reduced.

In practicing my invention I employ what I term a "selecting-magnet," which when energized preferably does not cause the operation of the ratchet-wheel that forms a part of the selecting mechanism, but which desirably causes the operating-pawl to ride over a tooth of the ratchet-wheel, so that when the magnet is deënergized a retractile spring to which the magnet is opposed may effect the reverse movement of the pawl to operate the ratchet-wheel one step. This operation of the selector-magnet and the pawl is effected for each movement of the ratchet-wheel. There is provided upon the ratchet-wheel a post or finger adapted to be brought into mechanical relation with a number of circuit-controlling switches or springs, the distances between said post and said springs varying at the different stations, so that, for example, at station No. 1 a movement of the ratchet-wheel two steps will bring the post into connection with the springs, at station No. 2 a movement of the ratchet-wheel three steps will bring the post into connection with the springs, and so on throughout the line. These circuit-controlling springs or switches govern the association of the signal at the station where said springs are located with the telephone-line. The final movement of the ratchet-wheel at a selected station thus mechanically accomplished establishes a circuit through the magnet that governs the circuit of the selector-magnet, whereafter another operation is performed at the exchange to operate the governing-magnet to open the circuit of the selector-magnet and maintain the same open, as the said governing-magnet desirably effects a latching engagement between an element coupled with the element that opens the circuit of the selector-magnet and a detent that is preferably stationary.

I will explain my invention more fully by reference to the accompanying drawings, showing a preferred embodiment, in which—

Figure 1 is a general diagrammatic view illustrating an application of the invention to a party-line, but one station of the party-line being indicated. Fig. 2 illustrates a portion of the mechanism looking from the end thereof.

Like parts are indicated by similar characters of reference throughout the different figures.

The party telephone-line extends by its limbs 1 2 from a plurality of telephone-stations, a single station A being indicated in connection with the line, though the relations of the other stations with the line will readily be understood. The limbs 1 2 of the line may terminate in the sleeve and tip contact-springs of a line-jack 3, that may be provided with back contacts to include some suitable form of line-signal 4, which in the embodiment of the invention illustrated is a low wound drop. At the exchange there are provided plugs 5 6, that may be used for uniting subscribers' lines in conversation, an operator's telephone outfit 7 being indicated in association with one end of the cord-circuit, while the other end of the cord-circuit is designed for association with the alternating or wave-form current generator 8, the battery-section 9, and the battery-section 10, according to the manipulation of the springs 11 12 by the operator's key 13 and according to the manipulation of the master-key 14 and the springs 15 16 17 18 operable thereby. Any suitable form of clearing-out indicator, as a

drop 19, of low resistance and high impedance, desirably in bridge of the cord-circuit, may be employed. In starting, it may be well to say that the battery-section 9 effects the operation of the selecting-magnet 21 (for convenience having its winding illustrated in Fig. 1 in longitudinal section) at each station, while the battery-sections 9 10 together serve to operate the governing-magnet 22, while the wave-form generator 8 operates the releasing-magnet 23.

Before describing the operation of the magnets 21 22 23 some reference will be made to their construction and interrelation, the construction shown being one of the many forms that may be used. The magnet 21 is preferably in the form of a solenoid whose bore is desirably lined with a non-magnetic substance, as a tube of brass 24, having fixed thereto a stationary section 25 of an iron core. A movable section 26 of the iron core travels within the tube 24 and is normally maintained against an abutment 27 by a spring 28. A bar 29 is secured to the movable core-section 26 and desirably projects over the winding of magnet 21, as indicated clearly in Figs. 1 and 2, the said bar 29 carrying an actuating-pawl 30, that rides over a tooth of the ratchet-wheel 31 upon each attraction of the core-section 26, which pawl is restored by the spring 28 when the magnet 21 is deënergized to effect the movement of the wheel 31 one tooth, a dog 32 preventing a return of the wheel 31 until the magnet 23 is operated to remove the dog from its association with the wheel 31, as will hereinafter appear. The magnet 22 in Fig. 1 similarly has its winding shown in longitudinal section for the sake of clearness of illustration. It also is provided with a lining of non-magnetic material, preferably a brass tube 33, to which is secured a core-section 34 of iron and in which is adapted to reciprocate a core-section 35, normally maintained against a stop 36 by a retractile spring 37. This core-section carries a bar 38, projecting over the top of the magnet 22 and carrying a latch 39, which is engaged with a detent 40 when the core-section 35 is attracted, so that the switch parts 41 42 may be maintained in the positions to which they are moved by an abutment of insulating material provided upon the arm 38, the switch element 41 being moved from its normal contact 44 into engagement with its alternate contact 69, while the switch element 42 is moved into engagement with its contact 45, with the results hereinafter to be set forth. The releasing-magnet 23 also has its winding shown in longitudinal section for the sake of clearness of illustration and desirably, also, has its bore provided with a lining of non-magnetic material, desirably in the form of a brass tube 46, to which is secured the stationary section 47 of an iron core and within which is adapted to reciprocate the section 48 of said iron core, normally held against a stop 49 by means of a retractile spring 50. A bar 51 is attached to the core element 48 and is projected over the magnet-winding 23, similar to the bars 29 and 38. This bar is provided with prongs $48'$ 48^2, that are respectively designed for engagement with the pawl 30 and the dog 32. When alternating or wave-form current from the generator 8 is impressed upon the winding 23, the core element 48 is attracted. The pawl 30 and the dog 32 are elevated by means of the prongs $48'$ 48^2 to remove the same from mechanical relation with the wheel 31, whereupon the coil-spring $31'$, attached to the said wheel, may restore the same to its initial position determined by a stop 31^2 and a finger 52, mounted upon the said wheel. A return of the wheel to its initial position is accompanied by the engagement between the finger 52 and the projecting end of the latch 39, whereby the spring 37 may withdraw the said latch and permit the springs 41 42 to assume the normal positions illustrated. A setting of the wheel 31, accomplished by the selector-magnet 21, brings the finger 52 into engagement with a switch element or spring 53 to effect connection between the spring 53 and the switch element or spring 54, with the results hereinafter to be set forth. The distances between the spring or switch elements 53 and the fingers 52 at the different stations vary, the variations of these distances preferably corresponding to a tooth-space of the wheel.

The telephone and signal apparatus at each station is preferably that illustrated at station A, where I have shown a telephone switch-hook 56, designed to support a telephone-receiver 57, having one terminal normally connected with limb 1 and with the spring 54 and having its other terminal connected, through the secondary 58 of an induction-coil, with a terminal 59, that may be engaged with the terminal 60 upon the elevation of the switch-hook 56 when the receiver is removed therefrom. One terminal of the receiver is connected with the limb 2 of the telephone-line when the latch 39 is engaged with the detent 40, such connection being effected by way of the switch element 45 and the condenser 63. While I prefer to control the complete connection of the receiver with the telephone-line through the agency of my improved apparatus, I do not wish to be limited to such control in all embodiments. The primary circuit provided for the subscriber's telephonic equipment and which includes the primary 64 and the battery 65 is closed when the switch-hook is elevated by way of the switch-hook and the switch-contact 60. The signal receiver or bell 66 has its connection with the telephone-line controlled by the switch elements 67 69 41, this circuit being adapted to be closed through the agency of

the magnet 22 when it brings the switch parts 41 and 69 together when the switch hook is depressed, for such depression of the switch-hook brings the contacts 67 68, forming a part of the bell-circuit, together. In order that my invention may be adapted to existing substation equipments, the ordinary polarized bell may be retained, providing a contact 70 in separable relation with the armature is employed, said contact being normally in engagement with said armature. The ends of the cores of the bell opposed to the armature have produced therein poles of unlike sign. I believe it to be new with me to provide a signal-bell of this description. For the purpose of operating the bell 66 current is so directed from battery-section 9 through the said bell as to cause the armature to be swung in a clockwise direction to strike the left-hand gong, the spring 71 upon the breakage of the circuit at 70 returning the clapper to strike the right-hand gong, this operation being continued as long as the battery 9 is thus included in circuit with said bell.

I will now describe the manner in which the apparatus of my invention is operated. It is of course understood that any line connected with the exchange may have connection with a party-line and any station on the party-line that I have indicated, so the operation of my apparatus will be readily understood by describing the manner in which any two stations on the same line may be connected. If a subscriber on the line initiates a call, he operates his generator 72 in normally open circuit, the operating mechanism of the generator closing a bridge of the line that preferably includes the generator to effect the operation of the line-signal 4, this bridge being preferably an independent one. The magnet 23 is of such high resistance that the generator 72 will not effect its operation, the said generator being limited to the operation of the signal 4, which is of low resistance, this generator being also adapted to operate the clearing-out drop 19 in the cord-circuit after connection has been established between the party-line and another line, which drop 19 is desirably in bridge of the cord-circuit and is also of low resistance, but high impedance. The operator inserts the plug 6 within the line-jack 3 and moves the knob or wedge of the key 14 to the right to bring the battery 9 into connection with the alternate contacts of the springs 11 12, whereafter the operator moves the wedge or knob of key 13 to the right to connect the sections of the cord-strand belonging to the plug 6 with the battery 9. The plug 6 being within the jack 3, circuit through the magnet 21 is closed, as said magnet is included in circuit with the battery 9 to cause the pawl 30 to ride over a tooth of the ratchet-wheel 31. This circuit may be opened either by restoring the key 13 or the key 14 to its central position, the key 13 being preferably employed for this purpose, permitting the spring 28 to withdraw the pawl 30 to move the ratchet-wheel 31 a single tooth. This first movement is had in order that the operator may place herself in connection with the calling subscriber, for the finger or post 52 then closes the spring 58 against its contact to connect the calling subscriber telephonically with the party-line. The telephonic circuits at all of the stations on the line are thus changed at 58; but obviously the telephonic circuit is only complete at that station where the receiver is removed from its switch-hook. This operation is essential in the apparatus illustrated, though it is not essential in all embodiments of my invention, for with the apparatus illustrated I am enabled normally to effect entire disconnection of the telephonic and signal receiving apparatus at the substations from the party-line, the only apparatus that is normally associated with the party-line at the substations being the signal-generator 72. Therefore in the embodiment of the invention illustrated, after having ascertained the connection desired and the number of the calling subscriber and assuming in the present case that the calling subscriber desires connection with a subscriber upon another line, the operator steps the wheel 31 around until the finger 52 is in engagement with the spring 53 to close the contacts 53 54 together to connect the magnet 22 with the party-line, such connection being preferably in bridge of the party-line, whereafter the position of the master-key 14 is moved to the left, to bring both battery-sections 9 10 as one battery in circuit with the line, the knob or wedge of key or switch 13 having been moved to the right, whereby the core 35 is moved to accomplish results to be presently stated. While the magnet 21 at the same time causes an operation of the core 26, there is no immediate change in the position of the wheel 31, because this change has to be effected by the spring 28, and this is an important feature of my invention. When the core element 35 is attracted, the springs 41 42 are moved into connection with the contacts 69 and 45, respectively, whereby the connection of the calling-subscriber's telephone with the line is again effected to permit the calling subscriber to converse with the called subscriber. When the core 35 has been attracted, circuit through the magnets 21 22 is opened at the springs 41 44, whereupon the finger or post 52, previously engaged with the spring 53, is moved beyond the spring, said finger 52 no longer having to perform a function until the releasing operation to be set forth. The magnet 22 is preferably of high resistance with respect to the magnet 21, so that the battery 9 acting alone will not operate the magnet 22

when it is included in circuit at the same time with the magnet 21. By providing the elements 41 44 and the mechanical operation of the pawl 30 it is immaterial whether or not the magnet 21 is energized at the same time with the magnet 22, for when the springs 41 44 have been operated by the arm 38 there is no further need for contact between the elements 53 54, and, in fact, the finger 52 moves one step farther and beyond the element 53 when the parts 41 42 have been moved in the manner specified, though I do not wish to be limited to this characteristic. There is, as a matter of fact, an advantage in having the finger 52 move beyond the element 53, because the magnet 22 has both of its terminals disconnected from the party-line, though in the apparatus illustrated only one terminal 44 of the magnet 21 is at this time disconnected. In order that the operator may release the key 13, the latch 39 is provided, which is engaged with the detent 40 when the core element 35 is attracted. With the construction of cord-circuit illustrated it is necessary to restore the key 13 to its central position, in which case the elements 39 40 or their equivalent are essential. When a calling subscriber whose station is on a party-line thus has his apparatus connected with the line for conversation with a called subscriber upon another line, obviously the subscribers at the other stations of the party-line are disconnected from the line and cannot listen in to the conversation. Where, however, secrecy is not desired, it will only be necessary to turn the wheel 31 one tooth in order to place the calling and called subscribers here spoken of in connection. Assuming that the calling subscriber desires connection with a subscriber at another station upon the same party-line the call is sent in to the operator, and the operator ascertains the connection desired and the number of the calling subscriber in the way hitherto stated, the operator rotates the wheel 31 a number of steps corresponding to the calling or called subscriber, according to which is the lower or higher numbered subscriber, first to bring the finger 52 into engagement with the spring 53 to close the elements 53 54 and thereafter to effect the attraction of the core element 35 to bring the parts 41 42 into connection with the elements 69 and 45, respectively. The operator then proceeds to step up the wheel 31 of the remaining subscriber to associate his apparatus with the party-line, one of such steps having been accomplished when the elements 41 44 were separated at the previous station, because of the operation of the spring 28, the remaining steps in such operation of the wheel at the remaining subscriber's station being accomplished by the operation of the key 13 in a manner hitherto set forth. One or the other of the subscribers thus connected with the party-line may be the called subscriber, and his signal-receiver 66 is connected in circuit with the telephone-line, such a circuit connection being traced from the limb 1 to the contact 62, the contact 61 to the signal-receiver 66 to the armature thereof, the contact 70 for the armature, the contacts 67 68, the spring 69, the contact 41, to the side 2 of the line, the condenser 63 being provided to prevent the flow of current from the battery-sections 9 10 or either of them through the telephone-receiver and through the magnet 23. The signaling-current is preferably a direct current furnished from the battery-section 9, and to impress this current upon the line the knobs or wedges of keys 13 14 are moved to the right, whereby the said battery is included in circuit with the now connected bell 66 at the called-subscriber's station, the bell at the calling-subscriber's station being removed from the line because of the elevation of the switch-hook, which has to be depressed and is depressed at the called-subscriber's station to include the signal-receiver in circuit. The relays of bell 66 are wound to produce poles of different signs near the polarized armature, the said armature being so polarized that whenever current from the battery 9 only is passed through said bell the armature will be moved against the force of the spring 71 to cause the clapper of the bell to strike the left-hand gong and to open the circuit including said battery 9 at 70, whereupon said spring will force the movement of the clapper to strike the companion gong, this operation being continued as long as the signaling-current from the battery 9 is in connection with the telephone-line and until the called subscriber removes his telephone from its switch-hook. When the party-line is to be thrown out of service, all of the ratchet-wheels 31 belonging to the subscribers' stations upon the line are to be restored to their normal positions, which result is accomplished by including the source of wave-form current 8 in circuit with the line, to which end the key 14 remains in a central position and the wedge of key 13 is moved to the right, whereby the winding 23 is subject to current from the wave-form generator 8 to effect the attraction of the core 48 to lift the pawl 38 and the dog 32 from the wheel 31 to permit the spring 31′ to restore the finger 52 (at each station) to engagement with the stock 31^2. As the finger 52 is restored it engages the latch 39 to lift the same from engagement with the detent 40, whereupon the spring 37 withdraws the arm 38 to permit of the restoration of the parts 41 42 to their normal idle conditions. After the generator 8 is removed from the line by the restoration of the key 13 the core element 48, that previously effected release of the elements 30 32, is restored by the spring 50. In order that the generator 8 may not effect the operation of the signal 66 of the stations selectively connected with a party-line, I pro-

vide the switch elements 61 62, through which the signal-circuit is normally completed, but which is separated by means of a post 73, operated by the core element 48 and which engages the spring 61, to separate it from its contact 62 when the core element 48 is attracted magnetically. I do not wish to be limited, however, to this particular way of opening the signal-circuit upon the release of the mechanism at selected stations.

It will be seen that in order to effect the operation of each wheel 31 the magnet 21 has only a uniform load imposed thereupon, for it does not have to operate against the force of the spring 31′. The force of the spring 31′ as it is wound is only opposed by the spring 28, which may be mechanically adjusted with reference to the spring 31′ to secure as full a rotation of the wheel 31 as is desired. In other words, the only work that the magnet 21 has to perform is to move the pawl 32 to escape a tooth of the wheel 31, which work is uniform irrespective of the position of the wheel 31.

While I have shown a manually-operated selecting-key 13 of the oscillating type, I do not wish to be limited to the form of selecting switching mechanism at the exchange that I have shown, as any suitable selecting mechanism may be employed at the exchange for the purpose of my invention.

It will be seen that I have eliminated all ground connections from the electromagnetic mechanism entering into the apparatus of my invention, the circuits governing said mechanism being metallically connected with the party-line.

The means that I prefer to employ for restoring the ratchet-wheel resides in a spring.

In some of the claims I speak of "breaking the engagement of the detent" in the sense of unlocking the switching mechanism. Mere contact of the detent and switching mechanism is not an engagement here contemplated, for such mere contact may not lock the switch.

It is obvious that many changes may be made in the apparatus and circuit arrangements that I have illustrated without departing from the spirit of my invention, and I do not, therefore, wish to be limited to the precise apparatus and circuit arrangement shown; but,

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. A telephone-line having a plurality of subscribers' stations associated therewith to constitute the same a party telephone-line, each of said subscribers' stations including selecting switching mechanism having a magnet in circuit relation with the line, a ratchet-wheel, a pawl operated by the magnet to escape the teeth of the ratchet-wheel, a spring operating upon the pawl to cause the same to move the ratchet-wheel, and a second magnet governing the circuit of the aforesaid magnet.

2. A telephone-line having a plurality of subscribers' stations associated therewith to constitute the same a party telephone-line, each of said subscribers' stations including selecting switching mechanism having a magnet in circuit relation with the line, a ratchet-wheel, a pawl operated by the magnet to escape the teeth of the ratchet-wheel, a spring operating upon the pawl to cause the same to move the ratchet-wheel, and a second magnet in circuit relation with the party-line governing the circuit of the aforesaid magnet.

3. A telephone-line having a plurality of subscribers' stations associated therewith to constitute the same a party telephone-line, each of said subscribers' stations including selecting switching mechanism having a magnet in circuit relation with the line, a ratchet-wheel, a pawl operated by the magnet to escape the teeth of the ratchet-wheel, a spring operating upon the pawl to cause the same to move the ratchet-wheel, a dog preventing premature restoration of said wheel, and a releasing-magnet for moving said pawl and dog out of mechanical relation with the ratchet-wheel to permit its restoration.

4. A telephone-line having a plurality of subscribers' stations associated therewith to constitute the same a party telephone-line, each of said subscribers' stations including selecting switching mechanism having a magnet in circuit relation with the line, a ratchet-wheel, a pawl operated by the magnet to escape the teeth of the ratchet-wheel, a spring operating upon the pawl to cause the same to move the ratchet-wheel, a second magnet governing the circuit of the aforesaid magnet, a dog preventing premature restoration of said wheel, and a releasing-magnet for moving said pawl and dog out of mechanical relation with the ratchet-wheel to permit its restoration.

5. A telephone-line having a plurality of subscribers' stations associated therewith to constitute the same a party telephone-line, each of said subscribers' stations including selecting switching mechanism having a magnet in circuit relation with the line, a ratchet-wheel, a pawl operated by the magnet to escape the teeth of the ratchet-wheel, a spring operating upon the pawl to cause the same to move the ratchet-wheel, a second magnet in circuit relation with the party-line governing the circuit of the aforesaid magnet, a dog preventing premature restoration of said wheel, and a releasing-magnet for moving said pawl and dog out of mechanical relation with the ratchet-wheel to permit its restoration.

6. A telephone-line having a plurality of subscribers' stations associated therewith to constitute the same a party telephone-line,

each of said subscribers' stations including selecting switching mechanism having a magnet in circuit relation with the line, a ratchet-wheel, a pawl operated by the magnet to escape the teeth of the ratchet-wheel, a spring operating upon the pawl to cause the same to move the ratchet-wheel, a second magnet governing the circuit of the aforesaid magnet, a dog preventing premature restoration of said wheel, and a releasing-magnet in circuit relation with the line for moving said pawl and dog out of mechanical relation with the ratchet-wheel to permit its restoration.

7. A telephone-line having a plurality of subscribers' stations associated therewith to constitute the same a party telephone-line, each of said subscribers' stations including selecting switching mechanism having a magnet in circuit relation with the line, a ratchet-wheel, a pawl operated by the magnet to escape the teeth of the ratchet-wheel, a spring operating upon the pawl to cause the same to move the ratchet-wheel, a second magnet in circuit relation with the party-line governing the circuit of the aforesaid magnet, a dog preventing premature restoration of said wheel, and a releasing-magnet in circuit relation with the line for moving said pawl and dog out of mechanical relation with the ratchet-wheel to permit its restoration.

8. A party-line subscriber's station having selecting switching mechanism including a magnet, step-by-step mechanism operated through the agency of said magnet, which thus constitutes a selecting-magnet, a governing-magnet, switching mechanism operated by the governing-magnet and controlling the circuit of the selecting-magnet, detent mechanism for holding the latter switching mechanism in the position to which it is operated by the governing-magnet, and a releasing-magnet and mechanism operated thereby for releasing the detent mechanism to permit of restoration of the latter switching mechanism.

9. A party-line subscriber's station having selecting switching mechanism including a magnet, step-by-step mechanism operated through the agency of said magnet, which thus constitutes a selecting-magnet, a governing-magnet, switching mechanism controlling the circuits of the selecting-magnet and signal-receiver, detent mechanism for holding the latter switching mechanism in the position to which it is operated by the governing-magnet, and a releasing-magnet and mechanism operated thereby for releasing the detent mechanism to permit of restoration of the latter switching mechanism.

10. A party-line subscriber's station having selecting switching mechanism including a magnet, step-by-step mechanism operated through the agency of said magnet, which thus constitutes a selecting-magnet, a governing-magnet, switching mechanism governing the circuits of the selecting-magnet and telephone, detent mechanism for holding the latter switching mechanism in the position to which it is operated by the governing-magnet, and a releasing-magnet and mechanism operated thereby for releasing the detent mechanism to permit of restoration of the latter switching mechanism.

11. A party-line subscriber's station having selecting switching mechanism including a magnet, step-by-step mechanism operated through the agency of said magnet, which thus constitutes a selecting-magnet, a governing-magnet, switching mechanism governing the telephone, signal-receiver and selecting-magnet circuits, detent mechanism for holding the latter switching mechanism in the position to which it is operated by the governing-magnet, and a releasing-magnet and mechanism operated thereby for releasing the detent mechanism to permit of restoration of the latter switching mechanism.

12. A party-line subscriber's station having selecting switching mechanism including a releasing-magnet for restoring the selecting mechanism to its normal condition, and a switching device operated by the releasing-magnet for opening the signal-receiving circuit.

13. A telephone-line having a plurality of subscribers' stations associated therewith, to constitute the same a party telephone-line, each of said subscribers' stations including selecting switching mechanism having a magnet in circuit relation with the line, a ratchet-wheel, a pawl operated by the magnet, to escape the teeth of the ratchet-wheel, a spring operating upon the pawl, to cause the same to move the ratchet-wheel in one direction, a spring for effecting the movement of the ratchet-wheel in a reverse direction, and a second magnet governing the circuit of the aforesaid magnet.

14. A telephone-line having a plurality of subscribers' stations associated therewith, to constitute the same a party telephone-line, each of said subscribers' stations including selecting switching mechanism having a magnet in circuit relation with the line, a ratchet-wheel, a pawl operated by the magnet, to escape the teeth of the ratchet-wheel, a spring operating upon the pawl, to cause the same to move the ratchet-wheel in one direction, a spring for effecting the movement of the ratchet-wheel in a reverse direction, and a second magnet in circuit relation with the party-line governing the circuit of the aforesaid magnet.

15. A telephone-line having a plurality of subscribers' stations associated therewith, to constitute the same a party telephone-line, each of said subscribers' stations including selecting switching mechanism having a magnet in circuit relation with the line, a ratchet-wheel, a pawl operated by the magnet, to es-

cape the teeth of the ratchet-wheel, a spring operating upon the pawl, to cause the same to move the ratchet-wheel in one direction, a spring for effecting the movement of the ratchet-wheel in a reverse direction, a second magnet governing the circuit of the aforesaid magnet, a dog preventing premature restoration of said wheel, and a releasing-magnet for moving said pawl and dog out of mechanical relation with the ratchet-wheel, to permit its restoration.

16. A telephone-line having a plurality of subscribers' stations associated therewith, to constitute the same a party telephone-line, each of said subscribers' stations including selecting switching mechanism having a magnet in circuit relation with the line, a ratchet-wheel, a pawl operated by the magnet, to escape the teeth of the ratchet-wheel, a spring operating upon the pawl, to cause the same to move the ratchet-wheel in one direction, a spring for effecting the movement of the ratchet-wheel in a reverse direction, a second magnet in circuit relation with the party-line governing the circuit of the aforesaid magnet, a dog preventing premature restoration of said wheel, and a releasing-magnet for moving said pawl and dog out of mechanical relation with the ratchet-wheel, to permit its restoration.

17. A telephone-line having a plurality of subscribers' stations associated therewith, to constitute the same a party telephone-line, each of said subscribers' stations including selecting switching mechanism having a magnet in circuit relation with the line, a ratchet-wheel, a pawl operated by the magnet, to escape the teeth of the ratchet-wheel, a spring operating upon the pawl to cause the same to move the ratchet-wheel in one direction, means for effecting the movement of the ratchet-wheel in a reverse direction, and a second magnet governing the circuit of the aforesaid magnet.

18. A telephone-line having a plurality of subscribers' stations associated therewith, to constitute the same a party telephone-line, each of said subscribers' stations including selecting switching mechanism having a magnet in circuit relation with the line, a ratchet-wheel, a pawl operated by the magnet, to escape the teeth of the ratchet-wheel, a spring operating upon the pawl, to cause the same to move the ratchet-wheel in one direction, means for effecting the movement of the ratchet-wheel in a reverse direction, and a second magnet in circuit relation with the party-line governing the circuit of the aforesaid magnet.

19. A telephone-line having a plurality of subscribers' stations associated therewith, to constitute the same a party telephone-line, each of said subscribers' stations including selecting switching mechanism having a magnet in circuit relation with the line, a ratchet-wheel, a pawl operated by the magnet, to escape the teeth of the ratchet-wheel, a spring operating upon the pawl, to cause the same to move the ratchet-wheel in one direction, means for effecting the movement of the ratchet-wheel in a reverse direction, a second magnet governing the circuit of the aforesaid magnet, a dog preventing premature restoration of said wheel, and a releasing-magnet for moving said pawl and dog out of mechanical relation with the ratchet-wheel, to permit its restoration.

20. A telephone-line having a plurality of subscribers' stations associated therewith, to constitute the same a party telephone-line, each of said subscribers' stations including selecting switching mechanism having a magnet in circuit relation with the line, a ratchet-wheel, a pawl operated by the magnet, to escape the teeth of the ratchet-wheel, a spring operating upon the pawl, to cause the same to move the ratchet-wheel in one direction, means for effecting the movement of the ratchet-wheel in a reverse direction, a second magnet governing the circuit of the aforesaid magnet, a dog preventing premature restoration of said wheel, and a releasing-magnet for moving said pawl and dog out of mechanical relation with the ratchet-wheel, to permit its restoration.

21. A party telephone-line extending from a plurality of subscriber's stations to an exchange, each subscriber's station having thereat a signaling-generator, a signal receiver or bell, switching mechanism serving, when unset, to permit of operative association between the signaling-generator and the line and between the telephone and the line, and, when actuated, to dissociate the generator and telephone from the line, additional switching mechanism for establishing operative association between the telephone and the line at a selected station, a detent engaging an actuated portion of the additional switching mechanism to hold the same in the position to which it is set, electromagnetic apparatus governing the aforesaid switching mechanisms and also operating to break the engagement of the detent at a selected station, and apparatus at the exchange for governing the operation of the electromagnetic mechanisms at the different stations.

22. A party telephone-line extending from a plurality of subscribers' stations to an exchange, each subscriber's station having thereat a signaling-generator, a signal receiver or bell, switching mechanism serving, when unset, to permit of operative association between the signaling-generator and the line, and, when actuated, to dissociate the generator from the line, additional switching mechanism for establishing operative association between the telephone and the line at a selected station, a detent engaging an actu-

ated portion of the additional switching mechanism to hold the same in the position to which it is set, electromagnetic apparatus governing the aforesaid switching mechanisms and also operating to break the engagement of the detent at a selected station, and apparatus at the exchange for governing the operation of the electromagnetic mechanisms at the different stations.

23. A party telephone-line extending from a plurality of subscribers' stations to an exchange, each subscriber's station having thereat a signaling-generator, a signal receiver or bell, switching mechanism serving, when unset, to permit of operative association between the signaling-generator and the line, and, when actuated, to dissociate the generator from the line, additional switching mechanism for establishing operative association between the signal-receiver and the line at a selected station, a detent engaging an actuated portion of the additional switching mechanism to hold the same in the position to which it is set, electromagnetic apparatus governing the aforesaid switching mechanisms and also operating to break the engagement of the detent at a selected station, and apparatus at the exchange for governing the operation of the electromagnetic mechanisms at the different stations.

24. A party telephone-line extending from a plurality of subscribers' stations to an exchange, each subscriber's station having thereat a telephone, switching mechanism serving, when unset, to permit of operative association between the telephone and the line, and, when actuated, to dissociate the telephone from the line, additional switching mechanism for establishing operative association between the telephone and the line at a selected station, a detent engaging an actuated portion of the additional switching mechanism to hold the same in the position to which it is set, electromagnetic apparatus governing the aforesaid switching mechanisms and also operating to break the engagement of the detent at a selected station, and apparatus at the exchange for governing the operation of the electromagnetic mechanisms at the different stations.

25. A party telephone-line extending from a plurality of subscribers' stations to an exchange, switching mechanism for establishing operative association between the telephone and the line at a selected station, a detent engaging an actuated portion of said switching mechanism to hold the same in the position to which it is set, electromagnetic apparatus governing the aforesaid switching mechanism and also operating to break the engagement of the detent at a selected station, and apparatus at the exchange for governing the operation of the electromagnetic mechanisms at the different stations.

26. A party telephone-line extending from a plurality of subscribers' stations to an exchange, switching mechanism for establishing operative association between the telephone and the line at a selected station, a detent engaging an actuated portion of said switching mechanism to hold the same in the position to which it is set, electromagnetic apparatus governing the aforesaid switching mechanism and also operating to break the engagement of the detent at a selected station, and apparatus for governing the operation of the electromagnetic mechanisms at the different stations.

27. Substation apparatus for party telephone-lines, including switching mechanism serving to control the association of the telephone with the line, a detent for holding the switching mechanism in the position to which it has been actuated, and electromagnetic mechanism for operating the said switching mechanism, to permit the detent to engage the same, and for breaking the engagement of the detent from connection with the switching mechanism.

28. Substation apparatus for party telephone-lines, including switching mechanism serving to control the association of the telephone with the line, a detent for holding the switching mechanism in the position to which it has been actuated, and electromagnetic mechanism for operating the said switching mechanism, to permit the detent to engage the same, and for breaking the engagement of the detent from connection with the switching mechanism, in combination with switching apparatus at an exchange for effecting the operation of said electromagnetic mechanism.

29. A party telephone-line extending from a plurality of substations to an exchange, signaling-generators at the substations, switching mechanism for establishing operative association between the signaling-generators and the line at the different stations, electromagnetic apparatus governing the aforesaid switching mechanism, and apparatus at the exchange for governing the operation of the electromagnetic mechanisms at the different stations.

30. A telephone-line extending from a substation to an exchange, a signaling-generator at the substation, switching mechanism for establishing operative association between the generator and the line, electromagnetic mechanism governing the operation of the switching mechanism, and apparatus at the exchange for governing the operation of the electromagnetic mechanism.

In witness whereof I hereunto subscribe my name this 10th day of March, A. D. 1905.

EDWARD A. BUELL.

Witnesses:
E. L. CRAGG,
M. CRAGG.